Summer 2023

Regional Water Resources Plan North West

Strategic Environmental Assessment

Environmental Report

Tionscadal Éireann Project Ireland 2040

6 CLEAN WATER AND SANITATION

Data disclaimer: This document uses best available data at time of writing. As data relating to population forecasts and trends are based on information gathered before the Covid-19 Pandemic, monitoring and feedback will be used to capture any updates. The National Water Resources Plan will also align to relevant updates in applicable policy. In December 2022, the Water Services (Amendment) (No. 2) Act, 2022 was signed into law. This act provides that, from the 31 December 2022, Irish Water will only be known as Uisce Éireann. It also provides that, from that date, all references in any enactment, legal proceedings or other document to Irish Water shall be construed as references to Uisce Éireann only. The SEA Environmental Report and Appendices reflect this transition from Irish Water to Uisce Éireann.

Baseline data included in the RWRP-NW has been incorporated from numerous sources including but not limited to; National Planning Framework, Central Statistics Office, Regional Spatial and Economic Strategies, Local Authority data sets, Regional Assembly data sets and Uisce Éireann data sets. Data sources are detailed in the relevant sections of the RWRP-NW. The year 2019 was selected as the base year to align with the planning period (2019-2025) of the NWRP.

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1 Introduction and Background

1 Introduction and Background

1.1 Introduction

On the 1st of January 2014, through the Water Services (No. 2) Act 2013, Uisce Éireann assumed statutory responsibility for the provision of public water services and management of water and wastewater investment. Uisce Éireann's role is to provide public water and wastewater services throughout the country.

Uisce Éireann is the custodian with the responsibility to manage the precious water resource and, with Local Authority partners, secure it for future generations. It is Uisce Éireann's responsibility to ensure that all their customers receive a safe and secure supply of drinking water and have their wastewater collected, appropriately treated and returned to the environment. Uisce Éireann support Ireland's social and economic growth in a sustainable manner through appropriate investment in water services.

Uisce Éireann is regulated by:

- The economic regulator, the Commission for Regulation of Utilities (CRU), which is charged with protecting the interests of the customer. The CRU also approves funding requirements to enable the utility to deliver required services to specified standards in an efficient manner;
- The environmental regulator, the Environmental Protection Agency (EPA), which sets standards and enforces compliance with EU and National Regulations for drinking water supply and wastewater discharge to waterbodies. The EPA liaises with the Health Services Executive in matters of public health; and
- Uisce Éireann, like all other developers, will also be constrained by planning and environmental legislation and building control regulations when delivering its infrastructure projects.

1.2 What is the National Water Resources Plan?

Effective water services, including the delivery of a sustainable and reliable clean water supply and safe disposal of wastewater, are essential for a modern country. Being able to understand and estimate how much water is required, where it is required, and the variability of requirements over the course of the year or over time, is essential to plan appropriately for the future of the public water supply.

A Water Resources Plan is a strategic plan used to identify deficiencies and need across a water supply and to develop Plan level solutions to address these issues.

Uisce Éireann's National Water Resources Plan (NWRP) will be the first resources plan for the public water supply in the Republic of Ireland. It will allow Uisce Éireann to integrate Government Policy, Legislation and external factors that have the potential to impact Uisce Éireann supplies into the planning and operation of its existing and future supply asset base.

The objective of a NWRP is to manage customer and communities needs while meeting their requirements over the short, medium and long term by ensuring safe, secure, sustainable and reliable water supplies. The NWRP will:

- Enable Uisce Éireann to address needs across our water supplies in the most effective way over time, by identifying and in turn, prioritising what needs to be included in regulated investment cycles;
- Ensure that there is a transparent framework to develop the most appropriate projects/programmes to meet statutory obligations in relation to water supply; and

- Provide a framework to track outcomes, allowing interventions to be prioritised to bring the water supply up to the required standards in the shortest possible timeframe.

As a basis for broad public and stakeholder engagement, the NWRP (the Plan) will be delivered in two phases. In the first Phase, the Framework Plan, Uisce Éireann consulted on the methodologies they have developed in order to identify need and find solutions to address need across all of its supplies. The Framework Plan was adopted by Uisce Éireann in May 2021. Uisce Éireann also assessed the need across each of the 539 public water supplies nationally, in terms of:

- **Water Quantity** that Uisce Éireann can provide;
- **Water Quality** that Uisce Éireann can provide; and
- Performance of and operational efficiency of Uisce Éireann's **Asset Base**.

Water Resources Plans are reviewed on a cyclical basis to take account of new information, data, policies and laws and are usually updated every 5 years in other jurisdictions. Uisce Éireann know things will change over the next 25 years so within the NWRP it has considered a range of possible futures, some more challenging than others. This approach is called adaptive planning, and means Uisce Éireann is ready and flexible whatever the future holds and will formally update the NWRP every 5 years.

The requirement for the NWRP was identified in Uisce Éireann's Water Services Strategic Plan (WSSP) published in 2014 which sets out the company's objectives in relation to the provision of water services for the State over a 25 year period.

As this is Uisce Éireann's first NWRP, it was considered necessary to divide the public water supply system into the regional groups (as more clearly outlined in the Framework Plan and the Regional Water Resources Plans (RWRPs)). The regional boundaries are only relevant for the development of the first NWRP and have been identified as the most appropriate way to allow Uisce Éireann to identify Preferred Approaches (water supply solutions) in an efficient and timely manner. Once the first NWRP has been finalised, while it is comprised of the Framework Plan and four RWRPs, together they will be treated as a unified plan. The relevant regional groupings will have no ongoing application for Water Supply in Ireland.

The Water Treatment Plants (WTPs) feed water into supply areas known as Water Resource Zones (WRZs). Each WRZ is an independent water supply system serving a region, town or village and is also governed by topography or the extent of the water distribution network in an area. Within a WRZ most customers receive the same Level of Service (LoS), measured as a probability of interruption to services (for example one interruption to supply in 50 years). There are 539 WRZs in the Republic of Ireland. These range in size, serving populations of less than 30 people (small rural areas) up to 1.6 million people (Greater Dublin Area (GDA)).

The Republic of Ireland has a dispersed population and water supplies were historically developed in response to need in the immediate vicinity. As a result, some supplies were developed using surface or groundwater sources with limitations in terms of quantity available and/or variable raw water quality.

Also, due to long term under investment in water services many of Uisce Éireann's water supply assets (WTPs, water mains etc.) are in need of upgrades or additional infrastructure is required.

As a result, there are a number of key issues that impact the quality, sustainability and reliability of Uisce Éireann's existing water supplies:

- **Single Source Supplies:** Many WRZs rely on a single source of supply, meaning they are more vulnerable to interruptions to supply;

- **Unsustainable Water Sources:** Current supplies often come from small local rivers. Abstractions from small rivers can have a large impact on flow rates during dry periods which has the potential to impact their status under the Water Framework Directive (WFD). Uisce Éireann must ensure that abstractions do not adversely impact the environment so that Ireland can comply with its obligations under the WFD. Abstractions from small watercourses may also be more likely to be impacted by water quality issues due to upstream wastewater discharges which proportionately have a greater impact on the receiving watercourse;
- **Treatment Capacity:** Rapid growth in some areas has meant that some WTPs are undersized and treat water in quantities that exceed the original design capacity of these facilities which could lead to lower treatment efficiencies;
- **Water Quality:** Although 99.6% of samples passed quality tests in 2019, some water treatment facilities and distribution systems do not function as effective barriers to reduce risk and may not consistently ensure safe drinking water at Customer's taps. A legacy of under-investment has exacerbated the problems with some water supply assets;
- **Network Performance**: The performance of the distribution networks does not meet European norms, and leakage and distribution losses are unacceptably high. Key issues include:
    - The average age of the water mains infrastructure in Ireland is estimated at between 65 and 85 years. This compares to an EU average of 36 years;
    - The cast iron mains in our cities and towns are often heavily corroded and vary in age from 50 to 160 years, giving rise to high leakage, rust discolouration and high risk of failure causing supply disruption; and
    - Other pipe materials such as uPVC and Asbestos Cement laid between the 1960s and 1980s can also be problematic with high burst frequency.
- **Constrained Funding:** Due to long term underinvestment in water services many of Uisce Éireann's assets are at risk of failing and are in need of significant capital investment. This issue, coupled with increasingly strict EU standards regarding treated water quality and protection of the environment, are together driving the need to increase as opposed to reduce expenditure.

1.3 Progress to Date

Uisce Éireann has made positive progress in improving water quality for their customers by developing policies and strategies for water supply. Uisce Éireann have progressed projects and programmes to deliver the requirements of these policies. Uisce Éireann's Investment periods, (known as Revenue Control periods) set out how much Uisce Éireann can spend on projects and programmes for that period.

The first Capital Investment Plan covered the period 2014-2016. The second investment plan covered 2017-2019. Uisce Éireann are currently implementing the investment plan for 2020-2024.

Between January 2014 and December 2019 Uisce Éireann invested €3.9 billion in public water and wastewater infrastructure, with a further projected spend of circa €5bn by 2024. Uisce Éireann have invested in a range of water projects and programmes that will support and enable proper planning and sustainable development at a National, Regional and Local level. The objective of this approach has been to deliver a balanced portfolio of investment across the three themes of Quality, Conservation and Future Proofing.

1.3.1 Water Quality

Uisce Éireann aims to lift Boil Water Notices (BWN) through targeted investment. Since 2014 Uisce Éireann has lifted 243 BWN's impacting over 1.7 million people of which, over 40,000 of these people

were on BWN's for a period of over a year. Uisce Éireann has removed 87 public water schemes from the EPA's remedial action list (RAL) between 2014 and 2020 reducing the number of WTPs on the RAL.

Uisce Éireann are also delivering a range of national programmes to address high risk water supplies. Through their National Disinfection Programme they have upgraded a total of 255 WTPs and under the National Lead Programme they have replaced a total of 38,414 lead services, representing a significant investment in protecting public health.

1.3.2 Water Conservation

Conservation is a key focus for Uisce Éireann. Its National Leakage Reduction Programme is reducing leaks across the Republic of Ireland by fixing or replacing old, damaged pipes and removing lead service pipes from the network. Through this programme Uisce Éireann have achieved total gross leakage savings of 154.2 Ml/d on the private side and 233.2 Ml/d on the public side of the water distribution network for the 2014-2019 period.

1.3.3 Future Proofing

Between 2014 and 2019 Uisce Éireann has delivered key outcomes to support growth including constructing 11 new WTPs and upgrading 36 WTPs. They have also laid a total of 1,906km of new and rehabilitated water main. Major national strategic infrastructure water projects have also been progressed during this time, including the Vartry Water Supply Scheme and Lough Guitane WTP in Kerry. These projects are of vital importance and critical to meeting the Republic of Ireland's growing water needs.

Despite this progress, Uisce Éireann will have further challenges to address. Therefore, it is essential that they put in place a NWRP in order to keep making progress in a strategic prioritised way for the next 25 years. Each cycle of the NWRP will then help Uisce Éireann inform the Capital Investment Plans for each future investment cycle.

1.3.4 Opportunities for Environmental Protection, Restoration and Enhancement

Uisce Éireann's long-term approach will increasingly include catchment management for drinking water source protection in partnership with key stakeholders. This approach is in accordance with Article 7(3) of the Water Framework Directive and has the joint benefit of protecting our water habitats and managing the risk to our drinking water sources.

In 2019, the Irish Government declared a National Climate Change and Biodiversity Emergency to highlight the significant concerns around Ireland's biodiversity and recognizing the urgency to act on these interconnected global crises. Uisce Éireann recognises the need to urgently increase and accelerate efforts to halt the decline of biodiversity and are committed to ensuring that infrastructure is built and managed so that our ecosystems are protected, and where possible enhanced.

Biodiversity protection is a key part of Uisce Éireann's Biodiversity and Sustainability Policies. The overall aim of Uisce Éireann's Biodiversity Policy is that in association with the provision of water and wastewater services, biodiversity and the natural environment are conserved, protected and where practical enhanced through our responsible stewardship, sustainable water services and strong partnerships. Uisce Éireann launched its Biodiversity Action Plan (BAP)[1] in 2021 to deliver on this aim.

One of the key objectives of the BAP is the promotion of biodiversity enhancement including nature-based solutions (NBS) for water protection and wastewater treatment, which have significant potential to

[1] Irish Water, 2021. *Biodiversity Action Plan*. [Online]. [Accessed 6 May 2021]. Available from: Biodiversity Action Plan

deliver biodiversity. NBS are multi-functional measures that aim to protect water resources and address water-related challenges by restoring or maintaining ecosystems as well as natural features and characteristics of waterbodies using natural means and processes[2]. The main functions are to improve water quality, reduce flood risk, and create habitats. NBS have many additional benefits that include reduction in energy usage, carbon sequestration, and amenity use for local communities. They include a broad range of measures such as: wetlands, basins and ponds, reedbeds, buffer strips and hedges and forest riparian buffers.

Some examples of NBS being utilised by Uisce Éireann in the North West Region include:

- Working in partnership with Local Authorities to progress an innovative wastewater project in Belturbet trialling an installation of reed beds as a way of sustainably managing water treatment sludge;
- Working in partnership with catchment stakeholders to support initiatives such as native tree planting and bog rehabilitation, which also help to protect and restore source waters; and
- Identifying opportunities for the incorporation of NBS, and catchment management activities within their abstraction catchments, will continue to be encouraged and promoted through the NWRP.

1.4 Future Challenges

Ireland has a temperate climate with relatively high annual average rainfall, so while it is easy to assume that there is plenty of water available for supply, this is not always the case. Rainfall is unevenly distributed across the country, with more falling in the west than the east. Figure 1.1 shows that the areas with lowest rainfall have the greatest population density, meaning resources in the most populated areas can become stressed.

[2] EU Commission, 2014. Policy document on Natural Water Retention Measures.

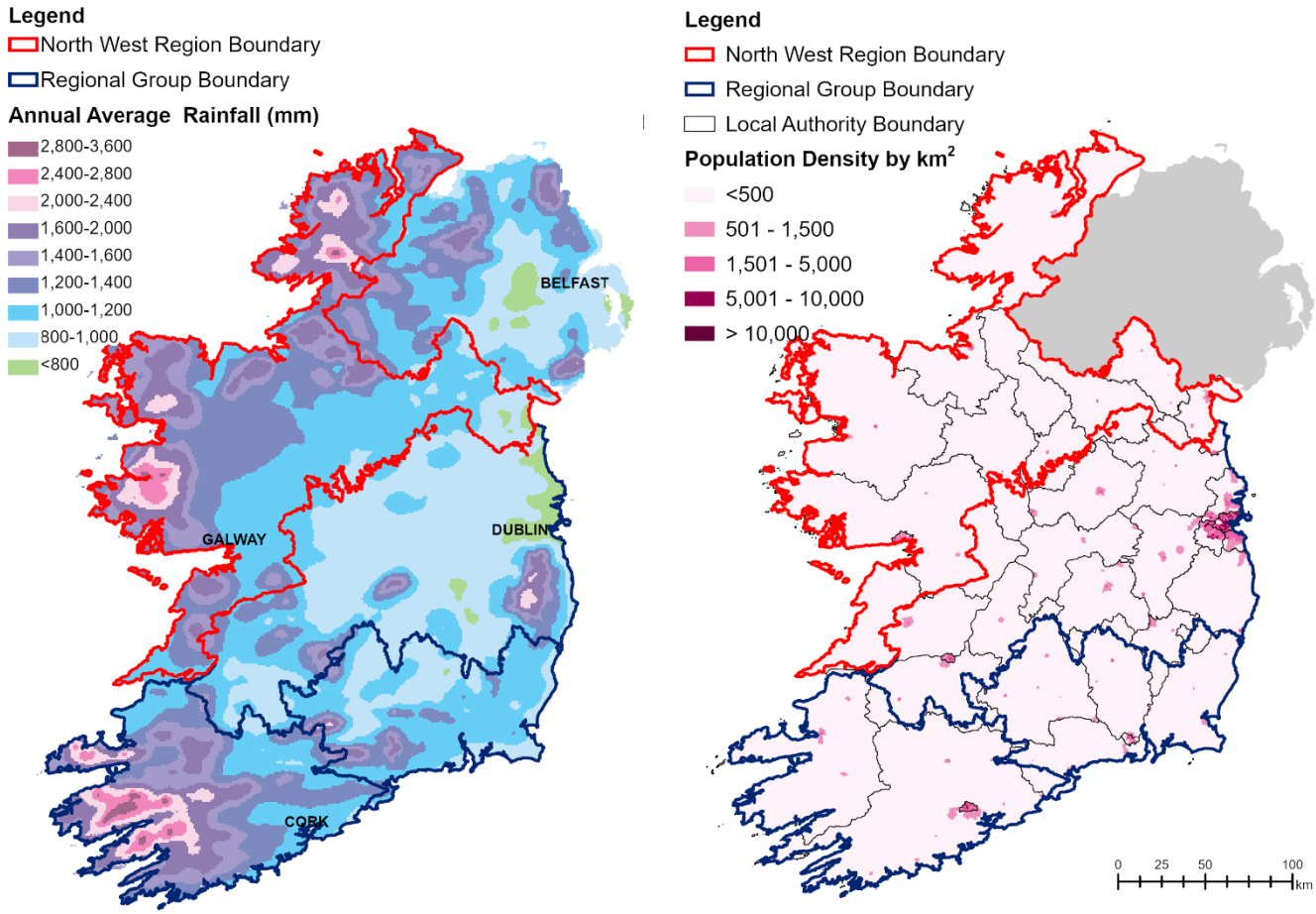


Figure 1.1 Rainfall in Ireland Compared to Population Density

In addition, Ireland also faces key challenges over the coming years, which have the potential to exacerbate the current problems with water supplies:

- **A Growing Population:** The country's population is expected to increase by 21% or 1.2 million people over the next 25 years[3], this will impact on the demand for water;
- **Changes in Land Use and Emerging Contaminants:** Increasing pressure on the quality of water in the natural environment before it is treated, due to changes in land use, emerging contaminants and higher quality/supply standards required under the recast Drinking Water Directive;
- **A Changing Climate:** Changing weather patterns reducing available supplies and increasing the frequency of droughts and other extreme weather events that can result in interruptions to supply and impact on the demand for water; and
- **An Environment in Need:** Uisce Éireann currently abstracts water from rivers and groundwater aquifers for the purpose of water supply but we need to make sure they leave enough water in the environment to protect the health of rivers and wildlife. The forthcoming abstraction legislation regime for the Water Environment (Abstractions and Impoundments) Act, 2022 (Abstractions Act), required to ensure that Ireland can meet its obligations under the Water Framework Directive, may reduce the amount of water Uisce Éireann is able to abstract from some of its sources in the future.

[3] See section 5.3.1 of this report on population growth and section 2.2.3 of the RWRP-NW for further explanation on estimating population growth

If Uisce Éireann can address these challenges as part of their Plan, it will ensure that future infrastructure development is proportionate to identified need and is sustainable, reliable and resilient.

1.5 Development of the National Water Resources Plan

Water Resources Plans are standard practice for other utility companies across Europe that are involved in drinking water supply. However, Uisce Éireann need to develop a plan that is specific to the Republic of Ireland which accounts for:

- Ireland's dispersed low-density population;
- The historical development of Uisce Éireann's existing water supply system; and
- The condition of infrastructural assets and the associated risks in terms of safety and security of Uisce Éireann's existing supplies.

Uisce Éireann must also ensure that the NWRP aligns with current government policies, such as: Ireland 2040: the National Planning Framework, River Basin Management Plan (RBMP) second cycle (third cycle in consultation) and the Climate Change Adaptation Policy (see Appendix F: Policy Plan and Programme Review).

The NWRP covers the entire state, which is a larger geographic area than most water resource plans would consider. The content of the NWRP, which is summarised below, is consistent with a 'typical' Water Resource Plan from another jurisdiction.

As this is Uisce Éireann's first NWRP it has been split into two distinct stages, summarised in Table 1.1.

Table 1.1 National Water Resources Plan Phases

NWRP Phases	NWRP Reports	Content
Phase 1: Framework Plan Completed	NWRP – draft Framework Plan	Need Identification including the Supply Demand Balance Calculations NWRP Objectives Generic Option Types Options Assessment Methodology Published for consultation with an SEA Environment Report and Natura Impact Statement
	Case Study - Study Area	Test of the Options Assessment Methodology against Study Area 5 in the Eastern Midlands region was provided as an example with the draft NWRP Framework to demonstrate the methodology. The outcomes were not part of the draft Framework Plan consultation.
	NWRP - final Framework Plan	Finalisation of the Framework Plan taking account of consultation comments. Framework Plan adopted and published with an SEA Statement and AA Determination in May 2021
Phase 2: RWRPs (Regional Plans)	Draft RWRPs (draft Regional Plans)	Application of Options Assessment Methodology and Identification of the Preferred Approach for the following regions: • **North West (GA1[4])**

[4] Group Area (GA) is an alternative reference for the regional areas

NWRP Phases	NWRP Reports	Content
		• South West (GA2) • South East (GA3) • Eastern and Midlands (GA4)
	Final RWRPs (final Regional Plans)	Finalise and adopt each RWRP (Regional Plans) once their individual consultations are completed.

1.5.1 Phase 1: NWRP - Framework Plan

Phase 1 of the Framework Plan included:

The methodology Uisce Éireann used to develop the Plan:

- How Uisce Éireann assess quantity need: Supply Demand Balance (SDB);
- How Uisce Éireann assess quality and reliability need: Barrier Assessment;
- How Uisce Éireann address sustainability by ensuring that all new options for water supply must be based on conservative approaches to protecting water sources;
- Uisce Éireann's Options Assessment Process; and
- Uisce Éireann's Preferred Approach Development Process.

An Assessment of Need in terms across each of Uisce Éireann's 539 public water supplies nationally in terms of:

- **Water Quantity** that Uisce Éireann can provide;
- **Water Quality** that Uisce Éireann can provide; and
- Performance and operational efficiency of Uisce Éireann's **Asset Base**.

The Framework Plan is available online at https://www.water.ie/projects/strategic-plans/national-water-resources/

1.5.2 Phase 2: Four Regional Water Resources Plans

Phase 2 of the NWRP comprises the development of four RWRPs each of which will be subject to SEA and AA. Each of the four draft RWRPs and associated environmental reports will have their own public consultation phases. These public consultations have been undertaken sequentially between 2021 and 2023. As this is Uisce Éireann's first NWRP, it was considered necessary to divide the public water supply system into the four regional groups as shown in Figure 1.2. The regional boundaries are only relevant for the development of the first NWRP and have been identified as the most appropriate way to allow Uisce Éireann to identify Preferred Approaches (water supply solutions) in an efficient and timely manner.

Each of the four RWRPs, together with their respective SEA Environmental Reports and NIS will ensure that consideration is given to the cumulative impacts and in-combination effects of the other RWRPs (this is explained further in section 6). Adjustments will be made to address those impacts to the fullest extent possible based on all available information.

The Regional Water Resource Plans (RWRPs) will be referred to as follows:

- Regional Water Resources Plan: North West (Group Area 1);
- Regional Water Resources Plan: South West (Group Area 2);
- Regional Water Resources Plan: South East (Group Area 3); and
- Regional Water Resources Plan: Eastern and Midlands (Group Area 4).

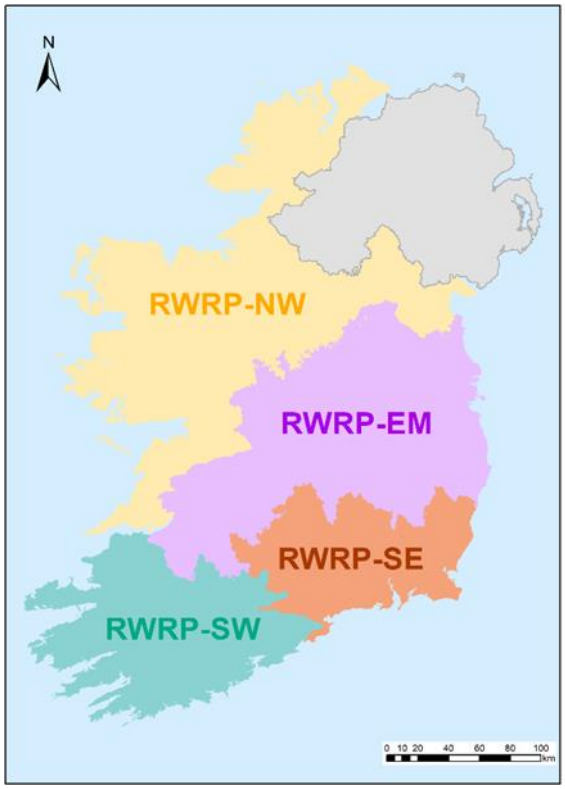


Figure 1.2 Regional Group Areas for Phase 2

These groupings reflect Uisce Éireann's operational regions and water supply boundaries, with modifications to account for river catchments, as delineated by the EPA in the RBMP. For the purposes of preparing the RWRPs, each regional area has been subdivided into study areas (SAs) to assist in the identification of both need and solutions, with all of the SAs to be considered holistically in each RWRP. The SA boundaries comprise clusters of WRZs and are based on WFD catchments and WRZ location and type (urban and rural). This enables a coordinated approach to developing solutions to meet water quantity and quality deficits and facilitates consideration of WFD impacts.

The study area assessments follow the outline methodology established by the Framework Plan. The assessments are undertaken following SEA scoping and are informed by the scoping consultation responses. The SEA Environmental Reports will be published for consultation alongside the Regional Plans.

Each Regional Plan's SEA also comprises appendices, including a Study Area Environmental Review for each SA. These demonstrate how the option assessment methodology has been applied for the SEA in the SAs and include:

- Introduction for SEA, WFD and AA applied at the SA level;
- Environmental baseline context;
- Environmental assessment for the options screening process and feasible options;
- Assessment of the alternatives considered and the Preferred Approach;
- Cumulative effects assessment between options within each SA and with other proposed developments within the SAs; and
- Recommendations for implementation, including mitigation and monitoring.

A summary of the whole NWRP process and the Regional Plan and environmental assessment components is provided in Figure 1.3. Current progress with the RWRP-NW is outlined in the red box.

The SEA process including legislative requirements and influence on the Regional Plan's development are described in more detail in the sections below.

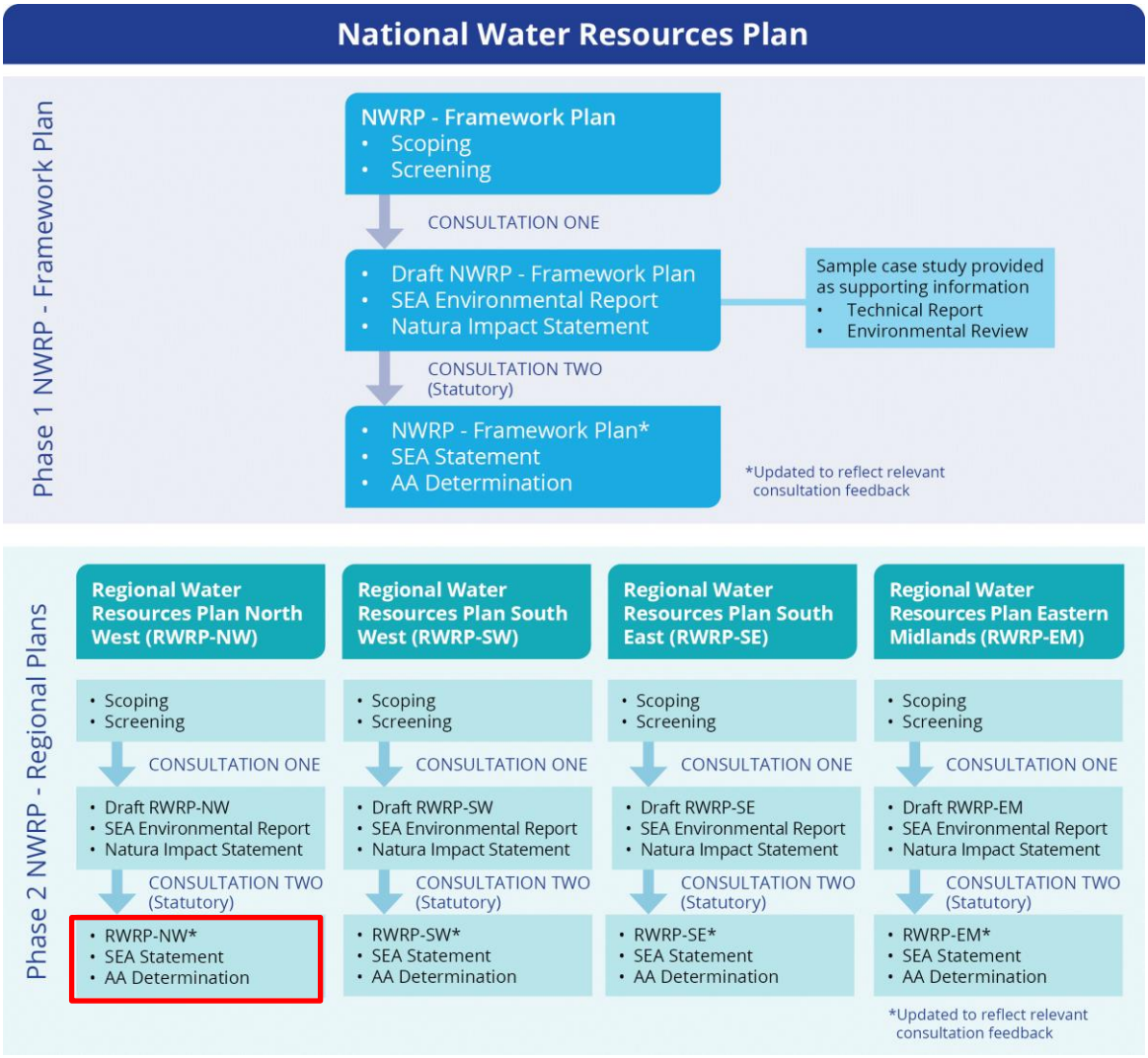


Figure 1.3 Components of the National Water Resources Plan

Two regional plans, the RWRP for the Eastern and Midlands region and the RWRP for the South West region have been taken through the assessment and consultation process and have been finalised and adopted. The RWRP for the North West region, which is the subject of this SEA Environmental Report, is to be adopted in Summer 2023. The RWRP for the South East is currently out for public consultation, and will be the final region for the Phase 2 NWRP. The Framework Plan, Regional Plans and supporting documentation are available at https://www.water.ie/projects/strategic-plans/national-water-resources/.

1.6 Strategic Environmental Assessment

1.6.1 This Report

This is the SEA Environmental Report which has been prepared to document the environmental assessment of the Regional Plan. This report has been prepared having regard to the SEA Directive (2001/42/EC) and its provisions that are transposed into Irish law by European Communities (Environmental Assessment of Certain Plans and Programmes) Regulations 2004 (S.I. No. 435 of 2004 as amended in 2011). This SEA Environmental Report has been updated following the consultation process to take account of comments received and amendments to the final Regional Plan and will be published together with its appendices alongside the SEA Statement and the adopted Regional Plan.

1.6.2 Legislative Requirement

Council Directive 2001/42/EC of the European Parliament and of the Council of 27th June 2001 on the assessment of the effects of certain plans and programmes on the environment (the SEA Directive) established the statutory requirement for SEA as part of the development of certain plans and programmes. The Directive is applicable to the Framework Plan and each of the Regional Plans of the NWRP.

The transposing Irish Regulations are the European Communities (Environmental Assessment of Certain Plans and Programmes) Regulations 2004 (S.I. No. 435 of 2004) as amended by the European Communities (Environmental Assessment of Certain Plans and Programmes) (Amendment) Regulations 2011 (S.I. No. 200 of 2011).

In accordance with the overall objective of the SEA Directive as set out in Article 1, SEA is required to:

"Provide for a high level of protection to the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to promoting sustainable development…"

According to Article 2 of the Directive, "plans and programmes" means plans and programmes, including those co-financed by the European Community, as well as any modifications to them:

- Which are subject to preparation and/or adoption by an authority at national, regional or local level or which are prepared by an authority for adoption, through a legislative procedure by Parliament or Government; and
- Which are required by legislative, regulatory or administrative provisions.

Under Article 3(2), an environmental assessment:

"…shall be carried out for all plans and programmes, (a) which are prepared for agriculture, forestry, fisheries, energy, industry, transport, waste management, water management, telecommunications, tourism, town and country planning or land use and which set the framework for future development consent of projects listed in Annexes I and II to Directive 85/337/EEC[5]."

1.6.3 The Strategic Environmental Assessment Process

The purpose of SEA is to enable plan-making authorities such as Uisce Éireann to incorporate environmental considerations into decision-making at an early stage and in an integrated way throughout the plan-making process. The SEA process is undertaken in four stages. The progress for each stage of the SEA process for the North West Regional Plan is summarised in Table 1.2. The SEA process for Phase 1 of the NWRP, the Framework Plan, has already been completed.

Table 1.2 Stages of SEA for the North West Regional Plan

Stage	Purpose and Requirements	Progress to Date / Current Status
Stage 1: Screening	Prior to starting the SEA process, a plan or programme undergoes "screening" to determine whether it requires an SEA.	SEA Screening Statement – Uisce Éireann (as the responsible authority) determined that SEA was required for the NWRP when screening was carried out in August 2017 and included with the Regional Plan SEA Scoping Report.

[5] Replaced by 2011/92/EU as amended by 2014/52/EU

Stage	Purpose and Requirements	Progress to Date / Current Status
Stage 2: Scoping	Consideration of the context and objectives of the SEA provides information on baseline data, identifies relevant environmental issues and trends, and defines the parameters of the scope of the SEA for the purpose of consultation.	SEA Scoping Report – The SEA Scoping Report set the geographical and temporal scope of the Regional Plan and SEA, the baseline environment, and a proposed framework of SEA objectives to inform the Stage 3 assessment. Formal statutory consultation was carried out between 1st June 2022 and 29th June 2022.
Stage 3: Identification, Prediction, Evaluation and Mitigation of Potential Effects	Within the context and parameters identified at the scoping stage. Identification and evaluation of likely significant effects of the Regional Plan is carried out, including consideration of alternatives and determination of measures to mitigate and monitor potential residual effects.	Environmental Report (SEA of the Regional Plan). Consultation will take place alongside the Regional Plan consultation.
Stage 4: Consultation, Revision and Post-Adoption	Consultation with statutory consultees and the public. This may require changes to the Regional Plan and SEA Environmental Report in light of responses. Implementation of the monitoring plan.	This stage will follow on from stage 3 and involve responding to the consultation comments and incorporating into the Regional Plan, finalisation of the plan and publication of the Post-Adoption SEA Statement **Current Stage in the SEA Process**

1.6.4 Appropriate Assessment

In addition to compliance with the SEA Directive, the preparation and implementation of the NWRP must meet the provisions of the Habitats Directive (92/43/EEC). The Habitats Directive has been transposed into Irish law by the Planning and Development Act, 2000 (as amended) and the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011). The Habitats Directive requires that if a plan, policy or programme is likely to have a significant effect on one or more European sites (that is, a Special Area of Conservation (SAC) or Special Protection Area (SPA), also referred to as "Natura 2000" Network), either alone or in combination with other schemes, plans or projects, then it must be subject to Appropriate Assessment (AA).

The NWRP therefore falls under the governing legislation of the European Communities (Birds and Natural Habitats) Regulations 2011; and as a "competent authority", Uisce Éireann must ensure that their NWRP meets these requirements.

The Regional Plan is not directly connected with or necessary for the management of European sites. The screening for AA (Stage 1) concluded that there was potential for significant effects on one or more European sites to occur as a result of the Regional Plan. Therefore, in accordance with Article 6(3) of the Habitats Directive, AA (Stage 2) of the Regional Plan was required. The AA screening focused on the

potential for significant effects on European sites that may arise due to the implementation of the Regional Plan. A Natura Impact Statement (NIS) has been prepared and is published for consultation alongside the SEA Environmental Report; however, the SEA and AA processes are clearly distinguished.

1.6.5 Development of the Regional Plan within the Framework Plan, the SEA and AA

The options development process which Uisce Éireann use to develop the Preferred Approach for all Regional Plans is described within the Framework Plan and was subject to a separate SEA process and finalised in May 2021. The options assessment methodology is outlined in chapter 6, with further detail available within the Framework Plan and the SEA Statement which accompanies the Framework Plan which can both be found at: https://www.water.ie/projects/strategic-plans/national-water-resources/.

SEA and AA requirements were incorporated into the development of the Framework Plan and have influenced the development of the options assessment methodology for this Regional Plans and future Regional Plans. Figure 1.4 shows how the SEA and AA reporting will align with each other and with development of the Regional Plan.

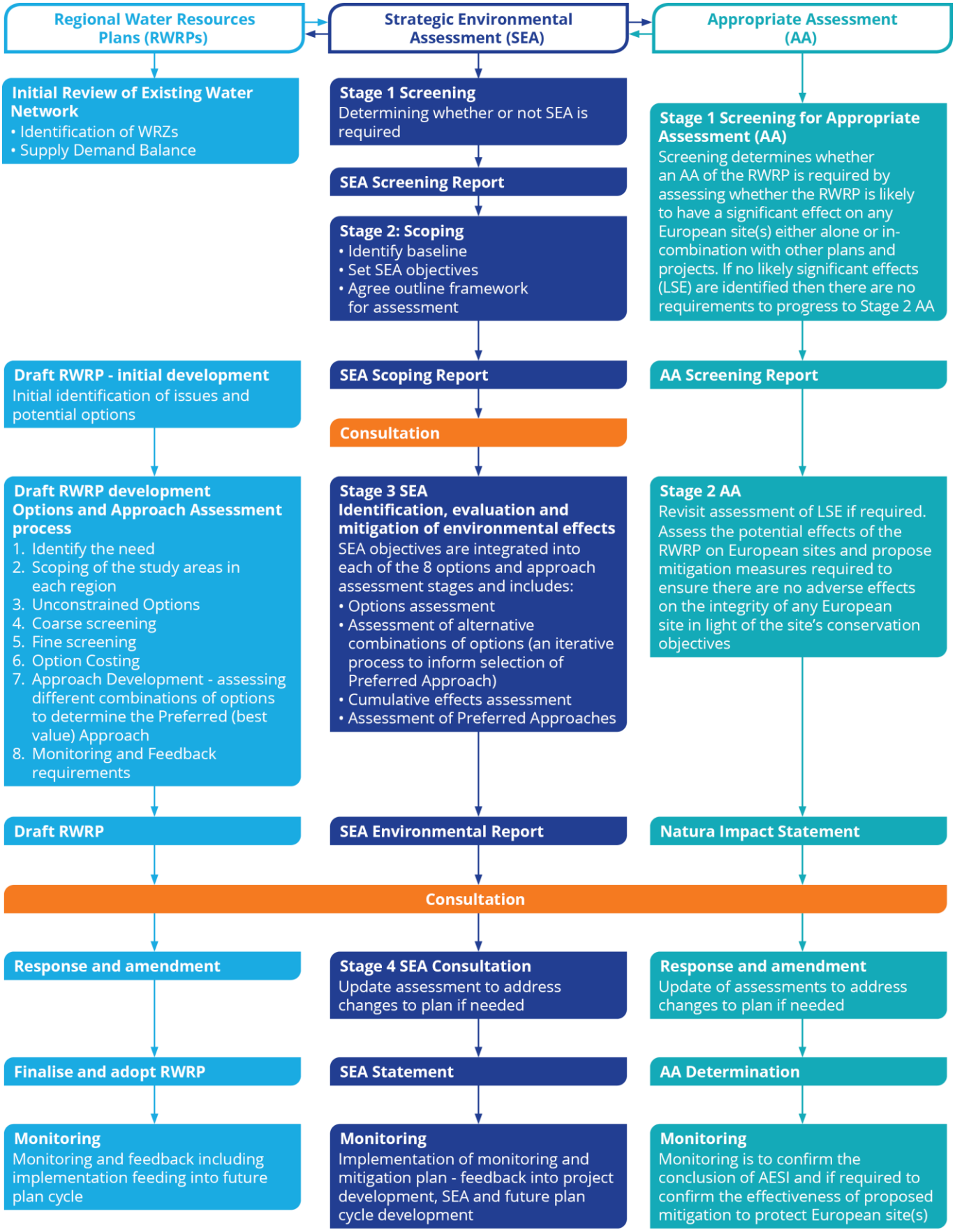


Figure 1.4 Regional Plan and Strategic Environmental Assessment Process

1.6.6 Consultation

The SEA Environmental Report waspublished on the Uisce Éireann website (https://www.water.ie/nwrp) alongside the draft Regional Plan and the NIS for public consultation. The SEA Environmental Report outlined the assessment of the Regional Plan, including effects on the environment and proposed mitigation. In accordance with Article 11 of European Communities (Environmental Assessment of Certain Plans and Programmes (S.I. No. 435 of 2004), SEA environmental authorities, as well as any relevant transboundary authorities (for example, Northern Ireland Environmental Agency), were notified so that they may make a submission or observation in relation to the SEA Environmental Report or the draft Regional Plan to Uisce Éireann.

Uisce Éireann have referred to theSEA Environmental Report and the NIS when preparing the Regional Plan for the North West area. The reports were on display for statutory public consultation between November 2022 and February 2023. Further information on the consultation on the Regional Plan, SEA Environmental Report and NIS is provided in chapter 3 of this report.

This SEA Environmental Report incorporates the updates and amendments responding to the comments received and associated amendments to the final Regional Plan. This revised SEA Environmental Report is produced as support for the SEA Statement and these SEA reports are published alongside the adopted Regional Plan for the North West Region.

2 Overview of North West Region

2 Overview of North West Region

Uisce Éireann is planning to develop a national programme of proposed solutions for reducing and eliminating the SDB deficits in their WRZs, meet water quality requirements and bring greater resilience to the water supply network. The aim of the programme is based around the following three pillars, as shown in Figure 2.1.

- **Lose Less:** reducing water lost to the system through leakage;
- **Use Less:** reducing water use through efficiency measures; and
- **Supply Smarter:** improving the quality, resilience and security of Uisce Éireann's supply through infrastructure improvements.

Figure 2.1 Three Pillar Approach to reduce or eliminate the SDB deficits

Together these pillars will enable Uisce Éireann to optimise their capital and operational interventions to achieve the best outcomes and react to emerging issues.

There are 539 WRZs in Ireland. Although this is a national plan, Uisce Éireann will review every WRZ. Due to their number, Uisce Éireann are having to deliver the SEAs on a prioritised basis and have split the country into the four regional groups shown in Figure 1.2 and Figure 2.2.

The North West Region was selected as the third regional group to be assessed as part of the NWRP.

Further information on the "three pillars" is detailed in section 5 of the RWRP-NW.

2.1 North West Region

There are 142 WTPs in the North West Region, which collectively serve 732,700 people or 18% of the population of Ireland, via approximately 17,700 kilometres of distribution network. The size of these WTPs varies, with the largest three in the region producing on average 32% of the water supplied and the remaining 139 producing on average about 68% or 251 Ml/d of the total supply.

The WTPs feed water into supply areas known as Water Resources Zones (WRZs). Each WRZ is an independent water supply system serving a region, city, town or village and is governed by topography or the extent of the water distribution network in an area. Within a WRZ most customers receive the same Level of Service (LoS), measured as a probability of interruption to services (for example one interruption to the supply in 50 years).

The RWRP-NW summarises key issues that impact the quality, sustainability and reliability of Uisce Éireann's existing water supplies, in this region, including:

- Levels of Service;
- Treatment Capacity;
- Water Quality;
- Network Performance;
- Abstractions potentially at risk of exceeding sustainable abstraction thresholds; and
- Constrained Funding.

In addition, Uisce Éireann also face key challenges over the coming years, which have the potential to exacerbate the current problems in the region, including:

- A growing population;
- A changing climate;
- Changes in land use and emerging contaminants;
- Legislative changes; and
- An Environment in Need.

Addressing these challenges as part of the overall NWRP, ensures that future infrastructure development is proportionate to the identified need and is sustainable, reliable and resilient.

2.2 North West Study Areas

The North West Region is further subdivided into seven study areas (SAs) based on WFD catchment and WRZ boundaries within the region, as shown in Figure 2.2.

An overview of the seven North West SAs is provided in Table 2.1.

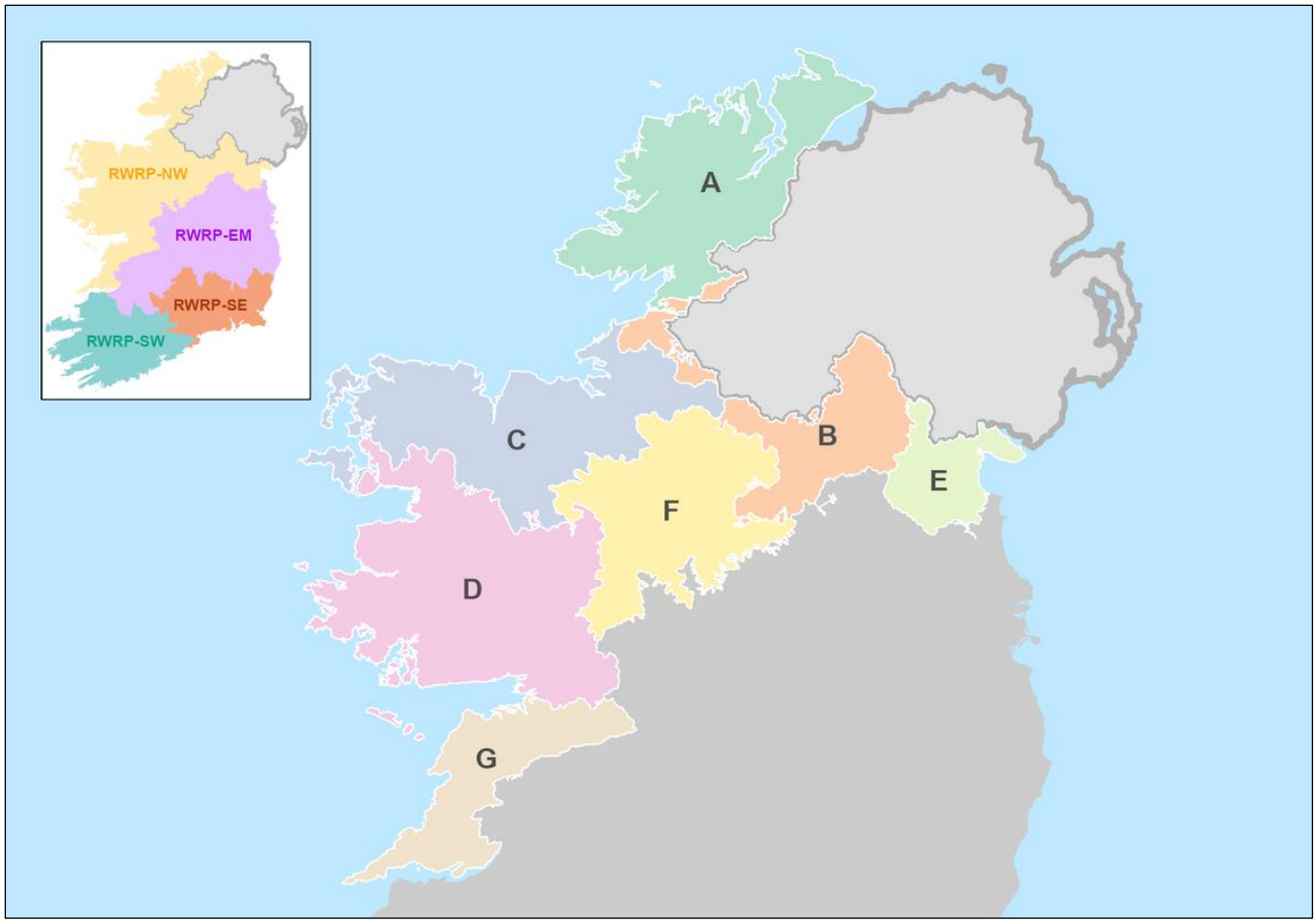


Figure 2.2 North West Region Study Areas

Table 2.1 Overview of the North West Study Areas

Study Area	Description
SAA Donegal	SAA total area is approximately 4,632 km^2 and lies within the Donegal County. The principal settlement (with a population of over 10,000) within SAA is Letterkenny (CSO, 2016).
SAB Cavan and Monaghan	SAB total area is approximately 2,788 km^2 and lies within the counties of Cavan, Monaghan, Leitrim, Longford. Donegal, Sligo. The principal settlement (with a population of over 10,000) within SAB is Cavan (CSO, 2016).
SAC Mayo and Sligo	SAC total area is approximately 5,147 km^2 and lies within the counties of Mayo, Sligo, Leitrim, Cavan, Roscommon. The principal settlement (with a population of over 10,000) within SAC are Sligo, Castlebar and Ballina (CSO, 2016).
SAD Galway and Mayo	SAD total area is approximately 6,704 km^2 and lies within the counties of Galway, Mayo, Roscommon and Galway City. The principal settlement (with a population of over 10,000) within SAD are Galway city and suburbs, and Castlebar (CSO, 2016).
SAE Louth	SAE total area is approximately 1,261 km^2 and lies within the counties of Louth, Monaghan, Meath and Cavan. The principal settlement (with a population of over 10,000) within SAE are Drogheda and Dundalk (CSO, 2016).
SAF Roscommon and Leitrim	SAF total area is approximately 3,990 km^2 and lies within the counties of Roscommon, Leitrim, Longford, Galway, Sligo, Cavan, Mayo and Westmeath*. The principal settlement (with a population of over 10,000) within SAF is Longford (CSO, 2016).

Study Area	Description
SAG Clare	SAG total area is approximately 2,389 km^2 and lies within the counties of Clare and Galway. There are no principal settlements with a population of over 10,000 within SAG. The largest settlements (with population of over 2,000) within SAG are Gort and Kilrush (CSO, 2016).

*Westmeath county intersects with SAF over less than 0.5 km^2

The North West Region includes 13 counties: Galway City, Galway, Leitrim, Mayo, Roscommon, Sligo, Cavan, Donegal, Monaghan, Longford, Louth, Meath and Clare. It covers approximately 26,900 square kilometres (representing about 40% of the Republic of Ireland) and extends from the Shannon Estuary on the southern boundary of County Clare to County Donegal, which borders Northern Ireland. Galway City is located in the south west of the region lying on the River Corrib between Lough Corrib and Galway Bay and comprises 19% of the regional population. The area also includes eight islands off the coast of Ireland, namely Inishmore, Inishmean, Inishere, Inisboffin, Inishturk, Clare Island, Achill Island and Arranmore Island.

The predominant land use is agriculture, representing 57.4% of the total land area. Natural habitats and forested areas comprise 31.7% and 9.5% of the land area, respectively. Urban areas cover just 1.2% of the region with industry and other minor land use categories making up the remaining 0.2%. The highest population density is in the west, including Galway City and the surrounding area. Uisce Éireann supplies around 369 million litres of water per day to a population of 732,700 people and 74,000 businesses in the North West Region. This represents 21% of our total supply nationally. It should be noted that in some rural areas there are small communities served by group and private schemes that do not receive a supply from Uisce Éireann's networks.

There are seven Key Towns that are identified in the Northern and Western Region Regional Spatial and Economic Strategy (RSES), including Ballina, Castlebar, Cavan, Carrick-on-Shannon, Monaghan, Roscommon, and Tuam. These represent settlements that "will play a significant role in strengthening the urban structure of the Region….. This is based on their strategic location and influence". It is envisaged that local authorities will plan for significant growth in these towns. Castlebar is the largest of the Key Towns, with a population of approximately 12,100.

3 Consultation

3 Consultation

3.1 Purpose of consultation and engagement

Public consultation and stakeholder engagement is a key element in ensuring stakeholders and members of the public have an opportunity to contribute to the development of plans and projects in Ireland. Uisce Éireann is undertaking an accessible, meaningful, and accountable consultation and engagement process with stakeholders and members of the public throughout the development of the NWRP including the Regional Water Resource Plans.

There are two main stages to the engagement and consultation relevant to the Regional Water Resource Plan North West (RWRP-NW) and this SEA Environmental Report. The overall consultation process for the RWRP-NW is summarised in Figure 3.1 below:

- **Framework Plan SEA process and consultation** – including SEA scoping consultation and wider engagement on the developing options and approach assessment methodology and the publication of the draft Framework Plan and SEA Environmental report for consultation which focused on setting out the methodology to be applied through the Regional Plans. The NWRP Framework Plan was adopted in Spring 2021 following extensive consultation and it, along with the SEA Statement and AA Determination, are available on https://www.water.ie/projects/strategic-plans/national-water-resources/; and
- **RWRP-NW SEA process and consultation** – these apply the methodology from the adopted Framework Plan and, as part of the SEA process, scoping consultation has been undertaken and responses have informed the SEA and RWRP-NW development.

In October 2017, a dedicated NWRP webpage went live on the Uisce Éireann website at www.water.ie/nwrp, introducing the NWRP and the Consultation Roadmap. The NWRP Consultation Road map, as seen in Figure 3.1, set out the process in developing the Plan and detailed the two stages where formal consultation would be undertaken in the development of the NWRP.

3.1.1 Pre-consultation 1 Engagement

The EPA, Department of Agriculture, Food and the Marine (DAFM), Inland Fisheries Ireland (IFI), National Parks and Wildlife Services (NPWS), Department of Culture, Heritage and the Gaeltacht (DCHG), Department of Housing, Planning and Local Government (DHPLG), Department of Communications, Climate Action and Environment (DCCAE) were invited to attend pre-consultation workshops to present key aspects of the NWRP including methodology for selecting and assessing water supply and demand management options. The workshop gave these authorities a platform to feed into the development of the NWRP and SEA.

Workshop 6th December 2017 – to present an overview of the NWRP with particular focus on the Options Assessment Methodology. The workshop was attended by the EPA and involved general discussion around the scope and content to be included in the NWRP, and feedback on the scoping questions from the scoping report in relation to the NWRP and the SEA and AA process to assist the authorities in making a formal submission on the Scoping Report.

Workshop 6th June 2018 – to present an update on the NWRP and case studies on the Options Assessment Methodology. Organisations that participated in this workshop included: EPA, IFI, DCHG, and DHPLG.

Workshop 4th December 2018 – to present the final approach for the NWRP. This was attended by EPA and IFI and covered an update to the proposed approach for the NWRP following the experience gained from storm and drought events in 2018 as well as emphasis on improving water efficiency and leakage reduction as integral to the plan approach

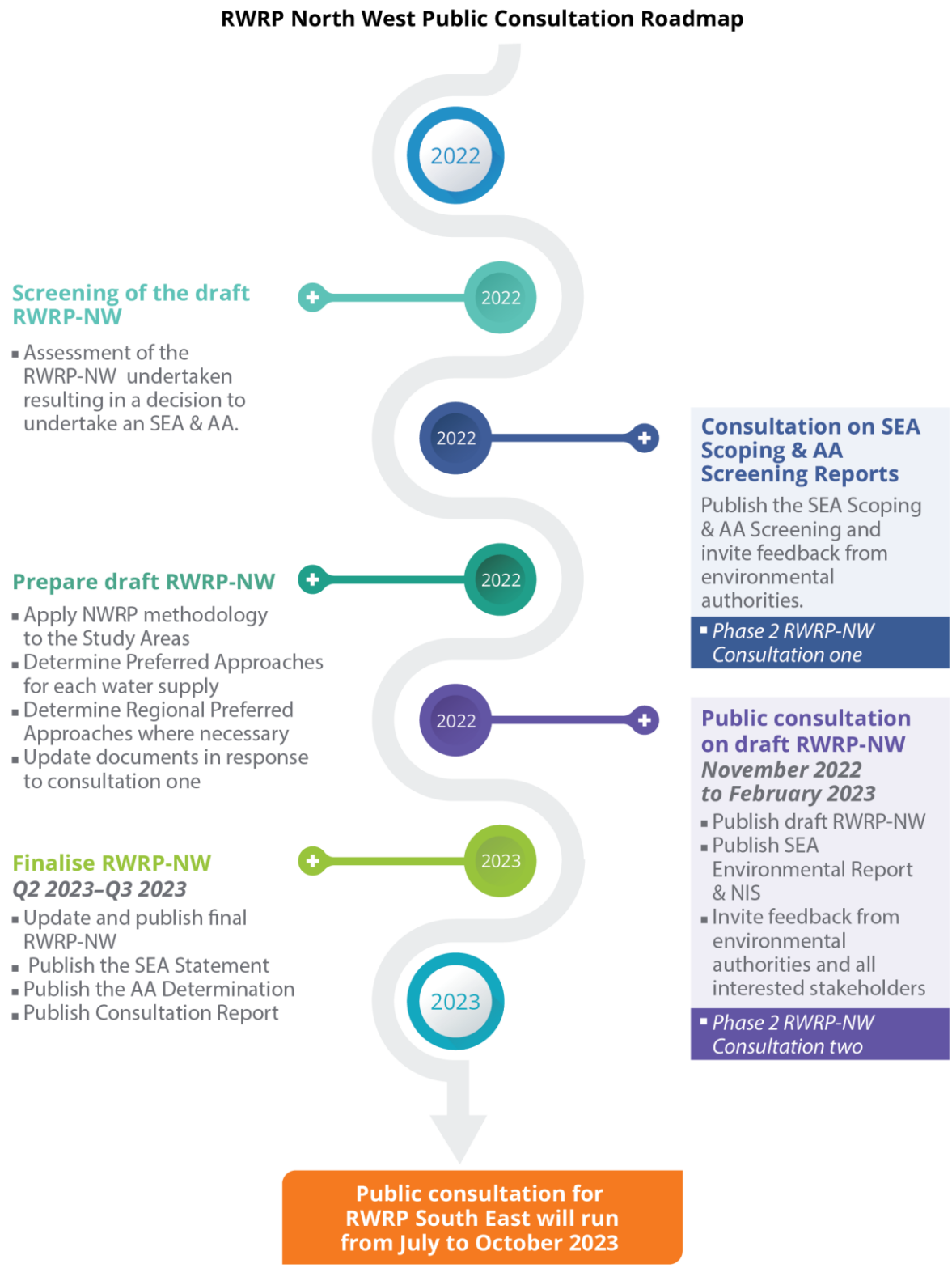


Figure 3.1 Consultation Roadmap

3.1.2 Consultation 1: Scoping Stage

The first stage of formal consultation was to inform the approach for the SEA and AA process for the NWRP. Consultation One commenced on Thursday 9 November 2017, ran for six weeks with the publication of the SEA Scoping Report, and concluded on Friday 22 December 2017. Members of the public, interested parties and environmental authorities were invited to contribute to the development of the NWRP, as part of the SEA and AA process, through public consultation.

The Scoping Report set the geographical and temporal scope of the NWRP and SEA and aimed to inform the development of the SEA Environmental Report and NIS. The report provided an outline of the NWRP, described the environmental characteristics of the study area and presented the initial understanding of the key environmental issues relating to the plan.

Uisce Éireann invited environmental authorities to briefings and workshops to further inform them on the NWRP, SEA and AA process. Meetings were held between December 2017 to December 2018, including a briefing to the Uisce Éireann National Stakeholder Forum, Industrial Development Authority (IDA) and the Commission for the Regulation of Utilities, Water and Energy (CRU) and a presentation made to the National Water Forum (An Fóram Uisce).

3.1.3 Pre-consultation 2 Engagement

Pre-consultation 2 workshops were held in autumn 2020 with stakeholders including the EPA, IFI, NPWS, An Fóram Uisce (National Water Forum), Northern Ireland Environment Agency, Geological Survey Ireland and Northern Uisce Éireann amongst others.

3.1.4 Consultation 2: Draft Framework Plan and Environmental Reports

Consultation 2 (statutory public consultation) took place between 8 December 2020 until 16 February 2021. Uisce Éireann facilitated two extensions to this statutory public consultation at the request of stakeholders, with consultation closing on 12 March 2021.

The draft Framework Plan SEA Environmental Report was published on the Uisce Éireann website alongside the draft Framework Plan and the NIS. The Environmental Report outlined the assessment of the draft Framework Plan, including effects on the environment and proposed mitigation.

The final Framework Plan was adopted and published with the consultation Report and the SEA Statement and AA determination.

3.2 RWRP-NW Consultation

The RWRP-NW has been developed applying the methodology from the adopted Framework Plan and SEA taking account of the consultation received through that process so is closely linked although a separate formal process is followed for each Regional Plan.

3.2.1 Consultation 1 Scoping Stage

A SEA scoping report was consulted on In line with Article 9 (5) of the SEA Regulations (S.I. No. 435 of 2004), and was issued to the following statutory Environmental Authorities:

- The Environmental Protection Agency (EPA);
- Department of Housing, Local Government and Heritage (DHLGH);
- The Department of Tourism, Culture, Arts, Gaeltacht, Sport and Media (DTCAGSM)- Development Applications Unit (DAU);
- The Department of Agriculture, Food and the Marine (DAFM);
- Department of the Environment, Climate and Communications (DECC); and

- For transboundary consultation, Northern Ireland's Department of Agriculture, Environment and Rural Affairs (DAERA).

This SEA Scoping Report is available online at the following website: https://www.water.ie/nwrp.

The scoping consultation commenced on 1st June 2022 and closed on the 29th June 2022. Comments received have been considered. The main themes from the comments received were:

- Need to consider Ireland's State of the Environment Report 2020 (SOER2020) including chapter 7 and water quality in the identification of deficiencies and needs in relation to water supply;
- Fisheries and marine environment – recognition of the impacts related to desalinisation options on fisheries and the marine environment;
- Identification of recently published or forthcoming policy, legislation, and other data sources, and consideration into aligning the RWRP with other key planning documents and strategies;
- Drinking water – recognition of the importance of raw water quality for the environment and reducing treatment and risk to supply; and
- Transboundary environment – a need for consideration of specific impacts relating to the transboundary environment, and whether there will be a significant impact

Responses to the comments for the draft RWRP and SEA are provided in Appendix G and range from amendments to include additional policy in the PPP review, provision of additional explanation on how expected legislation will be addressed, provision of additional information the assessment of sustainability of surface and groundwater abstractions, commitments to improve data collection going forward, undertake ongoing monitoring and feedback within the 5 year plan cycle and for involvement in collaborative engagement for the plan development and implementation.

3.2.2 Consultation 2: Draft RWRP-NW and Environmental Reports

The SEA Environmental Report was published on the Uisce Éireann website (https://www.water.ie/nwrp) alongside the draft Regional Plan and the NIS for public consultation. The SEA Environmental Report outlined the assessment of the Regional Plan, including effects on the environment and proposed mitigation. In accordance with Article 11 of European Communities (Environmental Assessment of Certain Plans and Programmes (S.I. No. 435 of 2004), SEA environmental authorities, as well as any relevant transboundary authorities (for example, Northern Ireland Environmental Agency), were notified so that they may make a submission or observation in relation to the SEA Environmental Report or the Regional Plan to Uisce Éireann.

Uisce Éireann has referred to this SEA Environmental Report and the NIS when preparing the Regional Plan for the North West area. The reports were on display for statutory public consultation between November 2022 and February 2023.

Consultation 2 (statutory public consultation) took place between 22nd November 2022 and 21st February 2023.

Note: This SEA Environmental Report incorporates the updates and amendments responding to the comments received and associated amendments to the final Regional Plan. This revised SEA Environmental Report is produced as support for the SEA Statement and these SEA reports are published alongside the adopted Regional Plan for the North West Region.

4 Review of Relevant Plans, Policies and Programmes

4 Review of Relevant Plans, Policies and Programmes

This section provides a summary of the plans, policies and programmes that have been identified as potentially important in development of the baseline environment and SEA objectives for the SEA of the Regional Plan for the North West.

4.1 Review Requirements

The SEA Directive states in Article 5(1) of Annex 1 that the environmental assessment must identify

"…the environmental protection objectives, established at International, European Union or national level, which are relevant to the plan or programme, or modification to the plan or programme, and the way those objectives and any environmental considerations have been taken into account during its preparation".

In accordance with this requirement, the relationship with the relevant policy, plan programme and legislative framework was explored in order to inform the scope of the SEA and to provide a focus for identifying the baseline environment and development of the SEA objective. The considered plans, programmes and policies are relevant to developing a transparent assessment of the likely environmental effects. Consideration of the plans, programmes and policies allows for application of a structured and informed SEA.

4.2 Key Plans, Policies and Programmes

A comprehensive review of relevant national and regional level policies, plans, programmes and legislative framework of relevance to water resource planning, including related Uisce Éireann plans and strategies, has been undertaken and consulted upon within SEA Environmental Report for the Framework Plan available at www.water.ie/nwrp. The identified documents will also be directly relevant to the Regional Plan for the North West and are provided in Appendix F (section F.1). Key influences identified at the national level which also apply to the Regional Plan include:

- UN Sustainable Development Goals (SDGs);
- EU WFD (Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for Community action in the field of water policy);
- EU Drinking Water Directive (Directive 2020/2184 of the European Parliament and of the Council on the quality of water intended for human consumption (recast);
- River Basin Management Plan for Ireland 2018-2021 (the draft 2022-2027 Plan was published for consultation in September 2021);
- National Adaptation Plan (NAP) & Adaptation Plan for Water Quality and Water Services Infrastructure;
- Climate Action and Low Carbon Development Act 2015 (as amended 2023);
- Climate Action Plan (CAP);
- Water Environment (Abstractions and Associated Impoundments) Act 2022 (Abstractions Act);
- National Planning Framework – Project Ireland 2040;
- National Adaptation Framework Sectoral Adaptation Planning;
- Regional Spatial and Economic Strategy (RSES) for the Eastern and Midlands Region, RSES for the Southern Region and RSES for the Northern and Western Regional Assembly; and
- Related Uisce Éireann plans and strategies including the Water Services Strategic Plan (Tier 1 plan), National Wastewater Sludge Management Plan, Lead in Drinking Water Mitigation Plan,

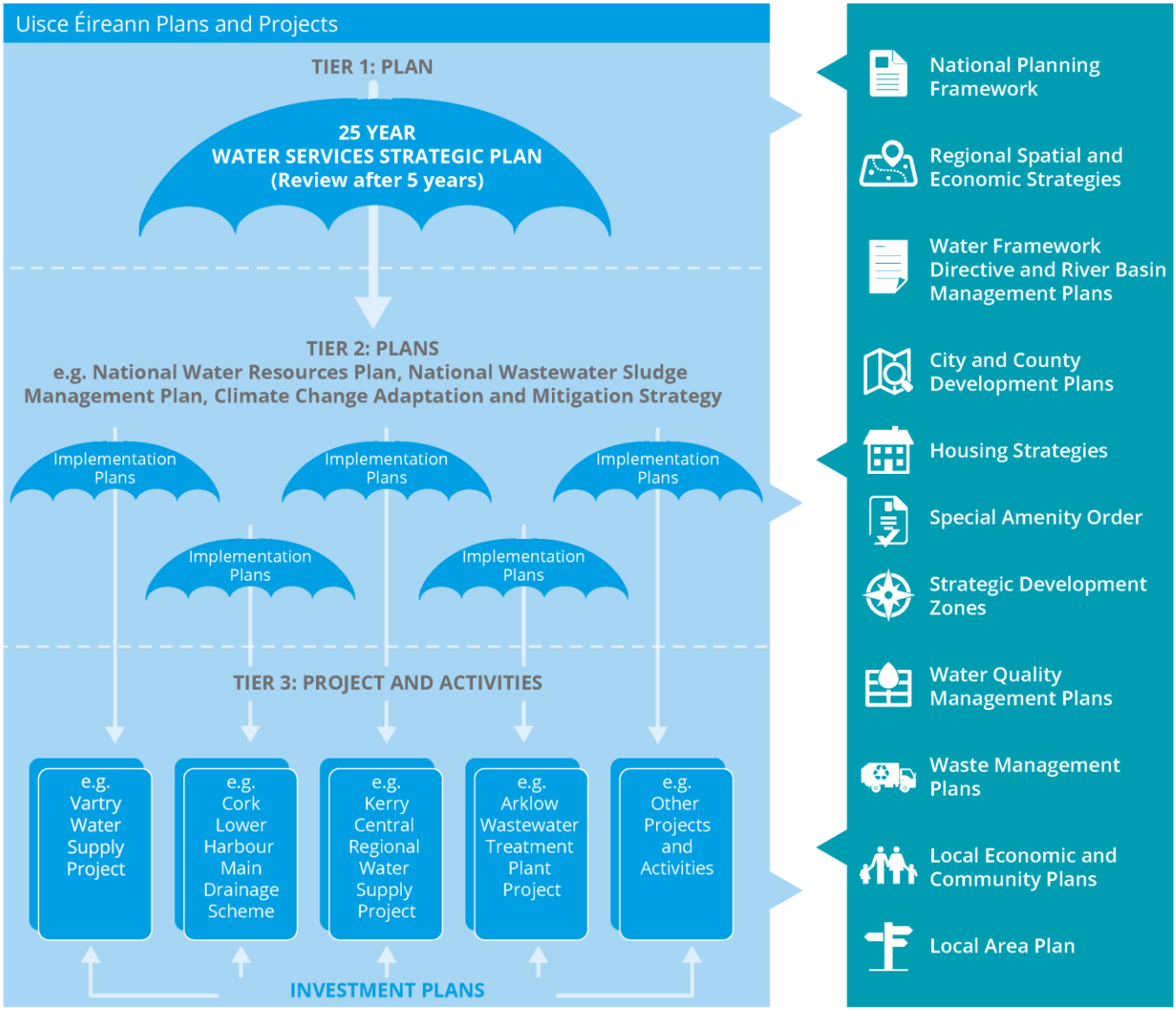
Sustainable Energy Strategy - Climate Change Mitigation and Adaptation Strategy, Leakage Reduction Programme and National Disinfection Programme.

A focussed list of additional local level plans policies and strategies relevant to Regional Plan for the North West specifically is provided in section F.2 of Appendix F. Regional and local level plans likely to be key for the purposes of the SEA for the Regional Plan fall under five main groups as follows:

- County Development Plans, Local Area Plans and Town Development Plans – Planning Authorities are legally required to make County and City Development Plans which sets an agenda for development to make adequate provision for the scale of population growth projected. Where appropriate, the latest draft plans have been used;
- County Heritage Plans and County Biodiversity Action Plans – these plans help ensure targets for species and habitat conservation in the National Biodiversity and Heritage Plans are effective at a local level;
- County Climate Change Adaptation Strategies and Climate Action Plans – these strategies and plans establish future climate risks at a local level and propose actions to adapt to currently observed and future climatic changes;
- County Landscape Character Assessments – these assessments classify and describe the landscape in a county; and
- Regional Waste Management Plans.

Other relevant plans, policies and strategies considered and listed within Appendix F include Conservation Plans, Renewable Energy Strategies, Community Biodiversity Action Plans and Noise Action Plans.

These plans and policies have been taken into account in the development of the SEA objectives as described in the Framework Plan and RWRP-NW SEA Scoping Report and in the assessment criteria used to assess the options and alternatives considered in the development of the RWRP-NW. Figure 4.1 identifies how the NWRP relates to the key national, regional and local level plans, policies and strategies identified above. When plans, policies and strategies are updated they will be incorporated through the monitoring process (see section 6.11).



It should be noted that the listing of the documents on the right of the graphic is not intended to show a hierarchy of plans or an alignment of the plans with the Uisce Éireann Tier 1, Tier 2 and Tier 3 plans/projects.

Figure 4.1 Interaction between the Planning System and Irish Water's Plans and Programs

4.3 Key Influences for the draft RWRP SEA

Key policies and plans relevant for the development of the RWRP-NW and shaping the approach for the SEA are summarised below

4.3.1 Water Framework Directive and River Basin Management Plan

The EU WFD (Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for Community action in the field of water policy) and the RBMP (required under WFD) are of particular relevance to the development of the Framework Plan as they set the framework for managing Irish waters from abstraction and pollution. They will strongly influence where and how much can be abstracted in creating new supplies and enhancing existing sustainable abstractions.

The WFD establishes a standard European wide strategic approach to managing surface water, groundwater, transitional and coastal waterbodies, wetlands and to meeting common environmental objectives.

The WFD environmental objectives for surface waters include the following:

- Prevent deterioration;
- Aim to achieve good ecological status (or for Artificial or Heavily Modified Water Bodies, good ecological potential);
- Aim to achieve good chemical status[6];
- Aim to reduce/cease emissions, discharges and losses from priority substances and priority hazardous substances; and
- Meet protected area objectives where relevant.

The WFD environmental objectives for groundwater include the following:

- Prevent deterioration of status;
- Aim to achieve good quantitative status;
- Aim to achieve good chemical status;
- Prevent or limit the input of pollutants;
- Reverse significant upward trends in the concentration of pollutants; and
- Meet protected area objectives where relevant.

Under Article 4(1)(a) of the WFD, Ireland must adopt the necessary measures to achieve the objectives of non-deterioration, preservation and enhancement of the status of bodies of water by making the programmes specified in the RBMP operational for the achievement of the WFD environmental objectives. Both the obligations to enhance, and to prevent deterioration of the status of bodies of water, are designed to attain the qualitative objectives pursued by the EU legislature, namely the preservation or restoration of good status, good ecological potential and good chemical status of surface waters.

More details on the WFD and the current baseline and key trends for the water environment are presented in chapter 5 of this SEA Environmental Report.

The RBMP for Ireland sets out how organisations, stakeholders and communities will work together to improve the water environment and fulfil the requirements of the WFD. The RBMP is updated every six-years as part of the river basin planning cycle; the current RBMP is the second cycle and sets out what

[6] While WFD objective of Good Status or Good Ecological Potential exists, if a higher objective (high status) exists then that is the objective for the waterbody because of the no deterioration condition.

measures will be undertaken to protect and improve Irish waters (the third cycle draft RBWP was published for consultation in September 2021 and is currently under review).

One of the key points which informed this current RBMP was the recognition that its implementation requires effective and efficient national, regional, and local structures, and thorough integration of some structures, to ensure effective co-ordination between scientific understanding of the problems to be addressed, and policy development and on-the-ground delivery. Such coordinated action is designed to protect public health, the environment, water amenities and to sustain water-intensive industries, including agri-food and tourism, particularly in rural Ireland.

Having learned lessons from the first RBMP cycle, the Government combined three River Basin Districts into one for the second RBMP, using a national and more integrated approach. The second RBMP aims to build on the positive aspects of the first cycle, and also to learn from those aspects which did not progress as well as they had expected to; for example:

- The structure of multiple River Basin Districts did not prove effective in terms of resource management and coherent management of similar challenges across the country;
- The governance and delivery structures in place were not effective and were overly complex; and
- The targets set were not realistic due to the concept of planning RBMP being new to EU member states and within the Irish context, and the level of ambition was not grounded on a sufficiently well-developed evidence base.

The Government has introduced new initiatives and policies to address many of Ireland's water quality challenges, building on the measures implemented during the first planning cycle, but also seeks to implement supporting measures on a prioritised basis; where necessary. A programme of key measures has been established, including:

- Local Authorities to put in place Support and Advisory Teams to carry out scientific assessments and to drive the implementation of mitigation measures at local level;
- Compliance with the Good Agriculture Practice Regulations will be improved through implementation of the Fifth Nitrates Action Programme for 2022-2025 and of the associated inspection regime. The Programme entails new strengthened water-protection measures, focused on intercepting and breaking nutrient transport pathways and preventing sediment and nutrient losses to waterbodies; and
- Greater opportunities for public consultation and engagement.

The RBMP sets out the objectives, targets and measures to improve waterbodies throughout Ireland. To improve water quality and achieve "Good" ecological status in waterbodies (rivers, lakes, estuaries and coastal waters) by 2027.

The third Cycle of the RBMP was published for consultation in September 2021 and identifies significant pressures in waterbodies in relation to hydromorphology, land use planning, agriculture, siltation and hazardous chemicals. All of these pressures have the potential to reduce the amount of water which Uisce Éireann can abstract, reduce water quality and or change suitable abstraction point infrastructure or locations. Any data that becomes available from the upcoming RBMP for the 2022-2027 period will be incorporated into the RWRP-NW as part of the plan review within the monitoring and feedback process as described in section 6.11 of this Report.

4.3.2 Abstraction Licensing

At the end of 2022, the government passed the Water Environment (Abstractions and Associated Impoundments) Act, 2022 (the Abstractions Act) , which will ensure that national abstractions align with

the requirements of the Water Framework Directive. The Abstractions Act has not yet commenced and the associated regulations and guidelines which will further detail the types of assessment and national methodology to be used are not yet published or in place.

Whilst the regulations and guidelines for the new abstraction regime are being developed, Uisce Éireann are assessing existing abstractions to identify surface water sites that may exceed future abstraction thresholds. Uisce Éireann has taken a precautionary approach based on their current understanding of how proposed abstraction legislation might be applied. This assessment suggests that certain schemes may be subject to reductions in abstraction under the new legislation; however, this will ultimately be determined by the EPA based on the project level information before them.

As Uisce Éireann does not have full visibility of the future regulatory regime and has not progressed through the licensing process on a site-by-site basis, estimations of sustainable abstraction within the SDB calculations are not used. Instead, Uisce Éireann uses the hydrological yield, water treatment capacity and bulk transfer limitations in its calculation of deployable output. Uisce Éireann uses the sustainable abstraction assessment to assess the sensitivity of the Preferred Approaches (solutions) that it develops as part of the NWRP.

Therefore, the Framework Plan and RWRP-NW assume that existing abstractions can continue on a transitional basis, subject to the regulatory requirements which will be outlined in the future regulatory regime.

For these existing abstractions, further studies will be undertaken in conjunction with the EPA and appropriate stakeholders. Following investigation, if an abstraction is confirmed to be affecting a waterbody status the SDB will be updated, and solutions will be delivered through the future cycles of RBMPs and/or the Regional Water Resources Plans.

As the objective of the NWRP is to achieve, safe, secure, reliable and sustainable supplies, all new abstractions developed by Uisce Éireann as part of the Regional Water Resources Plans are be based on conservative assessments of sustainable abstraction. This will ensure that water supplies continually improve in terms of environmental sustainability over time.

4.3.3 Drinking Water Directive 'Recast'

The Drinking Water Directive which concerns the quality of water intended for human consumption has been revised with the adoption by the European Parliament in December 2020 of the 'recast' Drinking Water Directive with two years for Member States to implement. The new Directive aims to improve safe access to water and the highest standards in the world for drinking water, in line with the zero pollution ambition for a toxic-free environment announced in the European Green Deal. The new rules update quality standards and introduce a catchment level and risk-based approach. The Directive introduces the obligation for Member States to improve or maintain access to safe drinking water for all, with focus on vulnerable and marginalized groups. It also foresees better access to information for citizens regarding water suppliers, concerning for example the quality and supply of drinking water in their living area.

4.3.4 National Planning Framework – Project Ireland 2040

The National Planning Framework is a national document prepared by the DHPLG published on 16th February 2018. It will guide, at a high level, strategic planning and development for the country over the next 20 years and beyond, so that population growth is sustainable in economic, social and environmental terms.

The National Planning Framework is accompanied by the ten-year National Development Plan, together forming one plan to guide strategic development and infrastructure investment at a national level.

Uisce Éireann have taken account of the National Planning Framework in the approach to the SEA assessment for the options required to support growth.

4.3.5 National Adaptation Framework Sectoral Adaptation Planning

Building on the work completed under the National Climate Change Adaptation Framework (NCCAF, 2012), the Department of Communications, Climate Action and Environment published Ireland's first statutory National Adaptation Framework (NAF) in January 2018. The NAF sets out the national approach to adaptation in Ireland in order to reduce the negative impacts of climate change. The framework requires each government department to develop a sectoral adaptation plan for their area of responsibility.

As part of this framework, the DHPLG produced the Adaptation Plan for Water Quality and Water Services Infrastructure. Figure 4.2 lists the acute priority impacts on water services and their associated risk controls and adaptation measures as stated in the Adaptation Plan. The NWRP is called out as an adaptation measure under all the identified acute priority impacts.

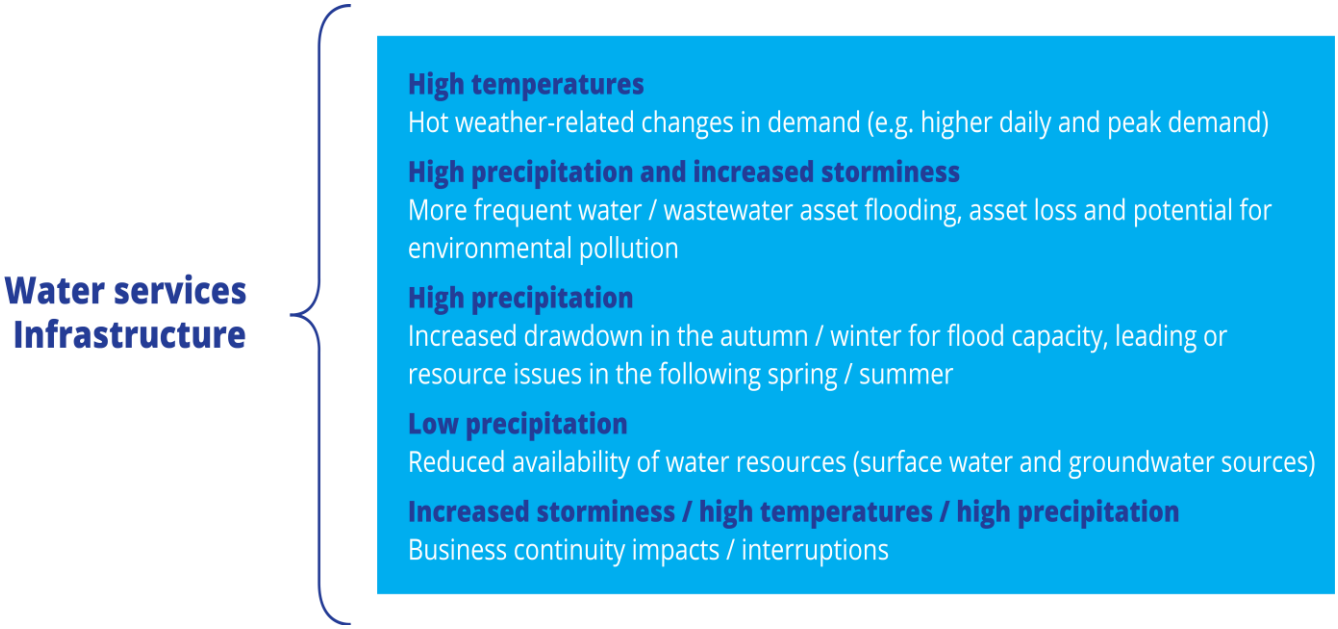


Figure 4.2 Adaptation Plan Acute Priority Impacts

4.3.6 The Climate Action and Low Carbon Development Bill 2015 (as amended 2021) and the Climate Action Plan 2023

The Climate Action and Low Carbon Development (Amendment) Act 2015 (as amended 2023) (Climate Act) sets out the legal framework for Ireland's transition to a climate resilient, biodiversity rich, environmentally sustainable and climate neutral economy by no later than 2050. It provides for a 2030 interim target to halve greenhouse gas emissions, five-yearly carbon budgets, sectoral emissions ceilings, an annually updated Climate Action Plan and a Long-Term Climate Action Strategy. The 2023 Climate Action Plan was published in December 2022 and updates the 2021Climate Action Plan and will be updated on an annual basis going forward. The plan sets out the actions required to achieve the targets in the Climate Act in terms of the measures to cut emissions for sectors including electricity, agriculture, land use and forestry and identifying governance measures including carbon budgeting.

4.4 Related Uisce Éireann Plans and Strategies

As illustrated in Figure 4.1, the NWRP falls into a wider hierarchy of plans and strategies. The relevance or scope of some of these plans and strategies is explained below.

4.4.1 Water Services Strategic Plan (Tier 1 Plan)

The WSSP is the highest tier Uisce Éireann asset management plan as illustrated in Figure 4.1. It sets the overarching framework for detailed Implementation Plans. The NWRP is just one of the Implementation Plans developed to achieve the objectives of the WSSP.

The WSSP has six strategic objectives; one of which is to 'ensure a safe and reliable water supply', and another to 'protect and enhance the environment'. A number of aims have been identified in order to achieve these objectives. Under the objective 'ensure a safe and reliable water supply', two of the aims to support the achievement of this are to "reducing drinking water quality problems" and to "manage the sustainability and quality of drinking water from source to tap to protect human health". Under the objective 'protect and enhance the environment', Uisce Éireann intend to "operate our infrastructure to support the achievement of objectives under the Birds and Natural Habitats and WFDs" and "manage our residual waste in a sustainable manner". The NWRP will consider all strategic objectives and supporting aims within the WSSP during its development.

4.4.2 Other Related Tier 2 Plans

National Wastewater Sludge Management Plan

The National Wastewater Sludge Management Plan sets out the long-term strategy for the management of wastewater sludge produced at wastewater treatment plants (WwTPs) under the control of Uisce Éireann. The siting of new wastewater sludge infrastructure has the potential to impact the same receptors affected by the NWRP, including aquatic habitats and water quality. There is the potential for opportunities and impacts in terms of how the biosolid/sludge by-product of the wastewater treatment process can be used as an organic fertiliser, which can improve agricultural soil quality. Where this replaces artificial fertilisers, there may be potential to support catchment management approaches within the Plan.

Lead in Drinking Water Mitigation Plan

In 2015, the Government published the National Strategy to reduce exposure to Lead in Drinking Water. The main aim of this strategy is to protect human health and solve the issue of lead in drinking water in Ireland. As the national public water utility, Uisce Éireann developed the Lead in Drinking Water Mitigation Plan. Uisce Éireann developed this to address the risk of failing to comply with the drinking water quality standard for lead due to lead pipework serving properties connected to the public water network, for which Uisce Éireann are responsible. The Lead in Drinking Water Mitigation Plan identifies investment needs which, combined with needs from the NWRP, may influence the choice of an optimal approach.

The SEA will have to consider the potential for in-combination effects with the Lead in Drinking Water Plan. There is potential for in-combination effects on human health, biodiversity and water quality as a result of the orthophosphate treatment at Water Supply Zones where lead replacement is not feasible.

Sustainable Energy Strategy - Climate Change Mitigation and Adaptation Strategy

Improving energy efficiency is one of Uisce Éireann's key sustainability measures for improving their carbon footprint and reducing greenhouse gas emissions. Uisce Éireann is implementing a sustainable energy strategy to become a low carbon, energy efficient, sustainable water utility and improve energy efficiency. The strategy includes 36 business wide energy action plans and 255 discrete energy projects to improve energy efficiency, including Energy Efficient Design, Energy Innovation, Energy retrofit upgrades, Water Conservation, Renewable Energy, Lighting and Heating, Capital Maintenance, Transport and Process Optimisation. Significant progress has been made in implementing the

sustainable energy strategy, in 2020, a 32% improvement in energy efficiency performance with a corresponding saving of over 95,000 tonnes of carbon was achieved. Uisce Éireann are on track to meet their target of 33% energy efficiency improvement, putting them in a strong position to meet the new target of 50% by 2030.

Energy efficiency improvement is a key mitigation measure of Uisce Éireann's climate change policy to help ensure water and wastewater services are resilient to climate change, developing a low greenhouse gas emitting water and wastewater service. Uisce Éireann is implementing a business wide climate mitigation and adaptation strategy, aligned with the Water Sector Adaptation Plan under the National Adaptation Framework. The strategy identifies the adaptation and mitigation actions to be undertaken to minimise the consequences of climate change on Uisce Éireann, their customers and the environment.

Key sustainability objectives included:

- Developing and implementing a sustainability strategy aligned with the Government Climate Action plan and UN Sustainable Development Goals;
- Continuing the implementation of our sustainable energy strategy;
- Implementing and communicating our climate change strategy;
- Developing a carbon neutrality roadmap;
- Continuing to decarbonise our energy consumption through energy efficiency improvement and renewable energy;
- Improving energy efficiency by upgrading and replacing inefficient plant and processes.
- Continuing to protect and enhance biodiversity on our assets;
- Embedding energy efficiency design into our activities in collaboration with the Sustainable Energy Authority of Ireland (SEAI); and
- Implementation of a waste management strategy, with a particular focus on circular economy.

4.4.3 Framework Plan Tier 3 Projects and Activities

Leakage Reduction Programme

Uisce Éireann is undertaking a national programme of works to reduce leakage and improve water supply. This programme will see invested €500 million in the public water network up to the end of 2021. The National Leakage Reduction programme was established in 2017, as a long-term strategic initiative to sustainably tackle the leakage problem and maintain leakage savings. The programme involves finding and fixing damaged and shared water mains, pressure management and replacing the worst-performing mains in terms of leakage. Due to the implementation of this programme Uisce Éireann are now saving 166 million litres of water every day. The programme supports the leakage reduction objectives of the NWRP and the committed and planned investments under it will need to be taken into account in the implementation of the Regional Plan. The same types of impacts identified by the Framework Plan SEA for leakage reduction options will also apply to the proposals under this programme.

National Disinfection Programme

Uisce Éireann has developed a disinfection programme to improve the quality of drinking water across the country. The phased programme involves the upgrade and standardisation of disinfection systems currently installed in WTPs for the disinfection of contaminated sites across the country. The programme supports the quality objectives of the NWRP. The programme is ongoing across all of the study areas in the North West Region. Progress will be taken into account in the baseline for the Regional Plans so that

priorities for future investment can be considered in the options assessment process in the development of the Regional Plans.

5 Baseline Environment

5 Baseline Environment

This section sets the proposed geographical and temporal scope of the SEA for the Regional Plan, and provides environmental baseline information on key environmental topics including:

- Population, Economy, Tourism and Recreation, and Human Health;
- Water Environment;
- Biodiversity, Flora and Fauna;
- Material Assets;
- Landscape and Visual Amenity;
- Air Quality and Noise;
- Climate Change;
- Cultural Heritage; and
- Geology and Soils.

5.1 Scope of the Assessment

5.1.1 SEA Geographical Scope

At this stage of the assessment the core baseline area for the SEA of the Regional Plan for the North West is the area covered by the seven study areas which comprise the North West Region (see Figure 5.1) and sites designated for nature conservation that are hydrologically connected to waterbodies in the core baseline area. The assessment process undertaken for the SEA and AA (see section 6.15) during evolution of the Plan will consider the potential for linkages of this type, and where necessary, the geographic scope of the core baseline area will be extended accordingly.

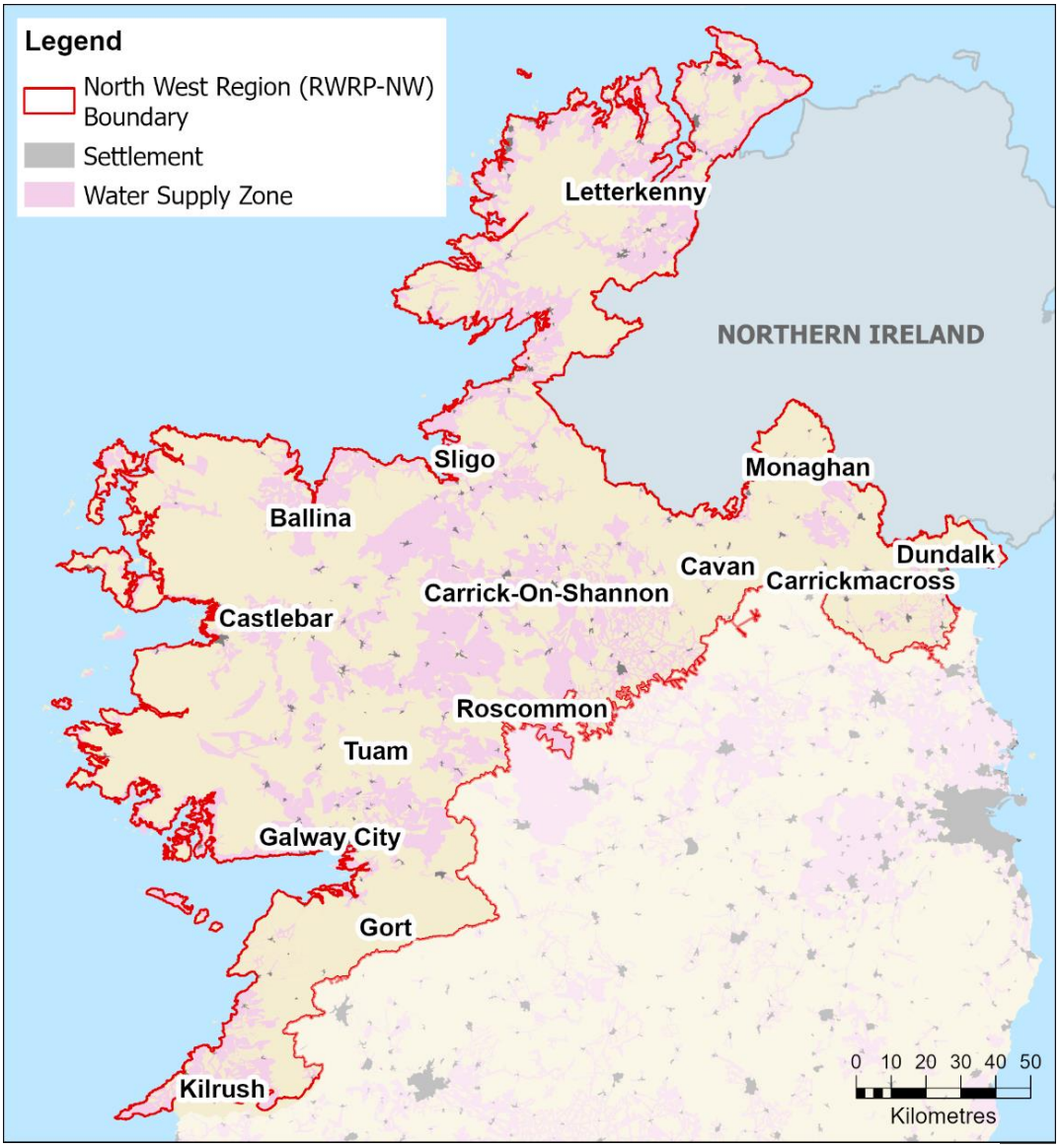


Figure 5.1 Water Supply Zones and Key Settlements in the North West Region

5.1.2 Transboundary Environment

The draft RWRP–NW covers Uisce Éireann's operational area for the North West which has a long border with Northern Ireland (see Figure 5.1). There is potential for transboundary effects on the basis of proximity of the border with Northern Ireland, shared WFD catchment units, waterbodies and other pathways for effects. Therefore, transboundary effects are scoped in for the RWRP-NW and will be considered further as part of assessing the proposals for the RWRP-NW.

Transboundary policies and plans have been reviewed as listed in Appendix F and potential for transboundary effects associated with plan proposals have been considered through the assessment process and findings are included in this Environmental Report. Where there are any new proposals for new construction works or schemes that are in close proximity to the border and thus may have an impact, we will include consideration of local landscape designations. The RWRP-NW, SEA Environmental Report and NIS will be provided to the relevant Northern Ireland agencies as part of the consultation process.

5.1.3 SEA Temporal Scope

The proposed temporal scope for the SEA is the 25-year period between 2019 and 2044 that is covered by the Framework Plan and RWRP-NW.

5.2 High Level Environmental Trends in the NW Region and Across Ireland

The EPA's latest State of the Environment Report (SOER, 2020) (EPA, 2020) provides:

- An assessment of the overall quality of Ireland's environment;
- An outline of the pressures being placed on this environment; and
- The key actions that can address these pressures.

The following areas identified as challenges to address across Ireland within the SOER 2020 are particularly pertinent to development of the RWRP-NW:

- **Climate:** high greenhouse gas (GHG) emissions continue, and the scale and pace of GHG reductions must accelerate to meet 2023 Climate Action Plan targets;
- **Water:** deteriorating water quality trends over the last 20 years, particularly for rivers; and
- **Nature:** deteriorating protected habitat trends, with 85% of EU protected habitats having unfavourable status. Trends for EU protected species are mixed, however freshwater species are most at risk and some freshwater species are under threat.

Waste and the circular economy and air quality are also areas where further action is needed to meet long-term objectives and targets. Further detail regarding the baseline environment for each of these topic areas is provided in the following sections.

These three key challenges of relevance to the RWRP-NW are directly linked to the following four UN Sustainable Development Goals (SDG):

- **SDG 6 Clean Water and Sanitation:** Ensure availability and sustainable management of water and sanitation for all;
- **SDG 13 Climate Action:** Take urgent action to combat climate change and its impacts;
- **SDG 14 Life Below Water:** Conserve and sustainably use the oceans, seas and marine resources for sustainable development; and
- **SDG 15 Life On Land:** Protect and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

Significant population increase is anticipated over the coming two decades, which is an important consideration for water demand, and subsequently for the water environment and compliance with the Water Framework Directive and SDG 6 and 14. Specific indicators for meeting the UN SDGs in Ireland are reported on Ireland's Sustainable Development Goals (SDG) data hub (Ireland's Hub for Sustainable Development Goals (geohive.ie)) and include CSO Report on Indicators for Goal 6 Clean Water and Sanitation: Overview – SDG 6 Clean Water and Sanitation (2023).

Section 3.2.5 of the draft RWRP-NW sets out the projected demand in the region over the next 25 years versus existing supply, taking into account where reductions in abstraction volumes are known to be required for sustainability reasons.

5.3 Population, Economy, Tourism and Recreation, and Human Health

5.3.1 Population

The North West Region falls within the Northern and Western Regional Assembly and Southern Regional Assembly and in a small extent within the Eastern and Midland Region. In total there are three Regional Assemblies which are parts of the regional tier of government in Ireland (Government of Ireland, 2020). Table 5.1 provides an overview of the population of the study areas (SAs) within the

RWRP-NW region and the projected increases in population between 2019 and 2044. For the NWRP and Regional Plans, Uisce Éireann has taken 2019 as the baseline population for its supply demand balance (SDB) forecasting. This is extrapolated from the 2016 Census data and growth projections used by Uisce Éireann are based on best available data from the National Planning Framework (NPF) and Regional Spatial and Economic Strategies (RSESs). The full 2022 Census data was not available at the time of the SDB analysis, however, Uisce Éireann will update the SDB with the 2022 census data when published. Updated data and information, will be incorporated via the monitoring and feedback process as set out in section 8.3.8 of the Framework Plan. As a headroom allowance has been provided in Uisce Éireann's SDB to allow for uncertainty in the data they do not anticipate any update to the SDB will significantly change their predictions. In addition, the ongoing work between the Regional Assemblies and the local authorities over the course of the development of the Local Authority County/City Development Plans is recognised by Uisce Éireann and will be incorporated into the demand forecasts, once finalised.

Each SA is divided into several Water Resource Zones (WRZs), and the average percentage population increase during the Plan period anticipated across WRZs within each SA is also shown in Table 5.1.

Table 5.1 Overview of the Population within the RWRP-NW Area

Study Area	Total population served 2019 (CSO, 2016 and Uisce Éireann 2019 population projections)	Population change 2019-2044 (%)
A	149,598	20.4
B	58,272	19.9
C	96,788	23.9
D	228,609	30.7
E	84,053	29.2
F	85,573	22.1
G	29,804	19.9
RWRP-NW Area Total	**732,696**	**25.2**

The overall predicted/estimated regional population growth from the SDB forecast is an increase of 25.2% over the period from 2019 to 2044. All SAs in the region have a projected growth rate that exceeds the 12% national rate observed in the 10-year period from 2006 to 2016. SAD (Galway and Mayo) has the highest projected growth rate at 30.7%, which is driven by the Galway City forecast growth of 46.5% by 2044.

5.3.2 Economy and Employment

Study areas or parts of SAs located within the North West region fall within the Border, West, Mid-West, Midlands and Mid-East of the Nomenclature of Territorial Units for Statistics 3 (NUTS 3) Regions. All of the NUTS 3 regions within the North West region had a household disposable income per person in 2019 that was below the average for Ireland (CSO, 2022a).

Within the core baseline area, unemployment rates in Q1 2023 were lowest in the Border region (3.8%) and highest in the Mid-East region (5.3%) (see Table 5.2).

Table 5.2 Unemployment Rates in Q1 2023

Region*	Unemployment rate Q1 2023 (%) (CSO, 2023a)
Border	4
West	3.8
Mid-West	4.0
Midland	4.0
Mid-East	4.0

* See Figure 3.8 (Appendix A) for study area boundaries in relation to regions. Majority of the North West Region lies within the Border and West NUTS 3 Regions of Ireland.

Population increase and expected economic growth has meant that housing and sustainable urban development have been made a priority for the National Development Programme; therefore, to supply the demand there is the aim to increase housing stock. New dwelling completions for Q1 2022 are shown in Table 5.3. Regionally, the number of new dwellings completed in the Border region was second lowest in Q3 2020 and third lowest in Q3 2021. The number of new dwellings completed in the Border region was the lowest and was highest in the Mid-East. New dwelling completions in the Mid-East and Border regions represented approximately 19% and 5% of the completions respectively in Ireland in Q1 2022.

Table 5.3 New Dwellings Completed Q1 of 2023

Region*	New dwellings completed in Q1 2023 (CSO, 2023b)
Border	339
West	434
Mid-West	431
Midland	292
Mid-East	1,338

* See Figure 3.8 (Appendix A) for study area boundaries in relation to regions. Majority of the North West Region lies within the Border and West NUTS 3 Regions of Ireland.

5.3.3 Non-Domestic Growth

Within the RSES and the NPF there are also projections of non-domestic growth. The precise nature of the business activity created to drive non-domestic growth can have a significant impact on water demand as non-domestic water demand varies enormously from sector to sector and property to property. Therefore, an allowance has been made in the RWRP-NW for non-domestic growth in towns and cities identified as strong growth areas in Project 2040. For other areas it has been assumed that there will be no significant increase in non-domestic demand. Uisce Éireann will review policy and trends in relation to this over the coming years and refine their forecasts as per the monitoring and feedback process set out in section 8.3.8 of the Framework Plan.

5.3.4 Tourism and Recreation

Tourism has an important role in the core baseline area, particularly in rural locations, with the National Planning Framework (NPF) stating that tourism is a key aspect of rural job creation now and in the future (Government of Ireland, 2018). The core baseline area encompasses Ireland's Wild Atlantic Way on its eastern edge and extends into Ireland's Hidden Heartlands on its Western side, two of Fáilte Ireland's tourism programmes in the country. Ireland's Wild Atlantic Way is Ireland's first long-distance touring route and aims to achieve greater visibility for the west coast of Ireland (Fáilte Ireland, 2020b). Hidden Heartlands is located in the Mid-West, focussing on rural communities (Fáilte Ireland, 2020a).

Key tourist attractions located within the core baseline area are described below:

- Galway City (SAD) is known as 'The City of the Tribes' and is a vibrant bohemian city located on the Wild Atlantic Way. The city is known for its historical medieval stone walls.
- The county of Galway (SAs D and G) is known for its coastlines, beaches and lofty mountain peaks including the wilds of Connemara, home to Kylemore Abbey.
- The county of Leitrim (SAs B, C and F) includes the towns Carrick-on-Shannon, Drumshanbo, Ballinamore, Manorhamilton and Dromahair. The county is home to Glencar waterfall, an inspiration to WB Yeats.
- The county of Mayo (SAs C, D and F) contains significant tourist attractions including the Museum of Ireland- Country Life, Céide Fields, Westport House, Foxford Woollen Mills, Michael Davitt Museum and the Jackie Clarke Collection (Mayo County Council, 2019).
- The county of Roscommon (SAs D and F) is known for its lakes, historic towns of Roscommon, Boyle and Castlerea). It is home to Lough Key Forest and Activity Park and Strokestown Park House and Garden.
- The county of Sligo (SAs A, C and F) is known for its scenery and remote islands. It is also the home county of W.B Yeats.
- The county of Cavan (SAs B, C E and F) is known as 'The Lake County'. It is home to Belturbet and Ballyconnell from which the River Erne and Shannon-Erne Canal can be explored.
- The county of Donegal (SAs A and B) is known as 'The County of the Gaels' and is home to the Derryveagh Mountains and Lough Eske. Malin Head is Ireland's most northerly point and is renowned for its landscape and beaches.
- The county of Monaghan (SAs B and E) is known for its rolling landscape and bountiful lakes. It is home to Glaslough, home to the Castle Leslie Estate, and Clones which hosts a number of festivals including the Flat Lake Festival.
- The county of Longford (SAs B and F) is known as 'Ancient Longford'. The town of Longford is full of history and has a thriving arts scene.
- The county of Louth (SAE) known as 'The Wee County' and is home to medieval Carlingford, Dundalk Bay, Cooley mountains and Clochafarmore's Standing Stone.
- The county of Meath (SAE) is known for its ancient history and busy towns.
- The county of Clare (SAG) is known for its jaw-dropping coastline carved by the Atlantic including the Cliffs of Moher. It is home to the holiday towns of Kilkee, Lahinch (home to Dough Castle) and Doolin (home to the longest free-hanging stalactite in the Northern Hemisphere), the Burren and Cliffs of Moher. Ennis is also expected to be subject to a Niche Destination Plan and to be a leading tourism destination.
- Visitor numbers to tourist destinations are recognised to increase demand on water supply especially during the peak tourism season.

Ireland's natural heritage is also recognised as an important tourism asset by the Department of Transport, Tourism and Sport (2019). Key natural heritage and outdoor recreation attractions within the core baseline area include:

- Study Area A: Glenveagh National Park, Lough Barra Bog Nature Reserve, Pettigo Plateau Nature Reserve, Sliabh Liag Cliffs, Inch Wildfowl Reserve and Silver Strand.
- Study Area B: Cavan Burren Park, Tullydermot Falls, Glangevlin, The Shannon Pot.
- Study Area C: Ballygilgan Nature Reserve, Easkey Bog Nature Reserve, Knockmoyle Sheskin Nature Reserve, Céide Fields, Wild Nephin National Park and Lough Cullin.
- Study Area D: Oldhead Wood Nature Reserve, Derryclare Nature Reserve, Leam West Bog Nature Reserve, Connemara National Park, Lough Corrib and Lough Mask.
- Study Area E: Lough An Leagh, Lough Muckno, Senator Bill Fox Memorial Park and Slieve Foy.
- Study Area F: Lough Allen, Lough Key, Termonbarry Harbour and Killykeen Forest Park.
- Study Area G: Cole Park Nature Reserve, Keelhilla (Slieve Carron) Nature Reserve, Ballyteigue Nature Reserve, The Burren National Park and Aillwee Cave.

Rivers, loughs and coastal areas across the core baseline area also all make an important contribution to tourism and recreational opportunities including use of navigable waterways for recreation uses and through supporting important fisheries.

5.3.5 Human Health

Table 5.4 provides well-being indicators for the core baseline area. Improvements in air quality, access to good quality drinking water and participation in recreation activity can all have a positive influence on health and well-being.

Table 5.4 Well-Being Indicators for the Core Baseline Area

Region*	Life expectancy (CSO, 2020a)	Participation in sports, fitness or recreational physical activities (% of persons aged 15+) (CSO, 2020b)	Air quality (EPA, 2021a)
Border	Male: 77.0 Female: 81.7	35	Good
West	Male: 77.1 Female: 82.7	56	Good
Mid-West	Male: 76.3 Female: 80.4	52	Good
Midland	Male: 77.2 Female: 81.5	47	Good
Mid-East	Male: 77.2 Female: 81.4	49	Good

*See Figure 3.8 (Appendix A) for study area boundaries in relation to regions. Majority of the North West Region lies within the Border and West NUTS 3 Regions of Ireland.

Key issues for public health include reliable access to good quality drinking water. This has water quantity and water quality components.

Water Resources for Supply

Regulated water service providers have to ensure appropriate service standards of supply and be able to endure drought conditions, peak events, and maintenance downtime on their assets. This requires reserve capacity in supplies. At present, the supplies across the RWRP-NW region do not have the reserve capacity to meet these levels of service at all times. Due to the limited historical monitoring of these supplies, particularly in relation to groundwater, this will need to be studied further.

Currently for day-to-day operations, the majority of WRZs within the RWRP-NW study areas suggest a Supply Demand Balance (SDB) deficit (based on a "do minimum" approach) under present and future scenarios (see Table 5.5 for a breakdown by study area). While sufficient in normal weather conditions, several would fail in drought conditions and these could result in restrictions to customer use.

During the drought in Summer 2018, all of Uisce Éireann's groundwater supplies were being monitored due to falling groundwater levels and a number of Uisce Éireann's supplies were impacted in terms of quality or quantity, including:

- Study Area A: In 2018, lower water levels required in-stream pumping for water sources supplying Carrigart Downings and Lettermacaward;
- Study Area B: Groundwater is sourced from shallow rainfall recharge-fed limestones in wet periods. For this reason, the available supplies at many raw water sources were impacted;
- Study Area C: North Sligo, Kilkelly and Swinford required sandbagging to contain impoundment in 2018;
- Study Area D: In-stream pumping and sandbagging were required in 2018 at raw water sources to maintain supplies to customers. This included Clifden WTP, Louisburg WTP, Mulranny WTP and Westport WTP; as well as the Bunowen River, which supplies Ahascragh. During the 2020 dry period, Inis Oirr WTP was tankered and night-time restrictions were in place for the areas served by the Inis Oirr WTP and Inishmean WTP. Night- time restrictions were also imposed in 2018 on the Aran Islands;
- Study Area E: In 2018 raw water levels dropped significantly at Lough Muckno, requiring overpumping at headworks feeding River Fane for Cavanhill WTP and night-time restrictions for Collon WTP;
- Study Area F: In 2020, night-time restrictions were imposed in Longford Springs and pumping from a nearby borehole was necessary to supplement supplies; and
- Study Area G: In 2018, raw water levels dropped significantly at the surface water abstraction at Gort WTP (where the river was sandbagged); and at the groundwater source at Carron WTP (Termon Spring). In these locations service interventions were required to maintain supplies to customers. Ballymacraven WTP and New Doolough WTP were also identified as at risk of potential drought. Surface water supplies to West Clare were impacted and required tankering to Moveen Reservoir.

Demand for water was also higher than normal during this period, driven by high temperatures and while disruption to customers and environmental impacts were minimised as a result of emergency plans and activities carried out by Uisce Éireann and Local Authorities customers experienced some impacts, including reductions in water pressure and some temporary loss of supplies, principally as a result as a lack of capacity in the existing infrastructure including for example:

- Night-time restrictions in critical areas to conserve supplies; and

- Provision of alternative water supplies to customers (Bowsers, stand pipes and bottled water), attention to critical customers, healthcare customers and vulnerable customers.

Water Quality for Supply

The risk to drinking water quality in the North West Region due to inadequate protection against key drinking water parameters (including bacteria and virus, protozoa and triahalomethanes) is high, with 97 out of the 142 WTPs assessed as high risk of not meeting for one or more of the water quality Barriers representing Uisce Éireann's internal asset standards. These standards are not an assessment of compliance with Drinking Water Quality Regulations but rather an internal conservative gauge to indicate where works are required.

Barrier 1: 30% of WTPs in the North West Region are classified as "high risk" of failing to achieve the required disinfection standard, while 70% are considered to be at "medium risk" of failing to achieve the required disinfection standard.

Barrier 2.1: 46% of the water supply system has a "low risk" of issues associated with maintaining residual chlorine through the network; however, 45% are at "high risk" of failing to maintain the required residual.

Barrier 3: 13% of WTPS are classified as "high risk" of failing to effectively remove protozoa, while 53% are considered to be at a "medium risk" of failure.

Barrier 6: 39% the WTPs in the North West Region have a "low risk" of issues associated with removing THMs whilst 24% are at "high risk" of failing to maintain the required levels of THMs. THMs can form when natural organic matter (NOM) is not sufficiently removed by Barrier 6, therefore reacting with chlorine over time.

The reliability of the water supply system is impacted by deficiencies in the WTPs and critical infrastructure.

Poor water quality can be linked to risks to health such as waterborne diseases. Further reference to the risks to human health from waterborne diseases and contaminants is covered in section 5.4.1. In addition, based on desk study Water Treatment Plant (WTP) assessments, a significant number of supplies in every study area within the North West Region appear to have significant water quality treatment risks (see Table 5.5), and further work is planned to provide more up to date and reliable assessment. As shown in Table 5.5 a number of supplies within the core baseline area are either on the EPA Remedial Action List (RAL) or are subject to an EPA direction. Uisce Éireann are currently progressing corrective action in relation to many of these supplies in advance of the Regional Plans.

Table 5.5 Water Quality and Supply Risks

Study Area	Current Number of WRZs with SBD Deficit (Total Number WRZs)	Number of Supplies with Confirmed Significant Water Quality Risks (Uisce Éireann Barrier Assessments)	Number of Supplies on EPA Direction or RAL
SAA	18(21)	22	3
SAB	8(23)	14	1
SA-C	14(17)	17	0
SAD	20(25)	17	3

Study Area	Current Number of WRZs with SBD Deficit (Total Number WRZs)	Number of Supplies with Confirmed Significant Water Quality Risks (Uisce Éireann Barrier Assessments)	Number of Supplies on EPA Direction or RAL
SAE	3(9)	14	3
SAF	9(15)	6	3
SAG	7(10)	7	4

National programmes being implemented to address asset reliability and water quality issues include:

- The **Source Protection Programme** which develops or upgrades groundwater sources;
- The **Reservoir Cleaning Programme** which involves inspections of reservoirs and the development of a prioritised works (cleaning/repair) schedule for implementation. The programme aims to reduce network water Quality issues;
- The **Disinfection Programme** which consists of chlorination upgrades and/or UV installations/upgrades to help resolve network water Quality issues;
- The **Lead Mitigation Programme** which is a pilot programme that involves the addition of orthophospate (a food additive) to the water to prevent lead in domestic pipes dissolving into drinking water. This programme will run in parallel to the Targeted Lead Services Replacement of all lead pipework on the public parts of the distribution system and the Government National Lead Strategy; and
- **Trihalomethane (THMs) Reduction** works (Box 5.1).

Box 5.1 – Trihalomethanes

Trihalomethanes are a by-product that can be formed when Irish Water disinfects* water supplies that contain naturally occurring organic matter. Within the Drinking Water Regulations, the maximum permitted levels of THMs in drinking water is set at 100 mg/L. When Irish Water took over the public supply in Ireland in 2014 it was estimated that 74 water supply zones (WSZs) within the public water supply were at risk of exceeding the limits for THMs. The European Court of Justise initiated an infringement case against Ireland for failing to address this issue.

Since then Irish Water has invested in the water supplies and resolved the THM issues in 57 of the 74 WSZs originally listed as part of the infringement case. The remaining 17 WSZs cover a population of 181,000, and will be addressed as follows:

- A further 8 supplies will be removed from this list by the end of 2021 (a reduction in impacted population of 129,000)
- The remaining 9 supplies will be permanently resolved by 2024.

* It should be noted that the potential health risks associated with THMs are much lower than the risk of serious illness that could result from drinking water that has not been properly disinfected.

5.4 Water Environment

This topic covers water quantity and water quality and includes consideration of hydromorphology, WFD and flood risk from surface waterbodies and groundwater. Groundwater aquifers are discussed in section 5.11.2.

Relative to other European countries, Ireland has twice the EU average of lake coverage (12,000 lakes covering ~2% land area). In the North West Region there are 638 lakes covering approximately 3% of the region's land area (740 km^2). The six largest lakes make up about 50% of the lake coverage in area - Lough Corrib (Upper and Lower), Lough Mask, Lough Conn, Lough Allen and Lough Erner (Upper). The larger known rivers within this region include the Shannon, Suck, Erne, Moy, the Clare-Corrib and the Inny, however, they represent only a fraction of the extensive 33,670 km network currently mapped by the EPA in the North West Region.

The parameters identified to reflect this sensitivity include geology, gradient and altitude. There are eight typologies for water resources standards for rivers that are defined based on these parameters. The river waterbodies in the North West Region comprise five of the eight typologies. The dominant river typology is represented by D2 – Granites and other hard rocks; low-high altitude; and low-medium slope, ultra-oligo trophic with cobble boulder bedrock and/or pebble bed. This makes up 41% (503) of the river systems in the region.

The most sensitive rivers are those within the C2 and D2 categories which are representative of headwaters, low nutrient, low pH and salmonid spawning and nursery areas. The salmonid spawning and nursery areas are particularly sensitive to low flows and impounding structures. These categories combined make up 71% of the river systems in the region. The surface water river systems are shown in Figure 5.2 below.

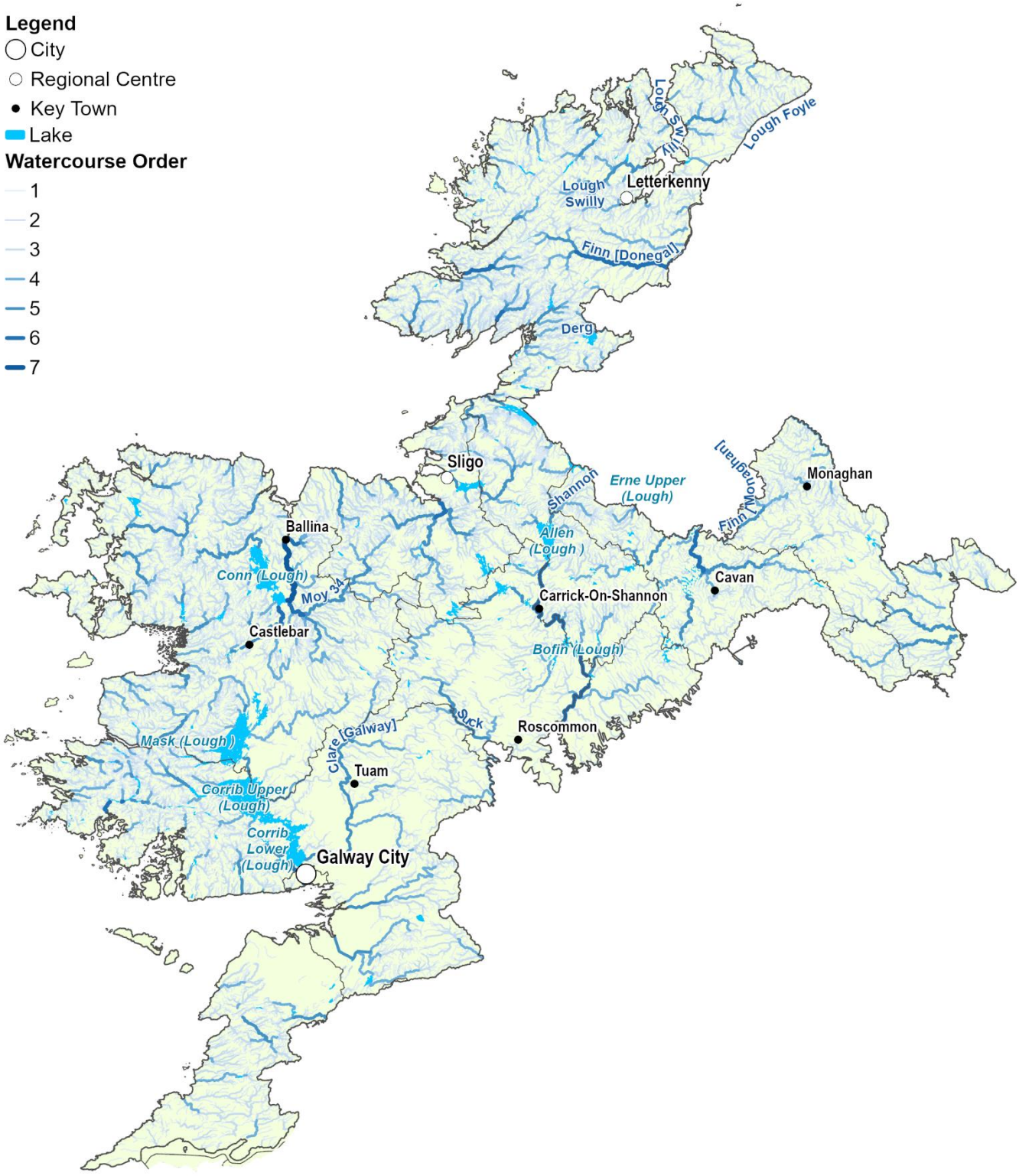


Figure 5.2 Water systems within RWRP-NW

5.4.1 Water Framework Directive

Under the Water Framework Directive (2000/60/EC), Ireland must ensure that all waterbodies achieve 'Good' status by 2027. In addition, under the legislation, any modification to a WFD waterbody should

not lead to deterioration in either the overall status[7] or any of the quality elements[8]. Figures 5.2a and 5.3a (Appendix A) show the baseline water environment within the core baseline area, including the WFD catchment boundaries and WFD status of rivers, lakes, canals, transitional and coastal waterbodies and groundwater bodies. Figure 5.8b (Appendix A) also provides an overview for the surface waterbodies in Northern Ireland.

Across Ireland there has been a decline water quality since the last three WFD assessment cycles (2013-2018). The most recent water quality assessment cycle (2016-2021) reports that the number of estuaries and coastal waters in satisfactory condition has declined by almost 16% and 10% respectively. There has also been a 1% decline of monitored rivers and a 3% decline of monitored lakes in satisfactory condition.

The most significant pressures on surface water ecological health include nutrient pollution from agriculture, hydromorphological alterations associated with agricultural land drainage and flood protection work and urban wastewater discharges (amongst other causes). The chemical status of surface waterbodies has remained generally good, as has overall groundwater water quality (EPA, 2023a). Failure to meet good chemical status in surface waterbodies is generally linked to elevated concentrations of priority substances such as mercury and polyaromatic hydrocarbons (PAHs), whereas failure to meet status objectives in groundwater bodies is generally associated with historical contamination from industrials sites although nitrogen leaching from agricultural soils is an emerging concern over the last decade. The EPA's State of Environment Report (SOER, 2020) highlights that significant progress is required to meet the legal requirements of the WFD Directive and transposing regulations (European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003) as amended).

Water quality is an important consideration in relation to water supply. Whilst public water supplies in Ireland generally show high compliance with microbiological and chemical standards (EPA, 2020), there are a number of supplies within the North West Region on the RAL list (see 5.3.5 for further detail). Key contaminants of concern include trihalomethanes (THM), lead, pesticides (particularly herbicides, such as MCPA) and microbial contaminants such as *Cryptosporidium* and *Giardia*. Of emerging concern is the potential role of waterbodies as a reserve of antibiotic resistant microorganisms (AMRs) (e.g. Hooban et al., 2021) and the Ireland's Second One Health National Action Plan on Antimicrobial Resistance (iNAP2) includes an objective to develop AMR surveillance systems. Veterinary pharmaceutical residues in waterbodies are another emerging area of concern in Ireland specifically with regards to drinking water supply quality (e.g. Mooney et al., 2021).

Uisce Éireann has adopted the Drinking Water Safety Plan (DWSP) approach. It seeks to protect human health by identifying, assessing and managing risks to both water quality and quantity; taking a holistic approach from source (catchment) to tap (consumer). The 'source' component of DWSPs is a key component and understanding the catchment characteristics is important to support the identification, assessment, and prioritisation of the risks. Uisce Éireann is developing scientifically robust semi-quantitative methodologies using GIS to risk assess drinking water sources and carry out site-specific Source and Sanitary Surveys. A greater emphasis is being placed on the source-pathway-receptor (SPR) concept for contaminant delivery. The SPR approach requires an understanding of the sources of contaminants and the pathways that contaminants might travel. Contaminants being considered includes

[7] The ecological status assigned for surface waterbodies is determined by the status of the poorest quality element. Overall status of groundwater bodies is assigned based on the combined chemical and quantitative element statuses.

[8] Surface water body status is assessed based on both ecological status or potential and chemical status. Ecological status includes various quality elements including biological elements, water chemistry and the physical condition of waterbodies.

Drinking Water Directive (DWD) regulated parameters such as *Cryptosporidium*, nitrate, ammonia and pesticides etc.

Uisce Éireann is committed to working with public bodies and other stakeholders towards a common goal of the protection of drinking water sources. They have developed an Interim Pesticide Strategy for their drinking water sources (published in 2021). It will serve as an interim strategy whilst pilot projects are ongoing, and Uisce Éireann develop their long-term approach for catchment management for drinking water source protection. The strategy will cover their collaboration with stakeholders in order to assess and manage the risk of pesticides in the catchment, with the DWSP forming a central role. The Interim Pesticide Strategy risk management framework consists of three key pillars with collaboration with stakeholders occurring during all stages of the risk management process.

The recast DWD updates quality standards for water intended for human consumption, in line with latest recommendations of the World Health Organisation and establishes a watch-list mechanism to allow for the monitoring of substances or compounds of public or scientific concern to health, such as endocrine disruptors, pharmaceuticals and microplastics. Uisce Éireann sit on the DHLGH DWD expert group, whose role is to provide advice to the Minister on the appropriate preparations and steps necessary for the successful transposition and implementation of the recast Drinking Water Directive.

Uisce Éireann is involved in Project Steering Committees/Groups for various ongoing research projects which focus on contaminants of emerging concern (CECs) and include Microplastics, Phthalates, Pharmaceuticals/Pesticides & Antimicrobial Resistance (EPA and UKWIR funded). Uisce Éireann provides asset data and facilitates sampling of wastewater influent and effluent and raw drinking water. Uisce Éireann also participates in iNAP 2 (2021-2025) meetings, where the main objective is to increase environmental surveillance and monitoring for AMR to identify national levels and understand transmission routes.

Figures 5.2b and 5.3b (Appendix A) show the locations of WFD ‘at risk’ waterbodies as identified from EPA data (EPA, 2023a,b) within the core baseline area. The Department of Housing, Planning and Local Government’s (DHPLG) (2019a) public consultation document regarding the significant water management issues has been considered by Uisce Éireann. A total of 98 of the Areas for Action identified within the River Basin Management Plan for Ireland 2018-2021 (DPHLG, 2018) fall within the core baseline area.

5.4.2 WFD and Abstractions within the North West Region

In September 2022, the Government passed the Water Environment (Abstractions and Impoundments) Act, 2022 (the Abstractions Act) which will ensure that national abstractions align with the requirements of the Water Framework Directive. Whilst standards for the new abstraction regime are being developed, Uisce Éireann are assessing existing abstractions to identify surface water sites that may exceed future abstraction thresholds. Uisce Éireann has taken a precautionary approach, based on their current understanding of how proposed abstraction legislation might be applied, as outlined in Appendix G of the Framework Plan. This assessment suggests that certain schemes may be subject to reductions in abstraction under the new legislation; however, this will ultimately be determined by the EPA based on the project level information before them.

As Uisce Éireann does not have full visibility of the future regulatory regime and has not progressed through the licensing process on a site-by-site basis, it has not included its estimation of sustainable abstraction within the SDB calculations. Instead, Uisce Éireann uses the hydrological yield, water treatment capacity and bulk transfer limitations in its calculation of deployable output. Uisce Éireann

uses the sustainable abstraction assessment to assess the sensitivity of the Preferred Approaches (solutions) that it develops as part of the NWRP.

Therefore, the Framework Plan and RWRP-NW assume that existing abstractions can continue on a transitional basis, subject to the regulatory requirements which will be outlined in the future regulatory regime.

For these existing abstractions, further studies will be undertaken in conjunction with the EPA and appropriate stakeholders. Following investigation, if an abstraction is confirmed to be affecting a waterbody status the SDB will be updated, and solutions will be delivered through future cycles of the River Basin Management Plans and/or RWRPs.

In parallel, Uisce Éireann will also consider other hydromorphological impacts as part of this process.

As the objective of Uisce Éireann's NWRP is to achieve safe, secure, reliable and sustainable supplies, any new abstractions proposed to be developed by Uisce Éireann as part of their RWRPs will be based on conservative assessments of sustainable abstraction. This will ensure that their water supplies continually improve in terms of environmental sustainability. Uisce Éireann has been an active participant in the characterisation process for the 3rd cycle River Basin Management Plan 2022-2027 and liaised closely with the EPA during the development of the Framework Plan. Therefore, although the proposed Abstractions Act is still under development and there may be some uncertainty in their calculations of sustainable abstraction, the assessments used as part of the development of the Regional Plan have followed the same principles as those that will likely be used by the regulatory authorities (based on the legislation as currently envisaged).

Uisce Éireann has also assessed surface water abstractions across the core baseline area with respect to potential conflicts with sustainability guidelines and WFD targets, with sources identified as surface water abstractions which exceed sustainable abstraction thresholds being at potential risk in Table 5.6[9].

Table 5.6 Surface Water Abstractions Potentially at Risk of Exceeding Sustainable Abstraction Thresholds

Study Areas	Surface Water Abstractions Potentially at Risk of Exceeding Sustainable Abstraction Thresholds	
	Number of Abstraction Sites	Site Name (WRZ)
SAA	29	Lough Shore (Arranmore Island) Lough Melvin, Lough Unshin, Lough Gorman (Ballyshannon & Bundoran) Lough Doo (Buncrana) Lough Nambraddan, Lough Nameeltoge, Lough Nacreaght (Carrigart-Downings & Cranford) Lough Agher, Lough Muckish (Creeslough Dunfanaghy) River Eske (Donegal) Shannagh Lake (Fanad East) Lough Naglea (Fanad West) Glencoagh Lough, St. Peters Lough (Frosses-Inver)

[9] UK Technical Advisory Group on the Water Framework Directive (UKTAG) guidance (UKTAG, 2013) on baseflows have been used for the purposes of this plan until Ireland specific standards come into place (see section 6.5).

Study Areas	Surface Water Abstractions Potentially at Risk of Exceeding Sustainable Abstraction Thresholds	
	Number of Abstraction Sites	Site Name (WRZ)
		Lough Anna (Glenties-Ardara) Lough Lagha (Gortahork-Falcarragh) Lough Fad (Inishowen West & Carndonagh & Culdaff) Lough Aderry Intake (Killybegs) Lough Salt, Lough Keel, Lough Greenan, Gort Lough, Lough Columbkille, Lough Fag (Letterkenny & Inishowen East & Pollan Dam) Lough Derkmore-Impoundment (Lettermacaward) Lough Mourne (Lough Mourne) Lough Nalughraman (Owenteskiny) Lough Keel Intake (Rosses)
SAB	9	Lough Bawn (Ballybay (Lough Egish)) Nadrageel Lough (Ballyjamesduff RWSS) St. Columbkill Lake (Cashilard) Lough Acanon Dam (Cavan RWSS) Corconnolly Lake (Clones) Coragh Lough (Cootehill PWS) Corcaghan Lough, Greagh Lough (Monaghan) Feagh Lough (Newbliss) Greagh Lough (Monaghan)
SA-C	8	Accorymore Lake Intake (Achill) Lough Muck Intake (Foxford) Carrowcanada Spring (Stream) (Swinford) Lough Talt (Lough Talt Regional Water Supply) Lough Easkey (Lough Easkey Regional Water Supply) Gortnaleck (North Sligo Regional Water Supply) Lyle (North Sligo Regional Water Supply) Kilsellagh Impounding Reservoir (Sligo Town & Environs)
SAD	19	Lake Anaserd (Ballyconneely P.S.) Lough Lerin (Carna Kilkieran RWSS) Loughaunore Intake (Carna Kilkieran RWSS) Loughaunwillian (Carraroe) Knockmore River (Clare Island) Lough Courhoor (Cleggan Claddaghduff) Lough Nambrackeagh (Clifden)

Study Areas	Surface Water Abstractions Potentially at Risk of Exceeding Sustainable Abstraction Thresholds	
	Number of Abstraction Sites	Site Name (WRZ)
		Coolin Lough (Clonbur PS) ough Fawna (Inisboffin P.S.) Coolacknick Lake (Inishturk) Mountain Stream (unnamed) (Leenane P.S.) Lough Corrib (Galway City, Tuam, Loughrea)) Lough Rea (abstraction 1) (Lough Corrib (Galway City, Tuam, Loughrea)) Lough Rea (abstraction 2) (Lough Corrib (Galway City, Tuam, Loughrea)) Moher lake (Lough Mask & Westport) Bunnahowna River (Mulranny) Lough Aroolagh (Rosmuc P.S.) Lough Illauntrasna (Teeranea Lettermore P.S.) Diamond Hill Stream (Tully-Tullycross)
SAE	4	Barnavave (Cavanhill & North Louth) Carlingford Mountain (Cavanhill & North Louth) River Fane (Cavanhill & North Louth) Lough Brackan (Drumcondrath)
SAF	0	N/A
SAG	6	Lickeen Lake (Ennistymon) Gortglass Lough (Killadysert PWS) Doo Lough abstraction 1(West Clare,) Doo Lough abstraction 2 (West Clare)

Groundwater abstractions will also need to conform to the proposed new abstraction licencing regime. These abstractions will be assessed in two ways:

- Impacts on the groundwater bodies from which they abstract; and
- Impact of the groundwater abstraction on the base flow in surface waterbodies.

The 2016-2021 WFD Risk associated with the Groundwater Bodies (GWB) in the RWRP-NW indicates that 29 are currently ‘Under Review’, 170 are ‘Not At Risk’ and 17 GWBs are ‘At Risk’ (see Figure 5.2b (Appendix A)). Of the GWB ‘At Risk’ the predominant pressure associated with them is agriculture and waste facilities, followed by anthropogenic pressures.

The sustainable management of groundwater abstraction is challenging due to the difficulties in developing large abstractions due to the Regions’ hydrogeological conditions.

Over the coming years, Uisce Éireann will work with the environmental regulator, the EPA and the Geological Survey of Ireland (GSI), to develop desktop and site investigation systems to better understand the sustainability of their groundwater sources (informed by data gathered as part of GSI’s ongoing GW3D project).

5.4.3 Groundwater – Surface Water Interaction

Surface water and groundwater interactions are an important consideration when considering both the quality and quantity of groundwater that can be abstracted, identifying options to support increased water demands and in managing the water quality we supply. Interaction between surface water and groundwater can impact groundwater recharge rates and therefore sustainable abstraction rates as well as water quality through interactions with sources of pollution.

Groundwater and surface water are closely linked at certain karst features such as springs and swallow holes. Karst formations form regionally important aquifers in the North West Region particularly in the Burren, the Gort-Kinvara area, in County Roscommon, and the Northwestern Plateau (counties Sligo, Leitrim and Cavan), as discussed in Section 2.3.2. Bare rock and thin subsoils mean groundwater is vulnerable to pollution, thus presenting challenges for water supply and pollution prevention.

5.4.4 Coastal and Marine Waterbodies

The temperate waters that surround Ireland are highly productive and provide a rich mosaic of marine life, including hundreds of species of invertebrates and fish, 35 species of sharks, 24 species of whales and dolphins, breeding colonies of both the common and grey seal and some of the largest breeding populations of seabirds in Western Europe.

Ireland's location in the Atlantic Ocean on the edge of the European continent has meant that its marine environment has remained relatively unpolluted. In recent years, however, the level of environmental stress, from both internal and external sources, has increased. Coastal development, particularly during the 1990s, has resulted in an increase in the range and magnitude of pressures that have the potential to impact negatively on the quality of Ireland's tidal waters.

Around Ireland 36% of transitional water bodies and 81% of coastal waters are in high or good ecological status (Figure 5.2a – Appendix A). However transitional and coastal waters have seen a significant decline in status in the 2016 to 2021 assessment. The increase in nutrient inputs to the marine environment is likely to be a major contributor to these declines although more evident in the south and southeast of the country rather than the North West.

There are currently 148 identified bathing waters that are monitored and managed under the Bathing Water Regulations in Ireland. Factors considered by local authorities for identifying bathing waters include the water quality, the level of use, safety, access and facilities.

Overall, bathing water quality has continued to improve in 2022. Of the 148 identified bathing waters assessed, 144 (97%) met or exceeded the minimum required standard of Sufficient, with 79% reaching an 'excellent' rating (see Figure 5.2a).

Irish coastal waters are important for shellfish production, including oysters, mussles, cockles, scallops and clams. High water quality is important to support edible shellfish production and 64 areas have been designated shellfish protection areas including areas between Donegal to Sligo and Galway to Mayo (see Figure 5.2a – Appendix A).

Overall trends reported by the EPA (2023) indicate increased nutrient loading in the marine environment with negative impacts on marine ecosytems. The main sources being agricultural runoff and wastewater discharges. Other pressures on the coastal and marine environment include development, tourism and marine litter.

5.4.5 Flood Risk

Flooding is becoming a bigger issue in Ireland in the years; the frequency of flood events has been increasing and, with climate change, is expected to increase further. Increased flooding can cause pressure on drains and sewers and can affect water quality.

The Floods Directive (2007/60/EC) required member states to develop Flood Risk Management Plans for areas of existing and future potentially significant flood risk. The Floods Directive was transposed into Irish law by the EU (Assessment and Management of Flood Risks) Regulations 2010 and sets out the responsibilities of the Office of Public Works (OPW). The OPW has been implementing the Directive mainly through the Catchment Flood Risk Assessment and Management (CFRAM) Programme, through which 29 draft Flood Risk Management Plans have been developed. Approximately 300 Areas for Further Assessment have been established along with a range of measures to reduce or manage the flood risk within each catchment. CFRAMS mapping for all Areas for Further Assessment is available to view on the CFRAMS website (OPW, 2018).

Figure 5.4 (Appendix A) presents areas with high and medium probability of pluvial, fluvial, coastal flooding as well as historical groundwater flooding. There is no probability of groundwater flooding within the North West Region. Historic groundwater and surface water flooding is identified predominantly to the west of the North West Region, with a particular abundance of historic groundwater/surface water flooding in Study Area G. Areas adjacent to Lough Corrib and River Clare, adjacent to River Shannon near Longford and Carrick-on-Shannon as well many smaller areas within the North West Region are considered to have high probability (10% Annual Exceedance Probability (AEP)) of fluvial flooding. Dundalk Harbour and connected rivers such as Castletown River and Flurry River are considered to have high probability of both coastal and fluvial flooding. High probability of coastal flooding can also be observed in the areas of the southern coast of Galway. As well as considering surface water flooding, there are ongoing efforts to better understand the role of karst groundwater systems in flooding within the Flood Risk topic.

As well as considering surface water flooding, there are ongoing efforts to better understand the role of karst groundwater systems in flooding within the Flood Risk topic (McCormack et al., 2020).

Guidelines for Planning Authorities on flood risk management (November 2009)[10] highlight that flooding of the water supply network (this includes pumping stations electricity substations and water treatment works) can result in a loss of supply over large areas and magnify the effects of flooding beyond the immediate community directly affected. Uisce Éireann has considered the number of WTPs within areas of flood risk, where vulnerability to the effects of flooding need to be considered and for WTPs that are known to be at risk, are under review and where needed, protection measures will be considered for sites at risk. All new options will be reviewed in terms of their risk from flooding, and this will be taken into account in the detailed siting and design to ensure improved flood risk resilience for the supply network.

5.4.6 Drought Risk

Droughts occur when a period of lower than average rainfall causes a shortage of water. The shortage of water affects both the natural environment and sectors such as agriculture and water supply to our customers. The duration, timing and intensity of a drought can vary considerably.

[10] The Planning System and Flood Risk Management: Guidelines for Planning Authorities OPW November 2009

The drought events experienced in 2018 and 2020, although severe, were short in duration and are therefore not registered when compared to historical droughts. Despite this, the late spring and early summer of 2018 saw some of the lowest rainfall totals on record leading to drought conditions. Low rainfall levels resulted in low river flows and stress to water supplies.

Drought can cause low-flow conditions and higher water temperatures that lead to reduction of oxygen concentrations in the water. These environmental effects of drought contributed to fish kills seen in the summer of 2018. The fish kills caused by 2018 drought event may have increased the vulnerability of fish to acute pollution events as well as underlying levels of pollution.

Environmental pressures caused by drought are less likely to affect resilient waterbodies that are in good ecological health (EPA, 2020). The ecological health of waterbodies can also be negatively impacted by over-abstraction of water which can lead to reduction in river flows and lake levels. Uisce Éireann's active management of some at risk abstractions is needed to avoid negative impacts on waterbodies during drier periods. However, in general during none-drought periods abstractions in Ireland do not put significant environmental pressures on both surface water and groundwater resources (EPA, 2020).

Drought risk to water supplies within the baseline area is discussed in 5.3.5 and this section identifies experience with specific existing water supply assets at risk of failure or reduced levels of service during drought conditions.

5.5 Biodiversity, Flora and Fauna

5.5.1 Designates Sites

European, national and local designated sites within the core baseline area (North West Region) include 84 Special Protected Areas (SPAs), 218 Special Areas of Conservation (SACs), 17 sites designated as Wetlands of International Importance (Ramsar sites), three National Parks, 80 Natural Heritage Areas and numerous proposed Natural Heritage Areas and Nature Reserves. There are also 7 marine SACs and 22 marine SPAs that are not within the core baseline area but are hydrologically linked to it. The location of these sites in relation to the core baseline area is shown in Figures 5.5a, 5.5b and 5.5c (Appendix A). Figure 5.8a (Appendix A) also provides an overview for the designations in Northern Ireland.

Designated sites within Northern Ireland considered as part of the transboundary assessment include Ramsar sites, SACs, SPAs, Areas of Outstanding Natural Beauty, Marine Conservation Zones and Areas of Special Scientific Interest and are also identified in Figure 5.4.

5.5.2 Habitats

Figure 5.6a (Appendix A) illustrates the distribution of different habitat types across the core baseline area as reported in the Corine Land Use dataset (EPA, 2018). Agricultural land uses dominate SAB, SAE, SAF and SAG, with SAA, SAC and SAD having a relatively higher degree of woodland land cover and wetland type habitats in comparison to the other study areas. There is also a significantly high number of Commonage Land areas located in the far north and north-west of the core baseline area (EPA, n.d.).

Particularly relevant habitats that depend on the water quality and/or quantity are:

- Alkaline fens;
- Bog habitats – Active raised bogs, degraded raised bogs still capable of natural regeneration, *Rhynchosporion* depressions, transition mires and quaking bog habitats;
- Bog woodland;

- Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*;
- Coastal lagoons;
- Groundwater dependant terrestrial habitats, such as petrifying springs with tufa formation and blanket bogs;
- Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.;
- Machairs;
- *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae);
- Natural dystrophic lakes and ponds;
- Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation;
- Northern Atlantic wet heaths with *Erica tetralix*;
- Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea*;
- Oligotrophic waters containing very few minerals of sandy plains;
- Turlough ecosystems;
- Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho–Batrachion* vegetation.

5.5.3 Species

The key species and habitats of concern within the core baseline area (Nelson et al., 2019) include:

- Bat species – Lesser Horseshoe Bat (*Rhinolophus hipposideros*);
- Fish species - Atlantic Salmon (*Salmo salar*), Lamprey species;
- Fresh-water pearl mussel (*Margaritifera margaritifera*);
- Geyer's Whorl Snail (*Vertigo geyeri*);
- Killarney Fern (Trichomanes speciosum);
- Marsh Fritillary (*Euphydryas aurinia*);
- Marsh Saxifrage (*Saxifraga hirculus*);
- Narrow-mouthed Whorl Snail (*Vertigo angustior*);
- Otter (*Lutra lutra*);
- Petalwort (*Petalophyllum ralfsii*);
- 'Qualifying interest' bird species e.g. merlin (*Falco columbarius*), chough (*Pyrrhocorax pyrrhocorax*), hen harrier (*Circus cyaneus*), corncrake (*Crex crex*) and peregrine falcon (*Falco peregrinus*);
- Slender green feather-moss (*Hamatocaulis vernicosus*);
- Slender Naiad (*Najas flexilis*);
- Waterbirds of 'qualifying interest' e.g. Bewick's swan (*Cygnus columbianus bewickii*), Brent goose (*Branta bernicla*), whooper swan (*Cygnus cygnus*), Greenland white-fronted goose (*Anser albifrons flavirostris*), Greylag goose (*Anser anser*), Little Tern (*Sterna albifrons*) and winter migratory waders;
- White-clawed Crayfish (*Austropotamobius pallipes*).

It is also important to note that salmon, brown trout, pollan and artic char are cold water fish that are likely to be particularly vulnerable to climate change effects

The key invasive species to consider (National Biodiversity Data Centre, 2021) for developing option within the SAs are listed in Table 5.7.

Table 5.7 Key Invasive Species present in the North West Region

Animals	Plants
A colonial sea squirt (*Didemnum* spp.)	American skunk-cabbage *(Lysichiton americanus)*
American mink (*Mustela/Neovison vison*)	Brazilian giant-rhubarb *(Gunnera manicata)*
Asian river clam (*Corbicula fluminea*)	Broad-leaved rush (*Juncus planifolius*)
Brown hare (*Lepus europaeus*)	Cord-grasses (*Spartina* spp.)
Brown rat (*Rattus norvegicus*)	Curly waterweed (*Lagarosiphon major*)
Canada goose (*Branta canadensis*)	Dwarf eel-grass (*Zostera japonica*)
Common carp (*Cyprinus carpio*)	Fringed water-lily (*Nymphoides peltata*)
Common toad *(Bufo bufo)*	Giant hogweed (*Heracleum mantegazzianum*)
Grey squirrel (*Sciurus carolinensis*)	Giant knotweed (*Fallopia sachalinensis*)
Greylag goose *(Anser anser)*	Giant-rhubarb (*Gunnera tinctoria*)
Harlequin ladybird *(Harmonia axyridis)*	Himalayan knotweed (*Persicaria wallichii*)
Japanese skeleton shrimp *(Caprella mutica)*	Himalayan/Indian balsam *(Impatiens glandulifera)*
Muntac deer (Muntiacus reevesi)	Japanese knotweed (*Fallopia japonica*)
Roach (*Rutilus rutilus*)	Large-flowered waterweed *(Egeria densa)*
Ruddy duck (*Oxyura jamaicensis*)	New Zealand pigmyweed *(Crassula helmsii)*
Siberian chipmunk (*Tamias sibiricus*)	Parrot's feather (*Myriophyllum aquaticum*)
Slipper limpet (*Crepidula fornicata*)	Rhododendron (*Rhododendron ponticum*)
Stalked/leathery sea squirt (*Styela clava*)	Salmonberry (*Rubus spectabilis*)
Wild boar (*Sus scrofa*)	Sea-buckthorn (*Hippophae rhamnoides*)
Zebra mussel (*Dreissena polymorpha*)	Spanish bluebell (*Hyacinthoides hispanica*)
	Three-cornered leek *(Allium triquetrum)*
	Wakame (*Undaria pinnatifida*)
	Water fern (*Azolla filiculoides*)
	Waterweeds (*Elodea* spp.)
	Wireweed (*Sargassum muticum*)

5.6 Material Assets

Material assets are considered to be the natural and built assets (non-cultural assets) required to enable society to function as a place to live and work, in giving them material value. Some of the natural assets within the core baseline area are shown on Figure 5.6a (Appendix A) such as, agricultural land, urban and forest areas.

Built assets include transport and communications infrastructure, and other developed areas, including existing water supply infrastructure. These assets all need to be taken into account in new water resource planning and infrastructure.

Key road, rail and air transport infrastructure within core baseline area are shown in Figure 5.6b (Appendix A). Key water transport infrastructure includes Rossaveal Harbour (SAD) which is the main ferry port for the Aran Islands. There are no 'ports of significance' in the North West Region. Ireland's canals once played a significant role as a transport network; however, the main uses are now for recreational and heritage purposes. There are no canals of regional or national significance within the core baseline area.

Figure 5.6b (Appendix A) also shows locations of WTPs within the core baseline area. The Study Area Technical Reports appended to the RWRP-NW https://www.water.ie/nwrp provide further information regarding the source capacity, quality and quantity, and reliability of abstractions at each WTP, along with any sustainability concerns.

The highest volume surface water abstractions come from Lough Corrib and Lough Mask. The lakes are both located in SAD and supply Galway City and the Tuam Regional Water Supply Schemes and the Lough Mask Regional Water Supply Scheme, respectively. Abstraction from Lough Corrib accounts for 56% of the Water Available for Use (WAFU) for the Study Area in a normal year, while the abstraction Lough Mask accounts for another 23%. WAFU is further explained in section 3.2.1 of the RWRP-NW. The River Fane is the largest river abstraction and accounts for 57% of the WAFU in SAE.

The highest volume groundwater abstraction is Ballinagard Spring, supplying Cavanhill in SAF, with an abstraction volume of approximately 42 Ml/d. This accounts for 8% of the WAFU in SAF and just 1% of the total regional WAFU. Groundwater supplies make up the dominant abstraction in SAE and SAF, which typically target the karst formations. These boreholes produce yields of around 1,000 m^3/d (or 1 Ml/d).

A summary of the water sources for the study areas is provided in Table 5.8 below.

Table 5.8 Number of Water Sources in RWRP-NW

Study Area	No. of WRZS	No. of WTPS	Total Network Length* (km)	Water Sources		
				Total	Surface Water	Groundwater
SAA	19	29	4,010	35	31	4
SAB	22	17	1,205	21	12	9
SAC	17	19	3,120	21	14	7
SAD	25	33	3,565	34	26	8
SAE	9	16	1,035	19	8	11
SAF	15	18	3,340	18	5	13
SAG	9	10	1,455	11	6	5

Study Area	No. of WRZS	No. of WTPS	Total Network Length* (km)	Water Sources		
				Total	Surface Water	Groundwater
Total	**116****	**142**	**17,730**	**159**	**102**	**57**

* Network length values are rounded to the nearest 5km

Any new infrastructure considered for the North West Region will need to take existing, planned, land zoning and local development into consideration. At the time of review (April 2022) there were 315 developments in the core baseline area listed on myProjectIreland (2022). The review will be updated and examined in further detail for schemes taken forward as part of Project Level assessment including any additional developments initiated in the intervening period.

Water resources and water quality are also influenced by urban, agricultural and forestry activity within river and groundwater catchments. This can affect the availability and quality of water for supply. Current land use within core baseline area is set out below (EPA, 2018):

- Agriculture – 57.28%;
- Urban – 1.18%;
- Natural habitats – 31.767%;
- Forest – 9.47%;
- Industry – 0.07%; and
- Other – 0.24%.

5.7 Landscape and Visual Amenity

The National Landscape Strategy 2015-2025 is in the process of being implemented and will be Ireland's vehicle for complying with the EU Landscape Convention. Landscape assessment guidance is also available from the local authorities which will be taken into account when identifying landscape character areas and protected areas at the Project Level in the future. Physiographic Units are cartographic representations of the broad-scale physical landscape of a region and are valuable for regional land-use planning, and in studies of the influence of physical landscape on the ecological environment. A Physiographic Unit map produced in support of the actions to be implemented in National Landscape Strategy for Ireland 2015-2025 is also available to identify constraints.

The value of the landscape in the North West Region is reflected in the baseline data provided in sections 5.3.4 (tourism and recreation), and the designated sites identified in 5.5 (biodiversity, flora and fauna) and 5.10 (cultural heritage).

GSI's Marine and Coastal Unit in partnership with the Marine Institute, jointly manages INFOMAR, Ireland's national marine mapping programme; providing key baseline data for Ireland's marine sector. INFOMAR also produces a wide variety of seabed mapping products that enable public and stakeholders to visualize Ireland's seafloor environment with maps.

Key landscape features within the core baseline area include four National Parks. Glenveagh National Park comprises more than 16,000 hectares including mountains, lakes, native oak woodland and waterfalls and is located in the North West of County Donegal. Wild Nephin National Park comprises 15,000 hectares of Atlantic blanket bog and mountains and is located in the North West of Mayo. Connemara National Park comprises 2,000 hectares of mountains, bogs, heaths, grasslands and woodlands, and is located in the west of Galway County. Burren National Park comprises 1,500 hectares

of which the highest point is Knockanes (207 metres) and areas of extensive, low lying limestone pavement containing a number of semi-permanent lakes.

Landscape Character Areas (LCAs) with high sensitivity in the RWRP-NW area are located to the north and centre of Clare County, west of Galway County, and across the majority of Roscommon County. They include East Connemara Mountains LCA, Tulla Drumlin Farmland LCA, Doonbeg Coastal Plain, Castlerea and Upper Suck Valley and Roscommon Town and Hinterland LCA amongst others (EPA, n.d).There is limited LCA information available for the northern region of the core baseline area including Donegal County, Sligo County and Mayo County.

There are also several Seascape Character Areas (SCAs) that are not within the core baseline area but are hydrologically linked to it. SCAs are located around the coast in the North West of the core baseline area near counties Donegal and Sligo, and to the east of the core baseline area near Meath County. These SCAs include, but are not limited to, the North Donegal Atlantic Headlands, Loughs and Beaches, Sligo Bay and the Northeastern Irish Sea Islands and beaches.

Further information on landscape character assessments is provided in the Study Area Environmental Reviews, Appendix H SAA-SAG.

5.8 Air Quality and Noise

5.8.1 Air Quality

Air quality is monitored and managed using Air Quality Zones and air monitoring sites. The majority of the core baseline area falls within Air Zone D: Rural Ireland with Letterkenny, Sligo and Galway falling within Air Zone C: Other Cities and Large Towns (EPA, n.d.). The air quality index rating of the core baseline area is rated as ‘good’ (EPA, 2021).

In general, the water industry is not a major contributor to air quality issues, although there is potential for local pollution through Uisce Éireann vehicles, generator plants and drinking water residuals treatment facilities. There is a requirement to comply with air pollution regulations and also identify potential opportunities for reducing emissions.

5.8.2 Noise

The main areas within the core baseline area that experience noise pollution are located along M and N roads as shown in Figure 5.6b (Appendix A). Water infrastructure development is not expected to add significantly to noise pollution. Uisce Éireann acknowledges that construction noise can have adverse effects on the terrestrial and marine environments and therefore this will be considered at a project level through scheme construction management and design and where appropriate project specific mitigation for local receptors and for sensitive receptors in close proximity.

5.9 Climate Change

Ireland’s climate is heavily influenced by the Atlantic Ocean. Consequently, Ireland has a milder climate that has less extreme temperature variation compared with other countries at a similar latitude. The hills and mountains, many of which are near the coasts, provide shelter from strong winds and from the direct oceanic influence. Winters tend to be cool and windy, while summers are generally mild and less windy (Met Éireann, 2019).

Climate change will have significant effects on the availability of water at Uisce Éireann sources in the future. Mean annual temperatures for Ireland are expected to increase by 0.5°C to 1.7°C by 2050, with increases closer to 3°C in the east of the country. The projected increase in temperature will affect the

amount, timing and intensity of local precipitation. In Ireland, this is expected to mean wetter winters but also drier springs and summers (Department of Housing, Planning and Local Government, 2019b). Climate change simulations for Ireland show the precipitation in the autumn and winter months could increase by between 5% to 35%, while summer precipitation could decrease by a range of 0% to 30%. Under the medium to high carbon emissions scenarios dry periods are projected to increase in frequency, duration and/or magnitude from between 12% to 40% for the spring and summer months[11]. The historical analysis of average rainfall data undertaken by Murphy (2018)[12] confirms a continued trend of drier summers and wetter winters (Department of Housing, Planning and Local Government, 2019b).

For the North West region, areas are likely to experience an increase in drought conditions that will impact water availability. The increased threat of flooding across the region can also impact water availability if the drawdown of catchment reservoirs is required to increase flood capacity as this can lead to a reduction in available supplies for the following spring/summer.

Section 15 of the Climate Action and Low Carbon Development Act 2015 (as amended in 2021) sets a new "national climate objective" for Ireland, which provides that:

"The State shall, so as to reduce the extent of further global warming, pursue and achieve, by no later than the end of the year 2050, the transition to a climate resilient, biodiversity rich, environmentally sustainable and climate neutral economy".

The amended Act requires public authorities, including Uisce Éireann, to, so far as practicable, perform their functions in a manner consistent with the furtherance of the national climate objective and the relevant national and sectoral plans and strategies to mitigate greenhouse gas emissions and adapt to the effects of climate change.

The Department of the Environment, Climate and Communications' Climate Action Plan (CAP) 2023[13] published December 2022, replacing CAP 2019, commits to achieving a 51% reduction in overall greenhouse gas emissions by 2030 and reaching net zero carbon emissions by 2050. The aim is for more sustainable growth and to create a resilient, vibrant and sustainable country. The CAP defines a roadmap to this goal and initiates a set of policy actions to achieve this. A detailed sectoral roadmap has also been set out, which is designed to deliver a cumulative reduction in emissions, over the period 2021-2030.

CAP 2023 updates existing targets with renewable energy to provide 80% of electricity by 2030 and sets targets for sectors, including a target of 9 GW from onshore wind, 8 GW from solar, and at least 5 GW of offshore wind energy by 2030 (Department of the Environment, Climate and Communications, 2023).

The Climate Change Sectoral Adaptation Plan for Water Quality and Water Services Infrastructure (2018), identifies the following key priority impacts of climate change for the water services infrastructure sector:

- Hot-weather related changes in demand;
- Increased drawdown in the autumn/winter for flood capacity, leading to resource issues in the following spring/summer; and
- Reduced availability of water resources (surface and groundwater sources).

[11] Projected changes in precipitation are referred to in section 2.2.5.2 of the Climate Change Sectorial Adaptation Plan.
[12] Murphy, Conor, 2020. *A 305-year continuous monthly rainfall series for the island of Ireland (1711-2016).* Climate of the Past. pp.413-440.
[13] Department of the Environment, Climate and Communications. 2021. *Climate Action Plan 2021*. [Online]. [Accessed: 04/11/21]. Available from: https://www.gov.ie/en/publication/6223e-climate-action-plan-2021/

There are four aims that local authorities are required to include in their climate adaptation strategies (Department of Communications, Climate Action and Environment, 2018), these being:

1) Mainstream Adaptation: That climate change adaptation is a core consideration and is mainstreamed in all functions and activities across the Local Authority. Ensure that Local Authority is well placed to benefit from economic development opportunities that may emerge through commitment to proactive climate change adaptation and community resilience;
2) Informed decision making: That effective and informed decision making is based on reliable and robust evidence base of the key impacts, risks and vulnerabilities of the area. This will support long term financial planning, effective management of risks and help to prioritise actions;
3) Building Resilience: That the needs of vulnerable communities are prioritised and addressed, encourage awareness to reduce and adapt to anticipated impacts of climate change and promote a sustainable and robust action response; and
4) Capitalising on Opportunities: Projected changes in climate may result in additional benefits and opportunities for the local area and these should be explored and capitalised upon to maximise the use of resources and influence positive behavioural changes.

In addition to these high-level aims, each Local Authority is required to identify the key risks to their area. These are provided inTable 5..

Table 5.9 Climate Change Risks Identified by Counties in the Core Baseline Area

County	Key risk areas									
	Flooding (Pluvial, Fluvial, Groundwater or Coastal or Marine)	Extreme Rainfall	Rising Sea Levels and Storm Surges	Storm Frequency and Intensity	Extreme Cold/Heavy Snowfall and Ice	Extreme Heat/Drought Conditions	Bog, Sand, Dune, Gorse or Forest Fires	Coastal Erosion	Wind Speeds	Air Quality or Pollution
Galway City (Galway City Council, 2020)	✓	✓	✓	-	✓	✓	-	✓	✓	✓
Galway County (Galway County Council, 2019)	✓	✓	✓	✓		✓	-	-	-	-
Leitrim (Leitrim County Council, 2019)	✓	✓	✓	✓	✓	✓	✓	-	✓	-
Mayo (Mayo County Council, 2019)	✓	✓	✓	✓		✓	-	✓	-	✓
Roscommon (Roscommon County Council, 2019)	-	✓	-	-	✓	✓	-	-	✓	-
Sligo (Sligo County Council, 2019)	✓	✓	✓	✓	-	✓	-	✓	-	-
Cavan (Cavan County Council, 2019)	-	✓	-	-	✓	✓	-	-	✓	-
Donegal (Donegal County Council, 2019)	✓	✓	✓	✓	-	✓	-	✓	-	-
Monaghan (Monaghan County Council, 2019)	✓	✓	-	✓	✓	✓	✓	-	✓	-
Longford (Longford County Council, 2019)	-	✓	-	-	✓	✓	-	-	✓	-
Louth (Louth County Council, 2019)	✓	✓	✓	✓	✓	✓	✓	-	-	-

County	Key risk areas									
	Flooding (Pluvial, Fluvial, Groundwater or Coastal or Marine)	Extreme Rainfall	Rising Sea Levels and Storm Surges	Storm Frequency and Intensity	Extreme Cold/Heavy Snowfall and Ice	Extreme Heat/Drought Conditions	Bog, Sand, Dune, Gorse or Forest Fires	Coastal Erosion	Wind Speeds	Air Quality or Pollution
Meath (Meath County Council, 2019)	-	✓	✓	✓	-	✓	-	✓	✓	-
Clare (Clare County Council, 2019)	✓	-	-	-	✓	✓	-	✓	-	-

Ireland has a sectoral climate adaptation plan for the 'Water Quality and Water Services Infrastructure' sector. A summary of this report's findings is included in Table 5.8. Whilst not specifically identified in county level plans, climate change induced risk of water contamination through changes such as increased sediment loads and release of nutrients from catchment soils is a further issue and particularly relevant for approaches that can address these such as through catchment management and nature-based solutions.

Table 5.10 Summary of Key Points from the 'Water Quality and Water Services Infrastructure' Sectoral Climate Change Plan (Department of Housing, Planning and Local Government, 2019b)

Summary	
Key Points	• Protecting and improving water quality and improving water services infrastructure are major challenges in Ireland • Climate change-induced threats will increase the scale of these challenges • Risks to water quality and water infrastructure arise from changing rainfall patterns and different annual temperature profiles. The frequency and intensity of storms and sea level rise are also considered
The challenges: Water services infrastructure	• Increased surface and sewer flooding leading to pollution, water and wastewater service interruptions • Reduced availability of water resources • Hot weather increasing the demand for water • Increased drawdown from reservoirs in the autumn/winter for flood capacity, leading to resource issues • Business continuity impacts or interruptions for water services providers
Primary adaptive measures	• Fully adopt the 'integrated catchment management' approach • Improve treatment capacity and network functions for water services infrastructure • Water resource planning and conservation – on both supply and demand sides • Include climate measures in monitoring programmes and research • Many of these proposed adaptation actions are already underway through existing and scheduled water sector plans and programmes

Climate change is expected to influence weather conditions such as frequency of droughts and extreme events such as storms and is likely to affect habitats and species, water availability for supply and water demand. Across the core baseline area there are many supplies which do not meet the required levels of reserve capacity. As evidenced in the 2018 drought, there is the potential for these deficits to affect access to water in the future. Supporting environmental resilience to climate change will also be an important consideration for the future with additional benefits for supply resilience.

5.9.1 Climate Sensitive Catchments Project

Whilst there is recent work on potential climate effects on rainfall, there is less work on the projected impacts of climate change to river flow regimes across Ireland. There is also no Ireland-wide guidance available at present outlining the effects of future climate change on flows. Recognising this, Uisce

Éireann commissioned the Climate Sensitive Catchments Project (Project Partner: Maynooth University Irish Climate Analysis and Research Units (ICARUS)).

The Climate Sensitive Catchments research project improved Uisce Éireann's understanding of how river flows may change due to climate change and how best to prepare for a hotter climate. This research concluded in April 2019.

The 206 river catchments included in this research were characterised into five catchment sensitivity types (a) to (e). The research concluded that catchment types (a) are the least sensitive to changes in seasonality of wetter winters and drier summers due to high groundwater storage in these catchments. Catchment types (b) and (c) have lower natural water storage and see the greatest decreases in flow due to wetter winters and drier summers. Catchment types (d) and (e) lose more water due to evaporation and are mostly drier catchments in the midlands and east. Catchment types(d) are most sensitive to changes in annual mean precipitation. When changes in seasonality and mean quantity are considered together, catchment type (d) are also the most sensitive and types (b) the least. Catchment type (e) experience less evaporative losses than (d) and while sensitive to changes in seasonality and mean amount are less sensitive to these changes than catchment type (d).

In the North West Region, many of the catchments are characterised as types (b), (c) and (e). Types (b) and (c) have lower natural water storage and see the greatest decreases in flow due to wetter winters and drier summers whilst type (e) lose more water due to evaporation. Type (c) catchments include the Moy and Kilala Bay and Corrib catchments as well as small areas of the Gweebarra Sheephavent catchment. Type (e) catchments include the Shannon and Erne catchments.

This research projected low flow allowances for each of the five catchment sensitivity types. These low flow allowances provide resilience for lower river flows in the future due to climate change. The project concluded that in some instances an allowance for a 30% reduction in low flow would be insufficient to avoid future climate change impacts.

The findings of this research project will address the water quantity aspects of climate change, but because of changes either to temperature or flow regimes, changes in water quality will also have a bearing. In addition, climate change may result in land use changes which may compound the observed effects.

5.10 Cultural Heritage

There are no UNESCO World Heritage Sites (WHS) within the core baseline area however there are some sites listed on the Tentative List and Burren and Cliffs of Moher UNESCO Global Geopark (EPA, n.d.). There are six Irish Landmark Trust sites located within the core baseline area (EPA, n.d.), as well as numerous designated and non-designated cultural heritage assets inventoried in the Record of Monuments and Places, the Sites and Monuments Record (SMR), the Record of Protected Structures, and the National Inventory of Architectural Heritage (NIAH). In total in the North West Region (within the core baseline area) there are 48,101 sites recorded by the National Monuments Service and 13,194 sites recorded on the NIAH. Given the number of small sites across the core baseline area, these are best viewed on the Department of Culture, Heritage and the Gaeltacht's (2020) 'Historic Environment Viewer' website. There are also several undesignated heritage assets within the marine area surrounding the North West Region. Figure 5.3 shows cultural heritage sites in the North West Region. Figure 5.8c (Appendix A) also provides an overview for the cultural heritage assets in Northern Ireland.

There are also potentially unknown, undesignated archaeological and architectural remains, throughout Ireland.

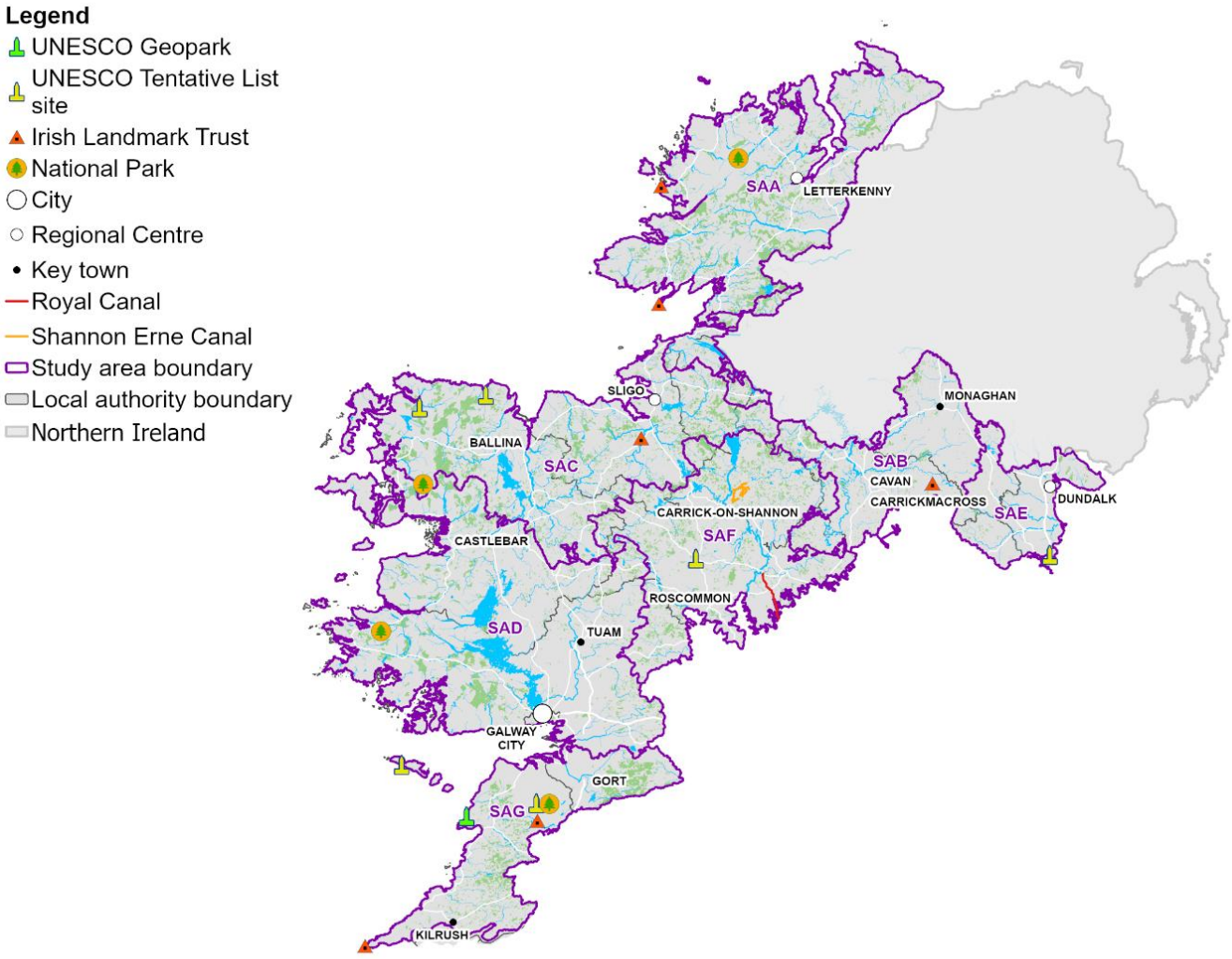


Figure 5.3 Cultural Heritage Sites in the North West Region

5.11 Geology and Soils

The geology and soils in the environment can impact the quality and quantity of water in the area through differences in drainage, chemical composition, filtration and resultant land use; which can also have a significant impact. The water supply can be heavily impacted by the type of aquifer in the area, as they impact the system's ability to store and transmit groundwater.

5.11.1 Geology

Figure 5.7 (Appendix A) shows the geology of the core baseline area, with particular reference to potential aquifers.

Understanding the geology of our catchments is vital to the provision of clean water. Geology is responsible for shaping mountain ranges, defining river network systems and determining their character, i.e. slope and erosivity. The bedrock geological maps developed by the GSI are the foundation maps upon which groundwater protection and vulnerability maps have been constructed and upon which WFD groundwater bodies and monitoring programmes have been established by the EPA. In general, the topography and its associated geological deposits can be broadly split into topographic highs and lowland valleys. Considering the extent of glaciation during the last ice age the Irish landscape can be considered a glacial one. Bedrock outcrop often prevails in the mountainous areas, while the

remainder of Ireland's bedrock is generally overlain by glacial material or glacially influenced materials (river alluvium, peat or coastal deposits).

The oldest geology of the North West Region, and indeed the country, comprising gneisses, schists (pelites and psammites), quartzites, and marbles formed during the Precambrian Period, 2,000 – 541 million years ago (mya). These represent 22% of the geology of the North West Region, consisting of highly complex metamorphic rocks. Most of them originated as sedimentary rocks such as limestones (which became marbles), sandstones (which became quartzites or psammites) and mudstones (which became schists or pelites). Their main occurrence is in the Co. Donegal, northwest Co. Mayo and the Ox Mountains, and in the Maamturk Mountains in Connemara.

The Ordovician and Silurian Periods, when present day northwest and southeast Ireland lay along the margins of separate continental masses and divided roughly along the Shannon Estuary, represents a relatively minor proportion (13%) of the North West Regions' bedrock geology. During the closure of the Iapetus Ocean, the subduction of oceanic crust was responsible for the formation of a volcanic island arc. These volcanic rocks were erupted and intruded into the Silurian marine sedimentary sequences, which include greywackes, mudstones, lavas and tuffs. These can be found in southwest Co. Mayo and form a belt which runs from the Co. Down coast to Co. Longford, known as the Longford-Down inlier.

Granites and other intrusive igneous rocks were intruded in Connemara and Donegal during the Devonian Period (c. 419 - 370 mya). They are all complex bodies and range widely in composition. Abundant minor granitic dykes accompany all the granites. The various granites of Connemara are differentiated on the basis of their mineralogy and by changes in their colour and texture. Pale cream coarsely crystalline pegmatite veins, consisting mainly of quartz, are present. The Devonian Old Red Sandstones (ORS) only form a very minor proportion (2%) of the bedrock in the region, compared to the south, and can be found in north Roscommon and Mayo.

Most of the bedrock geology of the North West Region (48%) falls into the Lower Carboniferous period (350 mya), which consists of a mixture of sandstone, limestone and shale, and these represent the transition from terrestrial to marine depositional conditions. During the transgression of the warm, shallow sea limestones sediments derived from the breakdown and disintegration of calcareous shells of invertebrate animals, were deposited. They are present in the lower lying areas, notably in the Shannon Basin underlying much of east Galway, Mayo and Co. Roscommon and Leitrim. The Upper Carboniferous (325 mya) is represented by 6% of the North West Region, dominated by deep water shales in the lower Namurian sequence, while the upper portions are generally sandstones and siltstones. These occur mainly in West Clare with smaller occurrences in Leitrim.

Important geological and geomorphological sites could be identified for protection as NHAs, however, until designation is confirmed, these sites are classified as Irish Geological Heritage Sites (IGHS). There are over 900 IGHS identified around Ireland, including 494 within the core baseline area (see Figure 5.5c, Appendix A).

County Geological Sites (CGSs) have been adopted in the National Heritage Plan and will form a major strand of geological nature conservation to complement the various ecological and cultural conservation measures and are the optimal way of addressing the responsibility of each authority under the Planning and Development Act 2000. 29 Local Authority areas have completed geological heritage audits, with Cork County currently under way, and the audit for County Kerry soon to be completed (Geological Survey Ireland, 2022).

Geological Survey Ireland maintains a number of online datasets of bedrock and subsoil geological mapping which are reliable and accessible and will be used in future assessments.

5.11.2 Groundwater Aquifers

Resource protection areas are delineated according to the value of the groundwater resources/aquifer category. They describe both resource potential/value (Regionally or Locally important, or Poor) and groundwater flow type (through fissures, karst conduits or intergranular). Regionally important bedrock aquifers are defined as those that can service public water supplies or that have excellent yields (>400 m^3/d). The aquifer area is >25 km^2 and flow is predominantly though fractures, fissures and joints. Locally important bedrock aquifers are defined as those that can service more local public water supplies/group schemes or that have good yields (100-400 m^3/d). Flow is predominantly though fractures, fissures and joints. Poor bedrock aquifers are defined as those that can service smaller abstractions (domestic supplies/small group schemes) or that have moderate-low yields (<100 m^3/d). Flow is predominantly though a limited and poorly-connected network of fractures, fissures and joints. Sand and gravel aquifers are classed as an aquifer if the deposit is highly permeable, more than 10m thick and greater than one square kilometre in areal extent. The thickness is more often used than the more relevant saturated thickness as the data for this is often not available.

Figure 5.7 (Appendix A) shows gravel and bedrock aquifers within the core baseline area.

The predominant aquifer type of the North West Region, is made up of poorly productive bedrock (62%), followed by karstic (28%), productive fissured (5%) and sand and gravel (0.6%) aquifers. The productivity of the Dinantian (Lower Carboniferous) aquifers depends on the nature and concentration of faults and fissures. Dinantian (early) Sandstones, Shales and Limestones Group comprises a mixture of siltstones, sandstones, mudstones, shales and limestones. Overall, the interbedding will tend to limit vertical permeabilities and groundwater flow systems will be rather localised. Permeability is generally low but may be higher in the sandstone and limestone beds, and substantially higher in certain areas, particularly in County Monaghan and County Cavan. Zones of higher permeability may be found in the above formations nearer faults and in the upper weathered fractured zone of the top 10-30 m. Groundwater flow in the lesser productive Dinantian Shales and Limestones circulates primarily though fissures as these rocks do not show significant intergranular permeability. These rocks occur primarily in the north and northwest of Ireland, in counties Monaghan, Cavan, Leitrim, Donegal and Sligo, and are predominantly interbedded shales and limestones, with little or no sandstone content. Development will usually be possible in local zones (i.e. along faults, fractures and zones of clean limestone). There are also large swathes of Dinantian (Lower Carboniferous) Impure Limestones which are interleaved with the Pure Bedded Limestones. The limestones are often characterised by the occurrence of chert and shale bands and are generally less productive than the Pure Bedded Limestones.

A number of large granite intrusions cover extensive areas, such as the Donegal Granite (949 km2) and the Galway or Connemara Granite (701 km^2). Although fractured, these rocks generally have a low permeability and are poor aquifers. Lastly the Precambrian rocks consist mainly of gneisses, schists (pelites and psammites), quartzites, and marbles and can be found in Co. Donegal, northwest Co. Mayo and the Ox Mountains, and in the Maamturk Mountains in Connemara. The development potential of the Precambrian rocks is very limited. The marbles may contain some solutionally enhanced permeability zones which could provide a domestic or farm supply or small group scheme.

The karst forms a key regionally important aquifer in some areas, particularly in the Burren, the Gort-Kinvara area, in County Roscommon, and the Northwestern Plateau (counties Sligo, Leitrim and Cavan). Limestone dissolution during karstification causes groundwater flow to concentrate along certain pathways/conduits, making it difficult to locate successful wells. Bare rock and thin subsoils are common across much of the area meaning groundwater is vulnerable to pollution, thus creating difficulties when it

comes to water supply and pollution prevention. Although recharge is high due to high rainfall coupled with low evapotranspiration and shallow/bare rock there is relatively low storage capacity among the limestones. Aquifer storage is low, and rapid flow-through means that the conduit karst aquifers are typified by erratic and unpredictable groundwater supplies, both from wells and springs. Large springs are characteristic of pure bedded limestones, especially in the West, and indicate a bulk permeability high enough to permit the throughput of substantial quantities of groundwater.

Groundwater flow in the productive fissured aquifers largely takes place along fractures and faults. Where extensive faulting occurs, such as in the Monaghan-Clones area, the aquifer permeability is likely to be increased. Additional fracturing may also be associated with the faulting. Where clean limestones are present, dissolution may occur along faults, fractures and bedding planes, widening them and enhancing the permeability. Although lower permeability fine grained shale beds are interbedded in some areas, they can serve as supply routes for large amounts of water due to the interconnectedness caused by the faulting. This is evidenced by the high yields in some of the wells at Monaghan, with the entire scheme capable of supplying upwards of 2 Ml/d. Similarly, the Kingscourt Sandstone aquifer, mapped as a small band to the southwest of Carrickmacross in counties Cavan, Meath and Monaghan, are capable of supplying significant quantities of water. The Mullantra borehole of the Kingscourt PWS typically supplies 375-435 m^3/d.

The differing spatial extents and permeabilities of sand/gravel aquifers results in a variable development potential. They act as areas for groundwater filtration owing to the intergranular flow mechanics, which offers good protection against microbial contamination. There are a number of sand and gravel aquifers throughout the region, with the main ones occurring in Co. Mayo. The Moy Sand and Gravel groundwater body acts as a discharge zone for the Killaturly springs and the Charlestown spring. The gravel body, although classified by the GSI as a 'Locally Important Sand and Gravel aquifer', is significant, and provides water to several supply schemes in the region. The sand/gravel deposits, when overlying areas of bedrock aquifers, can improve the overall flow and storage to the aquifer and also protect against pollution. Conversely, groundwater from the bedrock can feed into the gravel under certain conditions. This can be seen at Killaturly groundwater scheme, where groundwater in the limestone discharges into the overlying sand and gravel body, under inferred upward hydraulic gradients.

5.11.3 Soils

Dominant soil types in the north of the core baseline area are peats, podzolics and gleys (EPA, n.d). South-west and eastern parts of the core baseline area is dominated by peats and gleys with patches of peaty podzols and lithosols in the west. Central part of the core baseline area is covered by podzolics, gleys and raised bogs. Small patches of tidal marshes are present on the coastal areas located north-east of Dundalk, south of Galway and some along the west coast of the core baseline area.

5.12 Transboundary Baseline

Key sources information on the baseline environment for Northern Ireland are:

- State of the Environment Report for Northern Ireland (2013) - From Evidence to Opportunity; and
- Northern Ireland Environmental Statistics Report (May 2021) provides an annual update adding to the information and trends outlined in the State of the Environment Report for Northern Ireland.

There are eight cross-border catchments which are shared between Northern Ireland and Republic of Ireland and within these numerous WFD waterbodies, including rivers, lakes, coastal and transitional waterbodies and groundwater waterbodies, numbering around 70 cross border waterbodies in total.

In Northern Ireland there are 58 Special Areas of Conservation (SACs), 18 Special Protected Areas (SPAs) including the East Coast Marine SPA and Carlingford Marine SPA and 20 Ramsar sites. Marine Conservation Zones (MCZs) are adopted in Northern Ireland, totalling 55 sites. In the Republic of Ireland MCZ adoption is currently at a consultation stage, however marine classifications are included in the current designated sites classifications. The location of the catchments and biodiversity and landscape designated sites are shown in Figure 5.4.

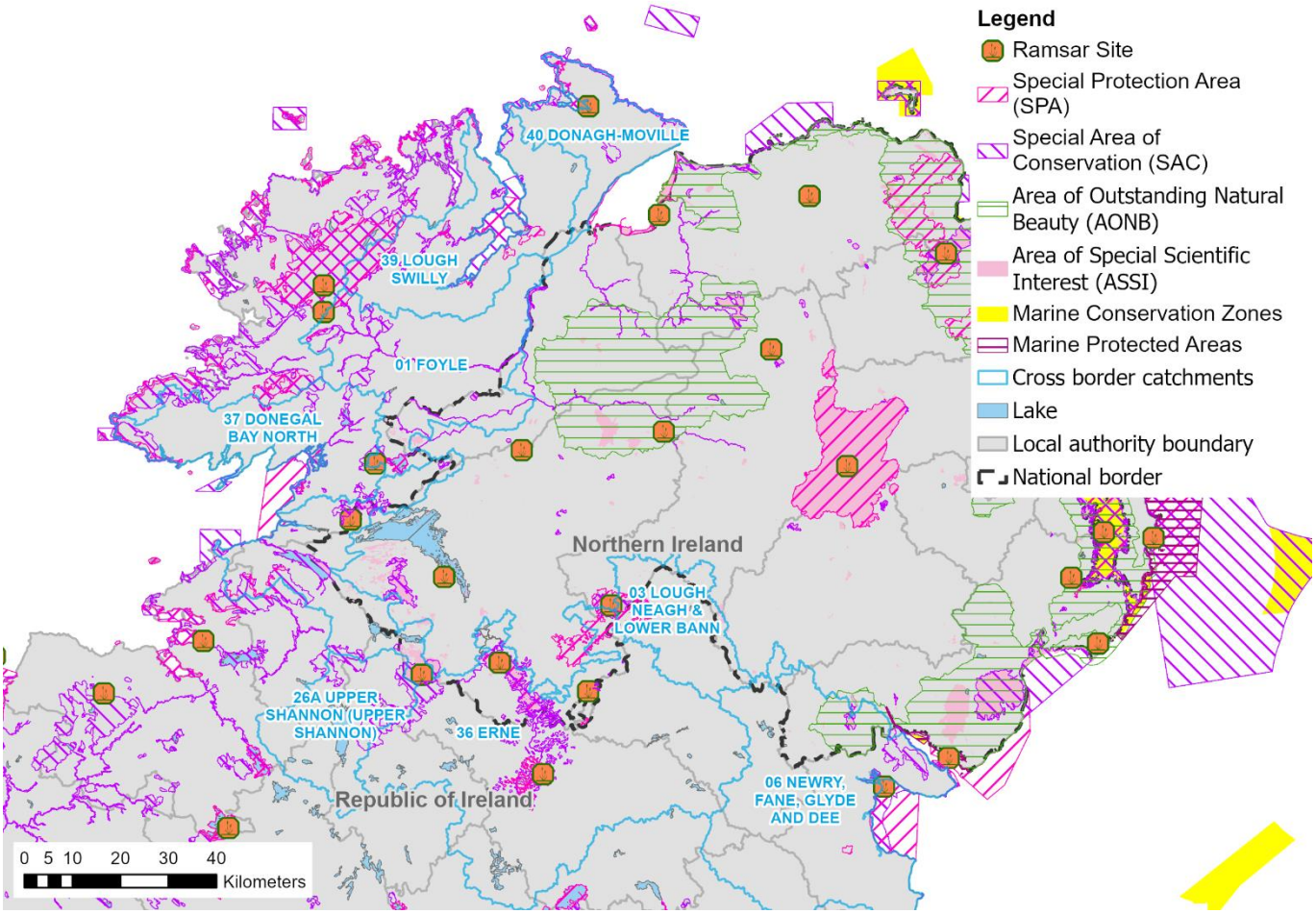


Figure 5.4 Transboundary Environment

Cultural heritage, WFD and biodiversity designations are provided in Figures 5.8a, b and (Appendix A) regarding the baseline of Northern Ireland.

A summary of the key sources of information on the Northern Ireland baseline environment is provided in Table 5.10. These sources will be considered where potential for transboundary effects or pathways for effects are identified.

Table 5.8 Northern Ireland Baseline Information and Data Sources

Topic	Data
Population, Socio-economics and Health	CENSUS 2021 Statistics: https://www.nisra.gov.uk/statistics/census

Topic	Data
Climate Change	Climate Change Mitigation Branch refers Uisce Éireann to the recently passed Climate Change Act (Northern Ireland) 2022. https://www.legislation.gov.uk/nia/2022/31/contents/enacted The UK Climate Change Committee (CCC) recently published its Climate Risk Independent Assessment 2021 which identifies the risk and opportunities posed by climate change over the next five years. A summary for Northern Ireland can be found below. https://www.ukclimaterisk.org/independent-assessment-ccra3/national-summaries/
Tourism and Recreation	Tourist and recreation sites in Northern Ireland: https://www.tourismni.com/ https://discovernorthernireland.com/ Landmark sites: https://www.irishlandmark.com/ Waymarked Trails in NI: (Ulster Way – WalkNI A 636 mile (1,024km) circular walking route taking in the six counties of Northern Ireland) https://www.theirelandwalkingguide.com/trails.html Outdoor recreation information Northern Ireland environmental statistics report | Department of Agriculture, Environment and Rural Affairs (daera-ni.gov.uk)
Biodiversity	Designated Scientific Sites: www.daera-ni.gov.uk/landing-pages/protected-areas DAERA have a map browser for NI protected sites and known priority habitat: www.daera-ni.gov.uk/services/natural-environment-map-viewer Northern Ireland Priority Species List: https://www.daera-ni.gov.uk/sites/default/files/publications/doe/northern-ireland-priority-species-list.pdf
Landscape, and Seascape	Regional Landscape Character Map viewer: https://www.daerani.gov.uk/services/regional-landscape-character-areas-map-viewer Regional Seascape Character Areas (RSCA) include: The Newry Estuary RSCA, Carlingford Lough RSCA, Atlantic RSCA, Lough Foyle RSCA, Foyle Estuary RSCA and North Coast Strands and Dunes RSCA. Northern Ireland Landscape Character Assessment 2000 (NILCA 2000) Northern Ireland Regional Seascape Assessment information: https://www.daera-ni.gov.uk/publications/northern-ireland-regional-seascape-character-assessment

Topic	Data
Cultural Heritage – Archaeological and Architectural	UNESCO: https://whc.unesco.org/en/statesparties/gb Historic buildings and monuments: https://www.nidirect.gov.uk/articles/historic-buildings-and-monuments Department for Communities, Historic Environment Map Viewer https://dfcgis.maps.arcgis.com/apps/webappviewer/index.html?id=6887ca0873b446e39d2f82c80c8a9337 Historic Environment Division Digital Datasets https://www.communities-ni.gov.uk/publications/historic-environment-digital-datasets
Geology and Soils	Northern Ireland State of the Environment Reports: https://www.daerani.gov.uk/publications/state-environment-report-2013 Northern Ireland Environmental Statistics Report 2022 : Northern Ireland environmental statistics report | Department of Agriculture, Environment and Rural Affairs (daera-ni.gov.uk)
Air Quality	Information on NO_2, and particulate matter trends Northern Ireland environmental statistics report | Department of Agriculture, Environment and Rural Affairs (daera-ni.gov.uk) Air pollution information is provided Air pollution in Northern Ireland 2020 | Department of Agriculture, Environment and Rural Affairs (daera-ni.gov.uk)
Noise and Vibration	Noise level maps are available through a web mapper Noise | Department of Agriculture, Environment and Rural Affairs (daera-ni.gov.uk)
Water Environment	Water Framework Directive information Northern Ireland Water Framework Directive Statistics Report 2021 | Department of Agriculture, Environment and Rural Affairs (daera-ni.gov.uk) Ground water, surface water and marine environment information for 2022: Northern Ireland Environmental Statistics Report (daera-ni.gov.uk) DAERA Marine Map Viewer: https://gis.daera-ni.gov.uk/arcgis/apps/webappviewer/index.html?id=e44a8e27333241bfa2faf4a387fd99d7
Material Assets	Information on cycling routes in Northern Ireland Cycling in Northern Ireland | Cycling UK List of cycles routes in Northern Ireland CAWIreland (cyclinguk.org)
General	Other: Northern Ireland State of the Environment Reports: https://www.daerani.gov.uk/publications/state-environment-report-2013 Northern Ireland Environmental Statistics Reports: https://www.daerani.gov.uk/articles/northern-ireland-environmental-statistics-report Our natural environment datasets are available at the link below: www.daera-ni.gov.uk/articles/download-digital-datasets

The environmental baseline sources are reviewed where there are pathways for transboundary effects potential for transboundary impacts depending on the location and nature of options proposed.

5.13 Baseline Topic Interactions, Issues and Opportunities

5.13.1 Interrelationships between SEA Topics

In accordance with the SEA Directive, it is a requirement to recognise the interrelationships between environmental topics, as changes to one environmental aspect can directly or indirectly influence others. Table 5.11 below indicates the potential interrelationships between SEA topics demonstrating most topics interact to some level in a range in some circumstances. Key interactions are highlighted. Table 5.10 presents the key issues and opportunities for the SEA topics.

Table 5.9 SEA Topic Interrelationships

SEA topics	Population, economy, tourism and recreation, and human health	Water environment	Biodiversity (including flora and fauna)	Material assets	Landscape and visual amenity	Air quality and noise*	Climate change	Cultural heritage (including architectural and archaeological)
Water environment								
Biodiversity, (including flora and fauna)								
Material assets								
Landscape and visual amenity								
Air quality and noise *								
Climate change								
Cultural heritage (including architectural and archaeological)								
Geology and soils								

Key	
Interaction	
Key areas of interaction	

* No specific issues identified; therefore, this topic has been scoped out of the SEA assessment.

Table 5.10 Key Issues and Opportunities

SEA Topic	Issues and Opportunities
Population, Economy, Tourism and Recreation, and Human Health	**Issues:** Increasing population and the increased stress of climate change on water quality and water resources could affect health and wellbeing. Tourism can add to peak demand for water. **Opportunities:** Uisce Éireann will put in place plans to assess water quality and put in place measures to address risks as part of the NWRP. Uisce Éireann has ongoing activities to improve the SDB across the North West Region, including, leakage management and water conservation measures. Raising awareness of the importance of water conservation and efficiency measures, and the value of the environment for health and wellbeing, can play an important part in water planning along with valuing water as part of access to environment for recreation.
Water Environment	**Issues:** The proposed abstraction licensing, aligned to WFD requirements, will require many current abstractions to be licensed and may limit future abstraction or involve significant conditions at associated sites. Across the North West Region some of the existing abstractions are potentially unsustainable in the medium term; specifically, during drought periods. Uisce Éireann will need to update their sustainability analysis and impact on their baseline SDB calculations when regulatory assessment for new legislation is undertaken. Groundwater and flood risks and vulnerability are potential issues for water supply and environment. The plan assessment aims to identify strategic level risk but detailed siting and design through the project development stages is expected to take account. **Opportunities:** To take account of identified pressure on the water environment in the selection of solutions for individual study areas and opportunities for reducing pressures on resource and improving water quality.
Biodiversity, Flora and Fauna	**Issues:** It is considered especially important to avoid the loss of irreplaceable or rare terrestrial and aquatic habitats, and increasing pressure on vulnerable species; potentially through direct land take or indirect such as through increased abstraction pressure. Tourism can bring issues of marine litter and water transport can add to spread of invasive non native species. **Opportunities:** Potential for enhancement through reducing pressure on sensitive sites or building in requirements such as habitat enhancement in to schemes and identifying potential for nature-based solutions and catchment management.
Material Assets	**Issues:** WTP assets and network infrastructure requiring improvement or replacement. **Opportunities:** Improvements to support reliability of access to good quality water.
Landscape and Visual Amenity	**Issues:** Potential for climate change to affect land use and influencing landscape character, quality and amenity and potential for construction and infrastructure development to result in landscape and visual amenity change and loss of features. **Opportunities:** Potential to include enhancements in resintatement through appropriate planting schemes and screening.
Air Quality and Noise	No specific issues identified for the baseline for the North West Region related to the types of options and combinations under consideration for the draft Regional Plan.

SEA Topic	Issues and Opportunities
	Therefore, air quality and noise were scoped out of the assessment at the scoping stage (see section 3.8 of the SEA Scoping Report). Disturbances related to construction impacts are addressed in terms of receptors within the population and health topic.
Climate Change	**Issues:** Climate change issues regarding sea level rise, flooding, extreme weather events and changes in seasonal weather patterns. Climate change has been taken into account in supply forecasts and additional risks to infrastructure and operations will need to be taken into account in planning for drought and freeze/thaw events and in detailed scheme design and network operation. **Opportunities:** Additional management to minimise impact on supply and the environment, vulnerability to climate change and drought is required.
Cultural Heritage	**Issues:** Known cultural heritage, architectural heritage, and archaeological assets and potential unknown archaeological assets could be affected by construction works or change to setting or access. Potential for hydrological changes to affect heritage and archaeological assets.
Geology and Soils	**Issues:** Potential loss of soils or pollution from runoff - general need for good soil conservation and retention of nutrients and carbon in soil resources. **Opportunities:** Improve soil carbon and retention of nutrients contributing to improving water quality.
Interactions between topics	Key interactions include links between biodiversity and water resources and climate change and between soils, land management, water quality, biodiversity, flood risk, and climate change also between cultural heritage and biodiversity.

Key issues, trends and opportunities are addressed in each of the Study Area Environmental Reviews A-G (Appendix H).

6 Options and Approach Assessment Methodology

6 Options and Approach Assessment Methodology

6.1 SEA Approach Summary

The set of SEA objectives developed at the Phase 1 scoping stage have been refined and finalised following consultation (see Table 6.1). These have been influenced by the plans, policies and programmes review, the baseline trends and pressures identified, and the scope of the assessment as defined in chapter 6 of the SEA Environment Report for the Framework Plan and the SEA Scoping Report for RWRP-NW and consultation comments.

The methodology for the assessment was developed in accordance with the following EPA guidance:

- Developing and Assessing Alternatives in Strategic Environmental Assessment (SEA);
- Guidance on SEA Statements and Monitoring;
- Integrating Climatic Factors into SEA in Ireland - A Guidance Note;
- Good practice guidance on Cumulative Effects Assessment in SEA; and
- Guidance on the Authorisation of Direct Discharges to Groundwater[14]
- Good Practice Guidance in the Water Sector.

Table 6.2 sets out the SEA criteria for assessment.

Table 6.1 SEA Objectives

SEA Topic	SEA Objectives*
Population, economy, tourism and recreation, and human health	Protect and, where possible, contribute to enhancement of human health and wellbeing and to prevent restrictions to recreation and amenity facilities relating to the provision of water services.
Water environment	<u>Water quality and quantity</u> Prevent deterioration of the WFD status of waterbodies with regard to quality and quantity due to Uisce Éireann's activities. Contribute towards the "no deterioration" WFD condition and, where possible, to restore and improve waterbody status for rivers, lakes, transitional and coastal waters, and groundwater to meet WFD objectives related to the provision of water services.
	<u>Flood risk</u> Protect and, where possible, reduce risk from flooding as a result of Uisce Éireann's provision of water services.
Biodiversity	Protect and, where possible, enhance terrestrial, aquatic and soil biodiversity; particularly regarding European sites and protected species in providing water services.
Material assets	Minimise resource use and waste generation from, new or upgraded, existing water services infrastructure and management of residuals from drinking water treatment - to protect human health and the ecological status of waterbodies. Minimise impacts on other material assets and existing as well as future water abstractions.

[14] Guidance on the authorisation of direct discharges to groupdwater (2014) added in response to a EPA scoping comments although none of the options considered for the North West include groundwater discharges.

SEA Topic	SEA Objectives*
Landscape and visual amenity	Protect and, where possible, enhance designated landscapes in relation to the provision of water services.
Climate change	Climate change mitigation Minimise contributions to climate change emissions to air (including greenhouse gas emissions) as a related to the provision of water services.
	Climate change adaptation Promote the resilience of the environment, water supply and treatment infrastructure to the effects of climate change.
Cultural heritage	Protect and, where possible, enhance cultural heritage resources related to provision of water services.
Geology and soils	Protect soils and geological heritage sites and, where possible, contribute towards the appropriate management of soil quality and quantity.

*In response to scoping consultation comments, clarifications have been made to the Framework Plan SEA objectives to refer to 'water services' rather than activities provided by Uisce Éireann and also to the water environment objective to broaden this objective to include supporting WFD objectives where possible.

Table 6.2 SEA Criteria

SEA Topic	SEA Criteria
Population, economy, tourism and recreation, and human health	• Will the option impact public health and quality of life, during construction? • Will the option impact public health and quality of life, during operation? • What is the impact on recreational amenities?
Water environment	• Would the option or associated construction activities affect WFD Status of water body status, in terms of quantity and quality for surface water? • Would the option or associated construction activities affect WFD Status of water body status, in terms of quantity and quality for groundwater? • Would the option or associated construction activities affect WFD Status of water body status, in terms of hydromorphology? • Would this option reduce pressure on the water environment through water savings? • Is there a potential for this option to increase flood risk – e.g. increase base flow or result in loss of flood plain? • Will navigation be affected?
Biodiversity	• Would the option have potential to result in adverse effects on the integrity of a European site? • Is there potential for the option to impact Annex I (Birds Directive) and/or Annex I, II & IV (Habitats Directive) outside a European site? • Is there potential for the option to impact on national designated sites? • Would the option impact biodiversity in any other areas (local biodiversity risk) including terrestrial, aquatic and marine biodiversity and fisheries?

SEA Topic	SEA Criteria
	• Does the option have the potential to increase or reduce risk of Invasive Non-Native Species (INNS) spread?
Material assets	• Will the option make effective use of existing assets? Or reduce water abstraction? • Will this option conflict with critical infrastructure, or does the option conflict with existing business, planned land use or valuable agricultural land?
Landscape and visual amenity	• Could this option impact the landscape character areas, townscape character areas or important views – detract or improve?
Climate change	• What is the level of construction and operational carbon emissions associated with the option – tonnes?
	• Will the option support climate change adaptation and resilience for the environment?
Cultural heritage	• Does this option avoid direct damage to, or detract from the setting of, designated cultural heritage assets, or does this contribute to protecting them? • Does this option present a risk to undesignated heritage or archaeological interests?
Geology and soils	• Would any designated or non-designated geological features, valuable soils, or contaminated land sites be affected?

6.2 Options and Approach Assessment Summary

The options assessment methodology is outlined in chapter 9 of the Framework Plan. The methodology applied and how the SEA objectives and environmental assessment has been integrated into the application of the methodology, is summarised below.

The methodology is based around an option development process consulted upon and finalised in the Framework Plan. The process aligns with the seven standard steps set out in the Department of Public Expenditure and Reform (2019) guidance document “Public Spending Code: A Guide to Evaluating, Planning and Managing Current Expenditure”. For the NWRP methodology, there are eight key stages to the options assessment methodology which is applied:

1) Identifying need - based on SDB and/or Drinking Water Safety Plan Barrier Assessment.
2) Scoping of the Study Area (WRZs) – understanding the study area and the existing conditions of assets, supply and demand issues as well as environmental constraints and opportunities.
3) Identifying potential options for consideration relevant to the study area.
4) Coarse screening – assess the unconstrained options and eliminate any that will not be viable
5) Further option definition, information collection and preliminary costing.
6) Fine screening – options assessment and scoring against the key criteria with further removal of options identified as unviable and development of feasible options for costing (including environmental and social costs and benefits) and scoring assessment update.
7) Approach appraisal – comparison and assessment of combinations of options identified to meet the predicted supply demand deficit at WRZ, Study Area and Regional Group area level using Multi-Criteria Analysis (MCA) to determine the Preferred Approach. Approaches tested include:

- Least Cost;
- Best Appropriate Assessment (Best AA);
- Quickest Delivery;
- Best Environmental;
- Most Resilient; and
- Lowest Carbon.

8) Monitoring and Feedback into Plan – a feedback mechanism to ensure that the Framework Plan continuously adapts to changes such as evolving scientific data, understanding, and policy change in relation to the natural environment.

The SEA process has been applied across each of these steps as identified in Figure 6.1 below. In the description of the methodology in this chapter, key elements of the process relevant for the SEA process and supportive of SEA objectives are identified in green text boxes.

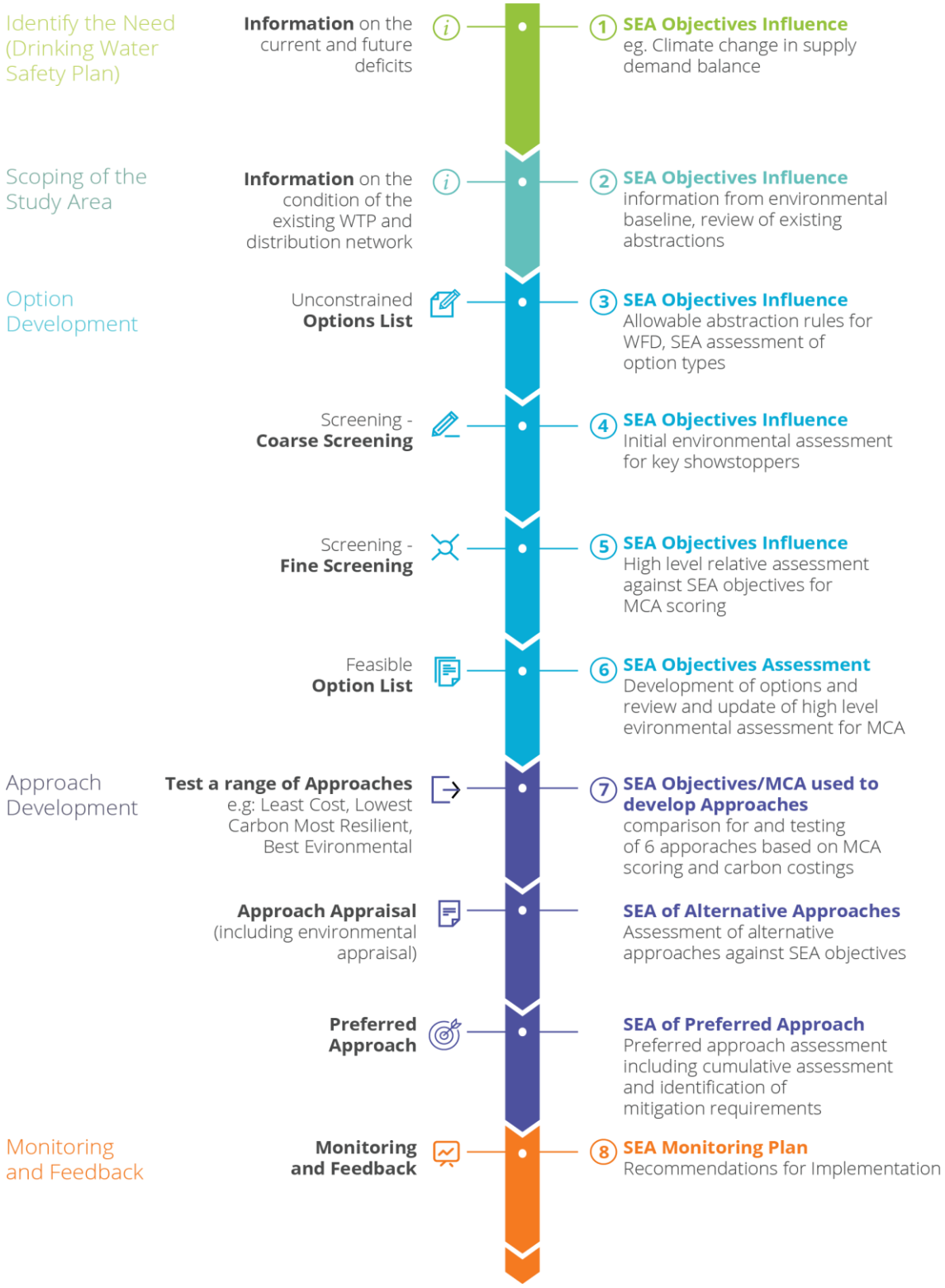


Figure 6.1 Options Assessment and Preferred Approach Methodology

The methodology is focused on ensuring that Uisce Éireann promote solutions that are resilient, environmentally and socially sustainable, and flexible to the changing environment and demands.

Uisce Éireann's options assessment methodology is based around the following five criteria:

- Resilience;
- Deliverability and Flexibility;
- Progressibility;
- Sustainability (Environmental and Social Impacts); and

- Cost.

Key aspects for integration of SEA objectives are outlined for each step in the process below.

6.3 Stage 1: Identify the Need

The process starts with the 'need identification' (quantity, quality, reliability and sustainability) as described in section 3 of the RWRP-NW. The identification of all these needs provides context for the Options Assessment Methodology and informs the scale of the solutions required. The options, approaches and Preferred Approach to address the identified needs for each WRZ will form part of the four RWRPs.

Environmental aspects related to SEA Objectives considered in Stage 1:

- Climate change affecting future water supply; and
- Public health requirements for access to good quality drinking water.

Options Development and Assessment

SEA and AA requirements have been integral to the methodology development, so the environmental aspects that influence options identification and assessment are based on a) SEA objectives and b) include risk of likely significant effects on European sites for AA. Options development is set out in Steps 1-6 of Figure 6.2.

Approach Development and Assessment

Information on performance against SEA objectives and AA requirements is used to identify alternative combinations of options referred to as approaches meeting SDB deficits at the WRZ, study area and Regional Group level for consideration and comparison to determine the best overall approach in Step 7.

The SEA process covers assessment of the alternative approaches meeting plan objectives, including a comparison with the 'do minimum' scenario and identification of the basis for selecting the Preferred Approach for the WRZ, study area and Regional Group.

SEA of the Preferred Approach considers requirement for mitigation and identifies significant residual adverse and beneficial, direct and indirect, short term, temporary, long term and permanent effects. In combination and cumulative effects both within the plan and with other proposed developments, plans and programmes are assessed and additional mitigation identified for potential significant effects.

AA is undertaken on the Preferred Approach, including Stage 1 identification of likely significant effects (LSE) and Stage 2 assessment of Adverse Effects on Site Integrity (AESI), as reported in the NIS for the Framework Plan and the Regional Plan.

The results of the SEA and AA also feed back into Step 7 of the assessment, where any significant effects are identified that cannot be addressed through mitigation or a high level of uncertainty remains. The SEA and AA also influence the mitigation and monitoring measures to be taken forward as part of Step 8 of the Plan.

6.4 Stage 2: Scoping of the Study Area

In order to manage the roll-out of the Options Assessment Methodology and delivery of Phase 2 of the NWRP (the four RWRPs), Uisce Éireann has split the public water supply into the four regional areas. These regional areas are further subdivided into clusters of WRZs termed "Study Areas".

Grouping WRZs into study areas means that:

- Options can be developed that address multiple problematic supplies, which prompts Uisce Éireann to consider regional solutions to resolve local needs in more than one supply; and
- Broader strategic decisions can be made.

The study area boundaries are based on WFD catchments and WRZ locations and types (urban and rural).

The SEA recommendation, based on the SEA objectives, considers environmental constraints and opportunities as part of this needs study and links to other initiatives and ongoing projects, such as the climate sensitive catchments, drinking water quality assessments and WTP residuals disposal management.

6.4.1 Identify Needs for the Study Area

The first stage of the options assessment process is to understand the study area and the existing condition of the assets. A detailed programme of consultation and workshops has been conducted with Uisce Éireann's Local Authority partners and stakeholders, to ensure a full and comprehensive understanding of need across the given study area, including essential maintenance, refurbishment work or issues with the distribution networks. For example, if a WTP in the study area is coming to the end of its lifecycle, requiring a complete refurbishment within the next 10 years, this should be allowed for in any proposed option, either as a WTP refurbishment or a replacement of the supply from other WTP(s).

6.4.2 Abstraction Sustainability

At this stage Uisce Éireann consider the status of their existing abstractions as well as identify opportunity to improve abstraction process and water quality. As mentioned in section 1, current water supplies often come from small local rivers where abstraction may be unsustainable. Uisce Éireann must ensure that their abstractions will not adversely impact the environment over the next 5 to 25 years so that Ireland complies with its obligations under the Water Framework Directive. At this stage, Uisce Éireann builds this information into the SDB to ensure any considered options allow them to plan for a reduction of supply from these sources.

This stage includes consideration of abstraction sustainability for surface water in relation to identifying the likely level of allowable abstraction (related to the SEA objective on water). It takes into account WFD waterbody status through a review of existing abstractions and the identification of new options. This is applied as a rule so that new options meet allowable abstraction criteria. Sustainability of groundwater abstractions are also considered based on a high-level desk study of the zone of contribution and aquifer recharge where more detailed information is not available.

6.5 Stage 3: Unconstrained Options

The SDB and the Barrier Assessment inform the type and scale of options that Uisce Éireann must consider. Key option types are shown in Figure 6.2. Sub-variants of each option type are also considered.

Figure 6.2 Option Types

Environmental and social assessment criteria are included at the earliest stages of the screening process. At the outset of the process, some fundamental rules are applied as part of option identification. For example, inter-catchment raw water transfers are excluded due to the high risk of transferring invasive non-native species (INNS) between catchments and potential conflict with WFD objectives.

WFD objectives have also been a key consideration at this stage through a sustainable abstraction risk review. This was a specialist review of groundwater bodies and surface water catchments that was undertaken as part of the option identification stage. UK Technical Advisory Group on the Water Framework Directive (UKTAG) guidance (UKTAG, 2013) on baseflows have been used until Ireland specific standards come into place.

The application of these conservative abstraction standards to new options ensures that any new or increased abstractions from rivers are likely to support conservation objectives for the most sensitive environmental sites. For surface waterbodies, the allowable abstraction standard of 10% of Q95 has been applied, with the exception of waterbodies requiring 'High' status where a higher threshold of 5% of Q95 has been applied. Allowable abstraction standards for lakes are set at 10% or 5% of Q50 in line with this guidance (the NIS sets out the approach in relation to Appropriate Assessment).

In the future, Uisce Éireann are likely to have to reduce or remove existing abstractions that are identified as not being sustainable under the new legislative regime for abstractions, which aims to bring abstraction licensing into alignment with WFD requirements.

A sensitivity analysis is conducted for each WRZ, to allow to stress test the sensitivity of the Preferred Approach against potential sustainability driven reductions to existing abstractions (taking a conservative and precautionary approach as to the level of reductions that may be required). This is undertaken to ensure that decision making is robust, and the Preferred Approaches are adaptable and compatible with future potential regulatory regimes, in so far as this can be anticipated at this stage. These and other aspects considered are explained in section 6.10 of this report and further detailed in the RWRP-NW section 6.

Based on these desk assessments, Uisce Éireann developed an initial list of unconstrained options for new supplies, increases and upgrades to existing supplies. An Unconstrained Options review workshop was held with Uisce Éireann's Local Authority Water Services Partners to identify any additional unconstrained options that might be available based on local knowledge.

Whilst options are considered individually, an approach to meet identified need may be provided from a combination of these options. For example, rather than seeking to meet a deficit of 10 million litres per day by increasing abstraction from an existing source by that amount, the Preferred Approach (solution) could achieve the same result by increasing an abstraction from an existing source by only 6 million litres per day but reducing leakage by 3 million litres per day and reducing consumption through demand management measures by 1 million litres per day (aligned with the Three Pillar approach outlined in section 3 of the Framework Plan).

The Unconstrained Options constitute all of the possible solutions, which either fully or partly resolve a water supply deficit, regardless of cost, environmental or social constraints. In developing the Unconstrained List, Uisce Éireann identify options that are applicable to meet the needs of the study area. This includes:

- A review of any options identified by Uisce Éireann that have not been committed to in the current Investment Plan;
- A review of options previously considered by Local Authorities;
- A review of options identified in other strategy documents, approaches, and projects; and
- Ideas generated at workshops with regional operational staff drawing on their knowledge and experience of the supply system and the geographical area.

The Unconstrained Options list can include solutions at a WRZ, Study Area, Regional Group Area or even National level.

6.5.1 Option Scale

Options to address the water supply deficits are developed at three different spatial scales:

- **WRZ Options** comprised of single or multiple options that can resolve the water supply deficit of a **single WRZ only.** For example, a WRZ Option could include a new abstraction bore and/or an import from an adjacent supply system. Each WRZ is reviewed individually to assess options that might address water resource or water quality need in that supply area.
- **SA Options (Group Options)** comprised of single or multiple options that can resolve the water supply deficit of **more than one WRZ within a single study area**. These options are generally dependent on each other and operate in an integrated way to meet the demands of a number of WRZs. For example, two WRZs could be interconnected, and an additional water source developed that supplies the newly integrated supply systems. This may involve the decommissioning of infrastructure, such as one of the existing WTPs and associated abstraction site. An assessment is made as to whether there are any larger options that might be able to address the need for multiple WRZs (generally within the same study area); although in some circumstances the solution at this level may involve a transfer from outside the SA in which the relevant WRZ is located).
- **Regional Level** Feasible Options are assessed at the Regional Area level to see if there are any options (or combinations of options) that can be applied across the entire Region.

The approach to developing options at the three different scales is described in further detail in Section 6.1 of the RWRP-NW.

6.5.2 Option Types

The SDB and Barrier Assessment (outlined in section 3 of the RWRP-NW) inform the type and scale of options that Uisce Éireann must consider. The main Option Types are shown in Figure 6.2.

For this iteration of the NWRP, Catchment Management option types are not selected. However, nature-based solutions and catchment management measures will be considered as part of the Drinking Water Safety Plans (DWSPs) that aim to reduce risk to our supplies; and where possible, will be incorporated at Project Level. The DWSPs include a comprehensive risk assessment process of our supplies from water sources (catchment) to consumer (tap). It is noted that options involving aquifer storage were a potential consideration at the unconstrained stage. However, due to the geology in Ireland, no aquifer recharge options were identified in the NW Region or nationally.

Irish Water identified **1,357 unconstrained options** for the RWRP-NW.

36% of the 1,357 Unconstrained Options identified for the RWRP-NW are local surface water abstractions and 17% are local groundwater abstractions. These are either an expansion of an existing abstraction site or the development of new sites to meet the Needs of WRZs within close proximity. These Unconstrained Options are usually combined with WTP capacity upgrades.

22% of the Unconstrained Options involve rationalisation, which refers to the merging of water supply systems and the subsequent decommissioning of the obsolete water infrastructure and associated abstractions. These Options may require a new or enhanced supply source - for example, a new or enhanced groundwater or surface water abstraction or a water transfer from another supply system. The upgrade and/or expansion of existing WTPs may be carried out as part of a rationalisation process.

Water transfers make up 20% of Unconstrained Options. As with the rationalisation of supplies, many of these require an additional or upgraded source.

2% of the Unconstrained Options are WTP upgrades that have been identified for WRZs that are not in supply deficit but require water quality improvements only.

The remaining 3% of the Unconstrained Options comprise:

- Network improvements that can include operational changes, strategic trunk mains and/or other critical infrastructure improvements that enhance supply capacity and increase resilience;
- Desalination plants (for example, a small desalination plant on Inishboffin Island to meet the estimated deficit of approximately 150 cubic metres per day in 2044);
- Reservoirs, such as the proposal to raise the existing dam height at Lake Coolacknick impoundment and construct a new impoundment on the other side of the lake to supply Inishturk Island (SAD);
- Cross Study Area supplies, such as the proposal to rationalise the Collon Drybridge WRZ in SAE to the South Louth East Meath WRZ in Study Area 3 of the Eastern and Midlands Region;
- Conjunctive Use involving the combined use of surface and groundwater sources; and
- Advanced Leakage Reduction additional to the reduction achieved through our national Leakage Reduction Programme (as outlined in section 3.2.6.6 and 5.2 of the RWRP-NW), which aims to meet Uisce Éireann's Sustainable Economic Level of Leakage targets (SELL). The Advanced Leakage Reduction Options will go beyond the SELL targets and reduce the calculated SDB Deficit.

6.6 Stage 4: Coarse Screening

The unconstrained options list is refined using a coarse screening assessment, which enables Uisce Éireann to rule out any non-viable options. The remaining options known as "Constrained Options" are then carried forward for more detailed Multi Criteria Assessment (MCA) at the Fine Screening stage (see section 6.7).

The Coarse Screening assessment uses the criteria listed in Table 6.3 with options scored against a red, amber or green (RAG) traffic light system, as shown in Table 6.4.

Any option which scores "red" against a question has a fundamental issue that would be difficult to mitigate and is discounted on the basis that it is unlikely to ever be delivered.

An amber rating across any of the Coarse Screening criteria will not rule out an option, however, it will highlight that this option may require mitigation. For example, a surface water abstraction from a source which is designated as a European site will obtain an amber rating (assuming that it meets the allowable abstraction limits) against the Deliverability and Flexibility criterion and the Sustainability (Environmental and Social impacts) criterion. However, such an option will most likely require mitigation in relation to construction related impacts, which will take time to develop. Therefore, Uisce Éireann must allow for consideration of the likely environmental site assessments and studies that will need to be carried out within Uisce Éireann Plan level costing for an option.

A 'Rejected Options Register' is produced to record and explain all options that are screened out on the basis of a red rating. Details of the rejected options and the justification for their rejection are outlined in the Study Area Technical Reports in the Technical Appendices 1-7 of the RWRP-NW.

Removal of options which are clearly likely to conflict with SEA objectives through coarse screening is supportive of the SEA objectives. The environmental grounds for removing options are clearly recorded.

Table 6.3 Unconstrained Options Assessment Criteria

Criteria	Unconstrained Option Assessment Questions	
Resilience	Q1	Does the option address the supply-demand problem?
Deliverability and Flexibility	Q2	Is the option technically feasible?
	Q3	Can the risks and uncertainties associated with the option be mitigated to avoid failure of the option?
Sustainability (Environmental and Social Impacts)	Q4	Can significant impacts on known high level environmental constraints for example European/ international or nationally designated biodiversity, landscape, cultural heritage sites, WFD objectives or community assets, be avoided or minimised? If not, is mitigation likely to be possible?

Table 6.4 Red, Amber and Green Decision Matrix

RAG matrix	Red	Amber	Green
Resilience	Does not address the supply-demand problem at all.	May address part of the supply-demand problem	Fully addresses the supply-demand problem.

RAG matrix	Red	Amber	Green
		(with due consideration on the size of the deficit).	
Deliverability & Flexibility	Option is not technically feasible. Associated risks and uncertainties are not viable and will result in a failure of the option.	There are some risks and uncertainties associated with the option but are not considered to be insurmountable at this stage.	Option is technically feasible. There are no associated risks or uncertainties which are unacceptable.
Sustainability (Environmental and Social Impact)	Likely significant impacts on European designated sites or WFD objectives* or important biodiversity, landscape designations, cultural heritage or community assets which cannot be avoided through design or where proposed mitigation is not feasible	There are some impacts identified. However, they are not considered to be prohibitive at this stage due to the potential for improved design and/or mitigation.	No major issues or sensitivities identified at this stage.

*options that cannot meet sustainable abstraction limits are removed unless more detailed study information provides a basis for different thresholds

There were **539 Options rejected for the Region** after being assessed against the coarse screening criteria of Resilience, Feasibility and Environment. The remaining **818 Options** (of the 1,357 Unconstrained Options) are taken forward for Fine Screening.

6.7 Stage 5: Fine Screening

Fine screening involves an analysis of the Constrained Options against a range of detailed criteria, through a process known as Multi-Criteria Analysis (MCA). The objective of the MCA and the fine screening process is to determine the potential benefits and impacts of the options across a range of key criteria. It involves dividing the decision into smaller, more understandable parts and analysing each part before integrating those parts to produce a meaningful assessment.

The MCA process allows a combination of issues to be considered together. This can help indicate if one option will be more: cost effective, environmentally acceptable, sustainable, resilient or feasible when compared to other options. This process requires a more detailed analysis of the options and their potential benefits and impacts against the key criteria. Additional information on the potential benefits and impacts will be collated at this stage. This information may highlight issues with options which were considered to be feasible at the coarse screening stage but now are not considered viable. If Uisce Éireann have a study area where there are a significant number of options, the fine screening process allows Uisce Éireann to rule out options which do not perform well over a range of criteria.

The MCA methodology has been tailored to provide a structured and transparent approach to inform the decision-making process and to remove subjectivity, as far as reasonably possible. This also recognises that both monetary and non-monetary objectives may influence decisions.

The MCA approach applies a common set of questions to determine the relative merits of each option across the key criteria. The questions are developed by dividing the criteria from the Coarse Screening stage into detailed sub-criteria against which options can be assessed. The resilience, deliverability and flexibility categories relate to technical and cost aspects of resource options and are covered in the RWRP-NW and the study area technical report appended (RWRP-NW: Technical Appendices 1-3). The sustainability criteria address environmental impacts which are the relevant focus for the SEA and therefore Table 6.5 lists the criteria and sub-criteria environmental questions that are applied at the Fine Screening stage.

The SEA topics and objectives are the basis for identifying key questions and developing the criteria for the environmental assessment and for scoring of options in the Fine Screening/ MCA as listed in Table 6.5.

Table 6.5 SEA Option/Approach and Fine Screening Environmental Questions

SEA Theme	SEA Objectives and Scope of Assessment	SEA Option/Approach Assessment Questions*	Fine Screening Options Questions** (to inform numeric scoring for the MCA)
Population, economy, tourism and recreation, and human health	Protect and, where possible, contribute to enhance human health and wellbeing and to prevent restrictions to recreation and amenity facilities relating to the provision of water services.	Will the construction and operation of the option/approach impact public health and quality of life in terms of improved supply security or access to water? For example, will the construction or operation of the option/approach cause significant disturbance to sensitive receptors from dust, noise and/or traffic? Or does the option address drinking water quality issues that are identified on the EPA remedial action list?	Will the option impact public health and quality of life, during construction?
			Will the option impact public health and quality of life, during operation?
		Will the option/approach result in loss of recreational amenity, footpaths, or access to recreational amenity (including water based recreation and navigation)?	What is the impact on recreational amenities?
		Does the option/approach help to raise public awareness of the need for water conservation?	
Water environment	**Water quality and resources**		
	Restore and improve WFD status and of waterbodies with	Would the option/approach operation or associated construction activities create the potential for deterioration of	Would the option or associated construction activities affect WFD

SEA Theme	SEA Objectives and Scope of Assessment	SEA Option/Approach Assessment Questions*	Fine Screening Options Questions** (to inform numeric scoring for the MCA)
	regard to quality and quantity due to Uisce Éireann's activities and contribute towards the "no deterioration" WFD condition and where possible restore and improve rivers, lakes, transitional and coastal waters and groundwater waterbodies to meet WFD objectives.	waterbody status/quantitative status or conflict with or contribute to potential to achieve RBMP/WFD objectives for achieving good status (groundwater and surface water) (covering surface water, groundwater, freshwater, estuarine and coastal and river channel/hydro-morphological aspects). For example, related to impacts from additional abstraction pressure on sources or does the option/approach address risk to the water environment from drinking water treatment residuals?	Status of water body, in terms of quantity and quality for surface water?
			Would the option or associated construction activities affect WFD Status of water body, in terms of quantity and quality for groundwater?
			Would the option or associated construction activities affect WFD Status of water body, in terms of hydro morphology?
		Would the option/approach reduce pressure on the water environment through water savings or improvements to water quality?	Would this option reduce pressure on water environment through water savings?
	Flood Risk		
	Protect and where possible reduce risk from flooding as a result of Uisce Éireann's provision of water services	Is there a potential for this option/approach to increase flood risk, for example increase base flow or result in loss of flood plain?	Is there a potential for this option to increase flood risk – e.g. increase base flow or result in loss of flood plain?
Biodiversity	Protect and where possible, enhance terrestrial, aquatic and soil biodiversity, particularly EU designated sites and protected species resulting from Uisce Éireann's provision of water services	Is there potential for the option/approach to result in significant adverse or beneficial effects on European or nationally designated sites (for example, by undermining the European sites' conservation objectives through direct or indirect effect pathways, including but not limited to direct loss of habitat, changes in hydrology) and/or terrestrial and aquatic populations of European or nationally protected species?	Is there potential to result in adverse effects on the integrity of a European site?

SEA Theme	SEA Objectives and Scope of Assessment	SEA Option/Approach Assessment Questions*	Fine Screening Options Questions** (to inform numeric scoring for the MCA)
		Is there potential for this option/approach to result in significant adverse or beneficial effects national, county or local, designated sites or biodiversity interest (for example flora and fauna protected under the Flora Protection Order, Salmonid Regulations, 1988 and/or the Wildlife Act, 1976), for example through loss of significant areas of ecologically valuable habitat (woodlands/hedgerows/wetlands) and in particular irreplaceable habitats (ancient or long-established woodlands) or by undermining biodiversity objectives outlined in the National Biodiversity Action Plan or local county development/biodiversity action plan?	Is there potential to impact on an Annex species outside designated areas?
			Is there potential to impact on National designated sites?
		Could this option/approach contribute to a significant increased risk in spreading Invasive Non-Native Species (INNS)?	Is there a risk of spreading Invasive Non-Native Species?
Material assets	Minimise resource use and waste generation from the provision of new or upgraded existing water services infrastructure and management of residuals from drinking water treatment - to protect human health and the ecological status of waterbodies.	Will this option/approach conflict with critical infrastructure, or does the option conflict with existing business, planned land use or result in the loss of significant area of valuable agricultural land?	Will this option conflict with critical infrastructure, or does the option conflict with existing business, planned land use or valuable agricultural land?
		Does the option/approach make use of suitable existing assets?	Will the option make effective use of existing assets?
		Does this option/approach increase resource use and waste production, including waste to landfill, or does it promote waste treatment efficiency and waste reuse, for example improvements to the management of drinking water treatment residuals?	(Waste management good practice application assumed on individual option basis so not used for fine screening scoring)
	Minimise impacts on other material assets	Would this option/approach affect other water users, for example through effects	(see question on navigation in water section above)

SEA Theme	SEA Objectives and Scope of Assessment	SEA Option/Approach Assessment Questions*	Fine Screening Options Questions** (to inform numeric scoring for the MCA)
	and existing and future water abstractions.	on existing groundwater abstractions*** or navigation?	
Landscape and visual amenity	Protect and, where possible, enhance designated landscapes related to the provision of water services.	Could this option impact landscape character areas, townscape character areas or important views – detract or improve?	Could this option impact the landscape character areas, townscape character areas or important views (detract or improve)?
Climate change	**Climate change mitigation**		
	Minimise contributions to climate change emissions to air (including greenhouse gas emissions) as a result of Uisce Éireann provision of water services.	What is the level of construction and operational carbon emissions associated with the option/approach – using indicator of level of emissions such as scale of construction or energy use or estimated tonnes?	What is the level of construction and operational carbon emissions associated with the option (tonnes)? (Overlaps with information considered for MCA questions on supply resilience)
	Climate change adaptation		
	Promote the resilience of the environment, water supply and treatment infrastructure to the effects of climate change.	Does the option/approach increase climate change vulnerability for the environment or add resilience?	
Cultural heritage	Protect and where possible, enhance cultural heritage interests.	Does this option have potential to damage, or detract from the setting of, designated cultural heritage assets or result in the loss of potential archaeological interest, or does this option contribute to protecting them?	Does this option avoid direct damage to, or detract from the setting of, designated cultural heritage assets, or does this contribute to protecting them?
Geology and soils	Protect soils and geological heritage sites and where possible contribute towards the appropriate	Would any designated or non-designated geological features be damaged by an option, or is there a risk to significant areas of valuable soils or are there risks from contaminated land? Or could the	Would any designated or non-designated geological features, valuable soils, or contaminated land sites be affected?

SEA Theme	SEA Objectives and Scope of Assessment	SEA Option/Approach Assessment Questions*	Fine Screening Options Questions** (to inform numeric scoring for the MCA)
	management of soil quality and quantity.	option support improvement to soil quality and reduce erosion risks.	

*these questions are used to inform assessment against the objectives for individual options, combinations of options and at plan level

The questions are used in the SEA options and approach assessments against the objectives and are used as the basis for the MCA scoring - the fine screening assessment can identify additional "showstoppers" and reasons for removing options. All questions can be responded to by recording either negative adverse or positive beneficial effects/risk.

Finally, the scoring guide for the evaluation against the Sustainability (Environmental and Social Impacts) criteria is set out in Appendix B. The guide aims to support consistency in the assessment across different option types.

The general aim is to keep options in for further consideration and to only remove options where there is a clear justification for doing so and to avoid unnecessary further option development and assessment work on unfeasible options. Where there is uncertainty or potential for issues to be addressed through design or mitigation options are retained.

No options were rejected after Fine Screening. A total of **539 options** were rejected based on multiple criteria, including environmental sustainability issues (see Table 6.6).

Table 6.6 Rejected Options Summary (Coarse and Fine Screening)

Number of Options	Reason for Rejection (coarse and fine screening)
110	Deliverability & Flexibility
89	Resilience, Deliverability & Flexibility
227	Resilience, Deliverability & Flexibility & Sustainability
113	Other reasons such as repeat Options or operational Options which did not provide additional supply.
539	**Total**

6.8 Stage 6: Feasible Options List – Option Costing

The output of the fine screening stage is called the Feasible Options List. An outline design and estimated cost is developed for each option on the list. Summary option dossiers are produced for each feasible option.

It should be noted that assessments at this stage are high level desk-based and plan level assessments. Environmental impacts and costing of projects are further reviewed at Project Level where alternatives will require to be considered as part of the environmental impact assessment process in the usual way. No statutory consent or funding consent is conferred by inclusion of any option in the draft RWRP. Any

projects that are progressed following identification in this plan will require individual environmental assessments, including where appropriate, Environmental Impact Assessment and Appropriate Assessment. These will be obligatory in support of planning applications (where a project requires planning permission) or in support of licensing applications (for example, for new or increased surface or groundwater abstractions). Any such applications will also be subject to public consultation.

6.8.1 Environmental and Social Valuation

Environmental performance against the SEA objectives as reflected in the MCA scoring against environmental criteria are reviewed and updated to reflect the option dossier information following outline design and scoring rules updated to reflect the assessment applied.

In addition to the construction and operational cost estimates and qualitative environmental options assessment, an environmental and social valuation of the option is undertaken to provide monetised values to feed directly into the approach appraisal process.

SEA methodology is based primarily on qualitative assessment to consider if potential effects are likely to be significant, but this is informed by quantitative information such as GIS based analysis. In addition, where possible the valuation of environmental and social costs and benefits (including carbon) are used to inform options appraisal. This involves monetising societal impacts and benefits and can be undertaken through a range of environmental economics tools, including natural capital accounting and ecosystems services assessment methodologies. These approaches are new and are still being developed but are likely to be increasingly used in the future.

The areas covered for the environmental and social costings are:

- Climate regulation – woodland;
- Traffic impacts – opportunity cost of time due to road congestion from roadworks;
- Food – crops and livestock; and
- Carbon emissions (calculated alongside the construction and operational costs for the options).

The aim of the calculations is to capture and value significant residual impacts in relation to the categories examined for each option and this can be especially valuable for providing information on combinations of options. However, the categories that can be used depend on the option and environmental information available to allow quantification metrics and valuation.

The approach for valuation of environmental and social costs and benefits is applied using information available. Insufficient information on option sites and pipeline routes is available to apply a natural capital assessment approach fully at this stage and an initial high-level quantification of potential land uses affected by the plan proposals is provided at a regional level as a starting point to be developed further as options are developed further and more detailed information is available on option impacts on habitat and land use types, areas and condition and the ecosystems they support. The approach applied aims to avoid double counting with the qualitative assessment undertaken for the SEA.

6.8.2 Selection of Options for the Approach Appraisal

The screening process provides MCA scores for the options which will or will not progress through for further consideration in the approach appraisal. As with the coarse screening, the justification for rejecting options will be recorded and these can be reviewed in the future.

Where there are very large numbers of constrained options covering a range of option types providing sufficient choice for the approach appraisal, screening is useful for identifying the worst performing

options. These can be removed or placed on a reserve list and the better performing options taken forward for further consideration in the feasible list. Any options which are discounted at this stage are recorded on the Rejected Options Register (Technical Appendices 1-7 of the RWRP-NW). Better performing options are taken forward for further consideration in the feasible list. This method can be appropriate for large WRZs or study areas.

For more limited numbers of constrained options within any WRZ or study area, screening is best used as a check. This is considered an appropriate method where options are likely to have been identified with some constraints and requirements already considered. Only options identified as clearly unfeasible, unsustainable or unviable will be removed. Where options perform poorly against specific sub-criteria, the potential for design or mitigation to address effects will be considered. If there is any doubt as to whether a particular option should be classified as feasible or not, then that option will be carried forward to the feasible list for further consideration.

Each option is subject to an objective assessment with uniform scoring criteria, based on best publicly available datasets. Options are scored using a seven-point Likert scale, from major adverse (scoring -3) through to major beneficial (scoring 3), as set out in in the scoring guidance provided in Appendix B.

The screening process provides MCA scores for each of the Feasible Options which then pass through to the approach appraisal stage for further consideration.

Each option is subject to an objective assessment with uniform scoring criteria, based on best publicly available datasets. Options are scored using a seven-point Likert scale, from major adverse (scoring -3) through to major beneficial (scoring 3), as set out in in the scoring guidance provided in Appendix B.

The screening process provides MCA scores for each of the Feasible Options which then pass through to the approach appraisal stage for further consideration.

The environmental MCA criteria are based on the SEA objectives from the SEA Scoping Report and consulted on with environmental stakeholders. Some criteria/screening questions may be more relevant to some options types than others.

Habitats Directive considerations have been integrated into the Options Assessment Methodology at a number of points to ensure both robust assessment and protection are integrated into the Plan. In particular, this is demonstrated through the MCA/fine screening scoring for the European sites and biodiversity question (see Best AA approach, Table 6.7) and again through consideration of mitigation measures to avoid adverse effects that have been identified.

6.8.3 Summary of Options Appraisal and SEA

These steps provide a valuable process for collecting information on the options and refining both the option design and capturing environmental assessment information which can be built upon in the next stage.

Summary of how the options appraisal process incorporates consideration of SEA objectives:

Pre-option screening application of allowable abstraction rules to new options to meet WFD requirements for good and high status waterbodies. (Note that these are precautionary rules and, in some cases, available hydrological/hydrogeological studies or appropriate assessment may provide more specific information on the relevant thresholds).

Screening out of options considered with reasonable certainty as likely to have significant effects on the environment that are considered unlikely to be mitigatable.

Improving the options by making use of an iterative process which will allow potential significant environmental issues for an option to be identified and the potential to address these to be considered. For example:

- Further option definition to address the concern, such as including information on allowable abstraction limits and operating principles;
- Highlighting aspects where further design, siting, routing or embedding mitigation measures in design or operation rules is required for the next stage;
- Identifying further information required to reduce the assessment uncertainty, such as aspects of design, option components, environmental information, or information on nearby abstractors; or
- Providing an opportunity to build mitigation measures and risk issues into option costings.

6.9 Stage 7: Approach Development

6.9.1 Test a Range of Approaches

The purpose of the Plan is to examine all potential options that could be used to meet the need and then to eliminate those that are not feasible or that have identifiable environmental issues (at a desktop level).

After fine screening the feasible options are assessed individually or as option combinations forming different potential approaches to identify the preferred option or combination of options to meet the need for each WRZ, study area and regional area.

A defined process has been identified to develop the Preferred Approach at the three spatial scales shown in Figure 6.3.

The final stage is to assess any inter-regional options and potential cumulative or in combination effects and determine if any adjustment is required (this will be addressed sequentially in each of the Regional Plans in turn).

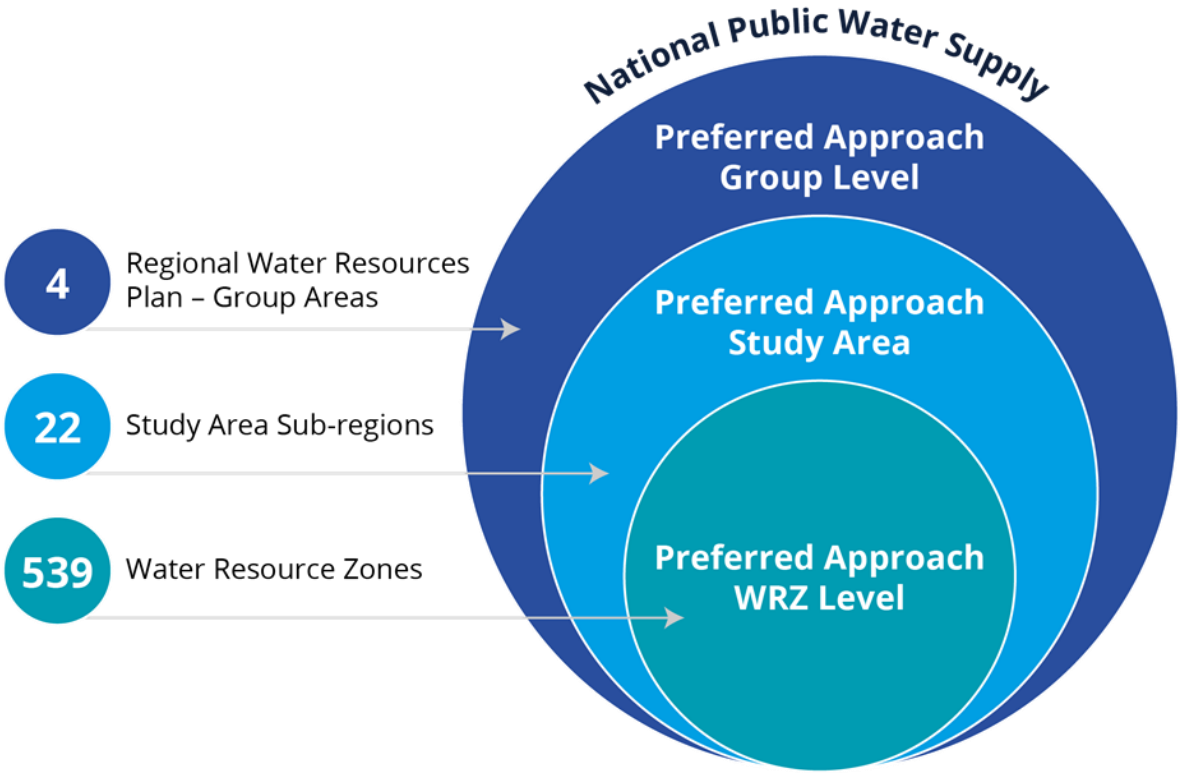


Figure 6.3 National Water Resources Plan Spatial Scale of Assessment

The Feasible Options, individually and in-combination, are tested to determine the Preferred Approach to meet the need across the three spatial scales. The options are tested against six Approach Categories which were selected to align the Framework Plan with all relevant Government Policy. The six Approach Categories are summarised in Table 6.7 and discussed in further detail below.

Table 6.7 The Six Approach Categories

Approaches Tested	Description	Policy Driver
Least Cost (LCo)	Lowest Net Present Value (NPV) cost in terms of Capital, Operational, Environmental and Social, and Carbon Costs	Public Spending Code
Best Appropriate Assessment (Best AA) (BA)	Lowest score against the European Sites (Biodiversity) sub criteria question based on assessing the option as having either no LSEs, LSEs that can be addressed with general/standard mitigation measures or LSEs that may be more difficult to mitigate. For options scoring -3, potential alternative higher scoring options are sought where possible.	Habitats Directive
Quickest Delivery (QD)	Based on an estimate of the time taken to bring an option into operation (including typical feasibility, consent, construction and commissioning durations) as identified at Fine Screening. This is particularly relevant where an option might be required to address an urgent Public Health issue (potential benefit for SEA Objective on population and public health).	Statutory Obligations under the Water Supply Act and Drinking Water Regulations

Approaches Tested	Description	Policy Driver
Best Environmental (BE)	This is the option or combination of options with the highest total score across the 19 SEA objective criteria MCA questions. In addition, high risk -3 issues are considered against individual criteria focusing on long term operational effects.	SEA Directive and WFD
Most Resilient (MR)	This is the option or combination of options with the highest total score against the resilience criteria. (Link to SEA Objective for climate change adaptation for environment)	National Adaptation Framework and Climate Action Plan
Lowest Carbon (LC)	This is the option or combination of options with the lowest embodied and operational carbon cost	Climate Action Plan

Least Cost Approach

The Least Cost Approach is determined using an Uisce Éireann Net Present Value (NPV) assessment tool which establishes the option with the lowest comparative NPV cost encompassing: Environmental and Social Costs, Carbon Costs, Capital Costs and Operational Costs. The NPV assessment tool utilises a strict set of requirements and is limited in the flexibility it offers. Therefore, where a number of Options provide similar NPV costs, and in some circumstances, so as to ensure that no such Options are excluded at this early stage by reference only to "least cost", Uisce Éireann has considered that all options within a 5% NPV cost margin are in principle eligible to be identified as the "least cost" option. This approach also recognises the desk-based nature of the NPV assessment, and the fact that these figures will change at project stage. To then determine the individual "least cost" option in each case, Uisce Éireann has applied wider factors, including SEA and Habitats objectives, as part of its exercise of professional judgement as provided for in section 8.3.7.4 in the Framework Plan. This approach also ensures that the plan level assessments align with the requirements of the Public Spending Code and the National Adaptation Framework.

Best Appropriate Assessment Approach

The Best AA Approach gives maximum consideration to the options with no potential for impacts (no Likely Significant Effects (LSEs)) on European Designated sites or options with LSEs that can be addressed with general/standard mitigation measures at the project level. This can equally be described as giving maximum consideration to the options with the least impact on European sites. It puts avoidance of impacts on European sites at the forefront taking account of the fact that options with a high likelihood of significant effects which could lead to adverse effects on a European site have already been removed at coarse screening stage.

This approach prioritises the avoidance of impacts on European sites, taking account of options likely to have a higher risk of significant effects and more likely to require mitigation to avoid significant effects.

Quickest Delivery Approach

The Quickest Delivery Approach is based on the estimated time for an option to be brought into operation (including typical feasibility, consent, construction and commissioning durations) as identified at fine screening. This approach allows Uisce Éireann to potentially optimise the Preferred Approach by minimising the time taken for an option to become operational. This could be appropriate in a WRZ with

a critical water quality issue that might impact on public health, as this approach would identify the option that could potentially be delivered in the shortest possible timeframe. As the NWRP does not confer funding or statutory consent for any project, and the identified needs across the North West Region must be considered. Uisce Éireann would be unlikely to modify an approach based on Quickest Delivery unless there is a critical driver.

Best Environmental Approach

The Best Environmental Approach is the option or combination of options with the highest total score from the SEA objectives and environmental sub-criteria MCA questions, assessed as part of the fine screening assessment described in Stage 5. The purpose of this approach is to consider overall performance across the SEA objectives and potential to minimise overall potential impacts in the options assessment and approach selection process.

For each option or combination of options, the MCA includes assessment across all 19 SEA objectives and sub-criteria, using the sum of positive scores and the sum of negative scores separately and avoiding combining positive and negative scores.

The scoring is also reviewed against:

- Individual criteria to identify where high negative or positive scores indicate potential for significant adverse or beneficial effects (for example the number of -3 scores); and
- How the assessment reflects important differences between options focusing on where these relate to potential operational or long-term effects and also the range of difference in the scoring.

This provides a basis for reviewing each option and the option combinations on a relative performance basis.

When the combination with the lowest environmental score also scores any -3 score under the Best AA criteria, we review the other combinations to determine if there are any combinations with a no -3 biodiversity score. The Best Environmental is the Combination with the best performing environmental score with the least no of -3 scores against the best AA criteria.

The potential approaches are also assessed in terms of overall performance against the SEA objectives against a ‘do minimum’ scenario.

Most Resilient Approach

The Most Resilient Approach is the option or combination of options with the highest scores from the four MCA screening questions relating to Resilience criteria. This approach is aligned to the NWRP objective to ensure a safe and secure water supply in the short, medium and long term.

Lowest Carbon Approach

The Lowest Carbon Approach is the option or combination of options with the lowest embodied and operational carbon costs. This approach is aligned with Uisce Éireann’s carbon reduction policies and the National Adaptation Framework (NAF)[15] in relation to climate change.

[15] Department of Communications, Climate Action and Environment. 2018. *National Adaptation Framework. Planning for a Climate Resilient Ireland*. [Online]. [Accessed: 24 October 2022]. Available from: National Adaptation Plan

6.9.2 Approach Assessment Ranking

The EBSD (Economics of Balancing Supply and Demand) method is applied to rank the options in order of lowest to highest NPV cost and with regard to their applicable MCA scores for the six Approach Categories. The EBSD method determines an optimum combination of options to address the future Need, balancing across the range of NWRP and SEA objectives outlined above. Further detail on the method applied is outlined in section 7.2.1 of the RWRP-NW.

In some instances, options may achieve similar, although not exactly identical, scores within an Approach Category. In these circumstances, and to ensure that options which perform better overall are not excluded from the approach development process, Uisce Éireann takes a wider look at the combination to consider which of these comparable options to categorise as the “Best” approach within each category. In particular, Uisce Éireann takes into account whether the option or combination of options meets the SEA and Habitats objectives outlined in the Framework Plan.

The Approach development process is designed to determine the Best Value approach to meet the need and this is then identified as the Preferred Approach. Best value is identified as the approach that provides the best performance overall, balancing across the range of NWRP and SEA objectives.

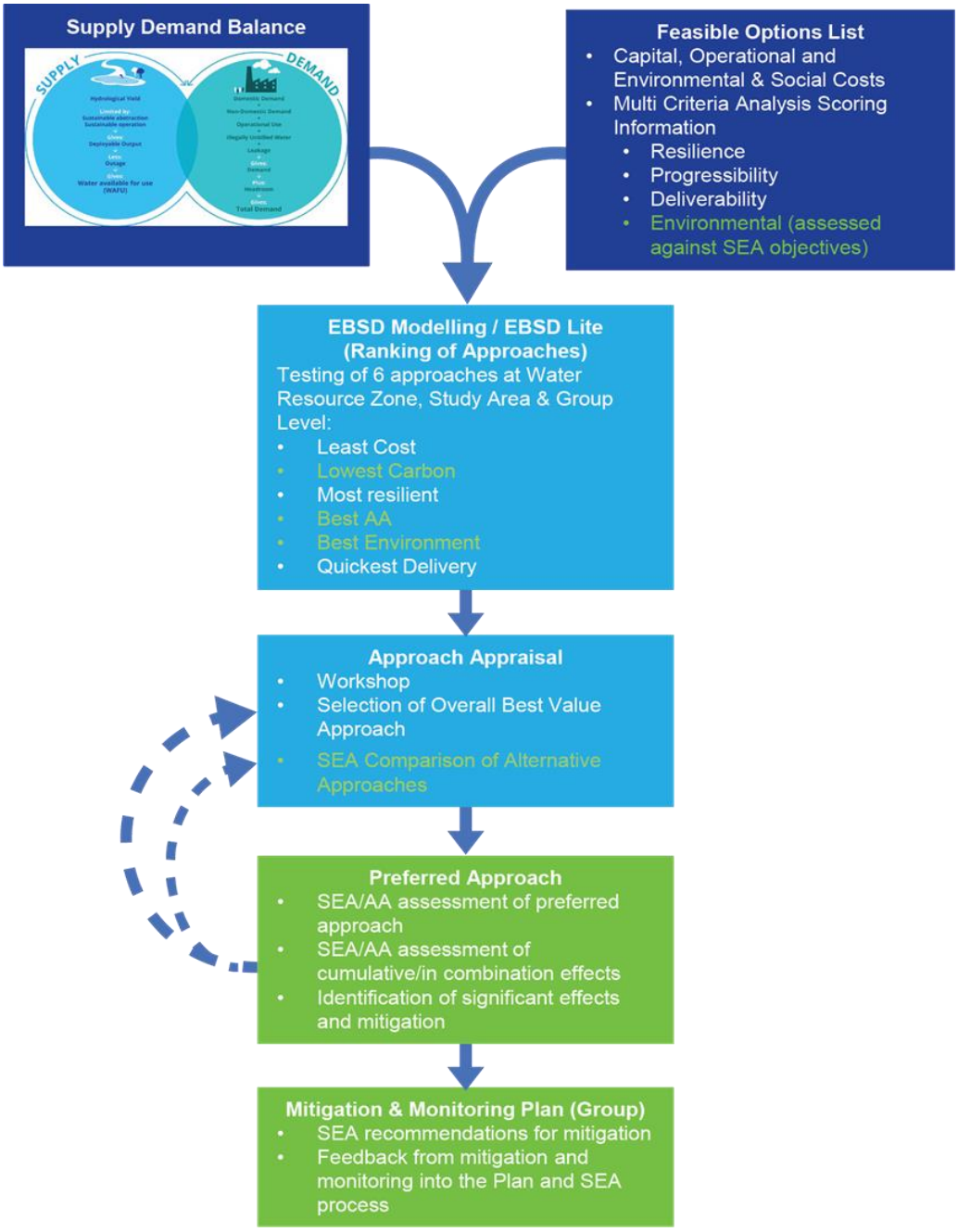


Figure 6.4 Approach Development Process

6.9.3 Approach Appraisal

Uisce Éireann then compare the options identified for each of the six Approach Categories (Least Cost, Best AA, Lowest Carbon, Best Environmental, Most Resilience and Quickest Delivery) against each other to come up with a Preferred Approach that meets the objectives of the Plan and aligns with all relevant Government Policy.

This Approach Development Process is conducted via a combination of interactive workshops supported by a process of ongoing engagement and dialogue between the technical experts, including Engineers, Hydrologists and Hydrogeologists, Ecologists and Environmental Scientists working directly on the development of the Preferred Approach (see Figure 6.4).

The identification of a Preferred Approach at a plan level does not confer any consent to develop a project, nor does it preclude other options being considered subsequently at the Project level. Assessments at this stage are desk based and plan level assessments. Environmental impacts and

costing of projects are further reviewed at Project level where alternatives will need to be considered as part of the Environmental Impact Assessment process in the usual way. No statutory consent or funding consent is conferred by inclusion of any option in the NWRP. Any projects that are progressed following this plan identification as a Preferred Approach in the Regional Plans, will require individual environmental assessments, including Environmental Impact Assessment and Appropriate Assessment (as required), in support of planning applications (where a project requires planning permission) or in support of licencing applications (for example, for new abstractions).

The Approach Development Process contains three tiers. This starts with WRZ Level and is then applied sequentially to each study area and then the region as follows:

Stage 1 – The WRZ is assessed individually to develop an initial Preferred Approach - the WRZ Level preferred approach - for all of the supplies in the study area

Stage 2 – The potential to use any larger options that might resolve deficits across multiple WRZs that are located within the same study area. Uisce Éireann then develop combinations of these options (SA combinations).

Stage 3 – The SA combinations and the WRZ Level preferred approach are assessed in order to determine the best performing combination across the six approach categories. This is known as the Preferred Approach at SA Level. The seven step Preferred Approach Development Process is summarised in Figure 6.5.

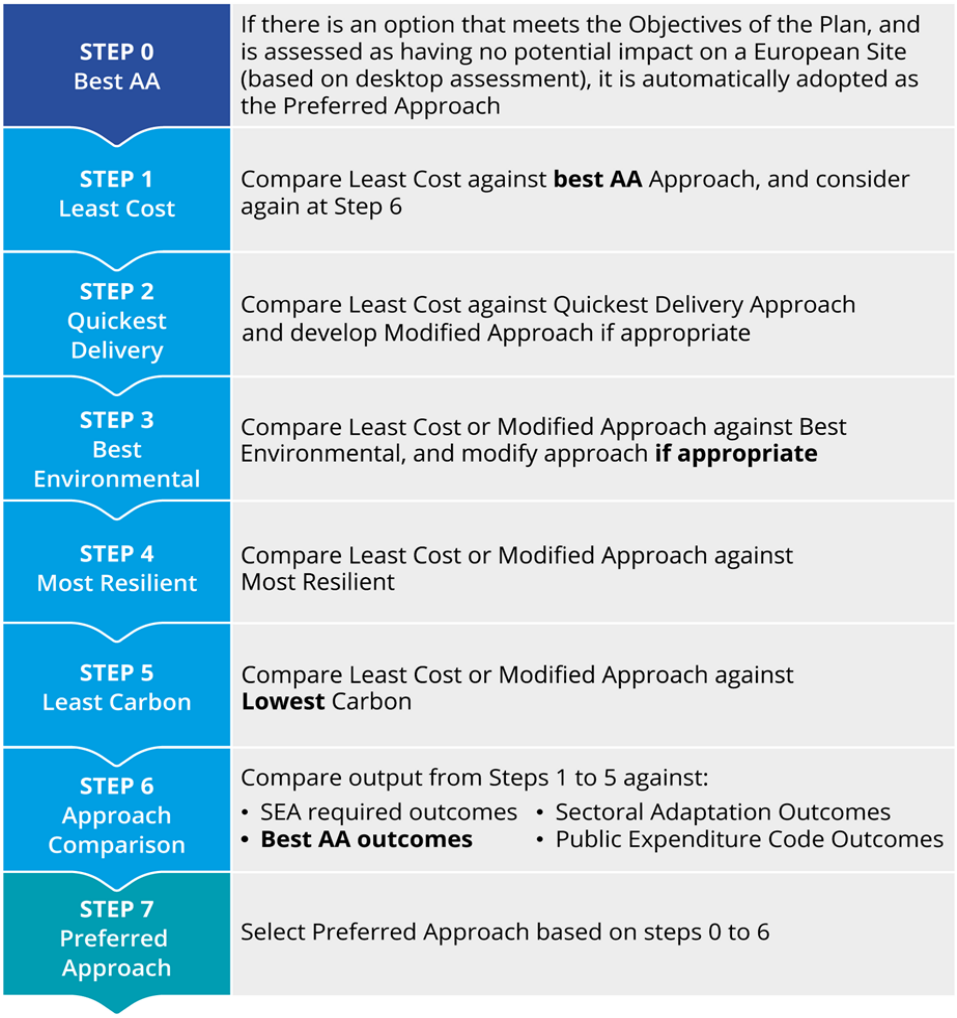


Figure 6.5 The 7 Step Process

6.10 Selection of Preferred Approach

The Preferred Approach to meet the need for each WRZ is identified using the Approach Assessment Process set out in Figure 6.5. As noted in Figure 6.3, this process is then repeated at the study area and regional scales. Figure 6.6-Figure 6.8 represent this process schematically.

Figure 6.6 Preferred Approach Development Stage 1

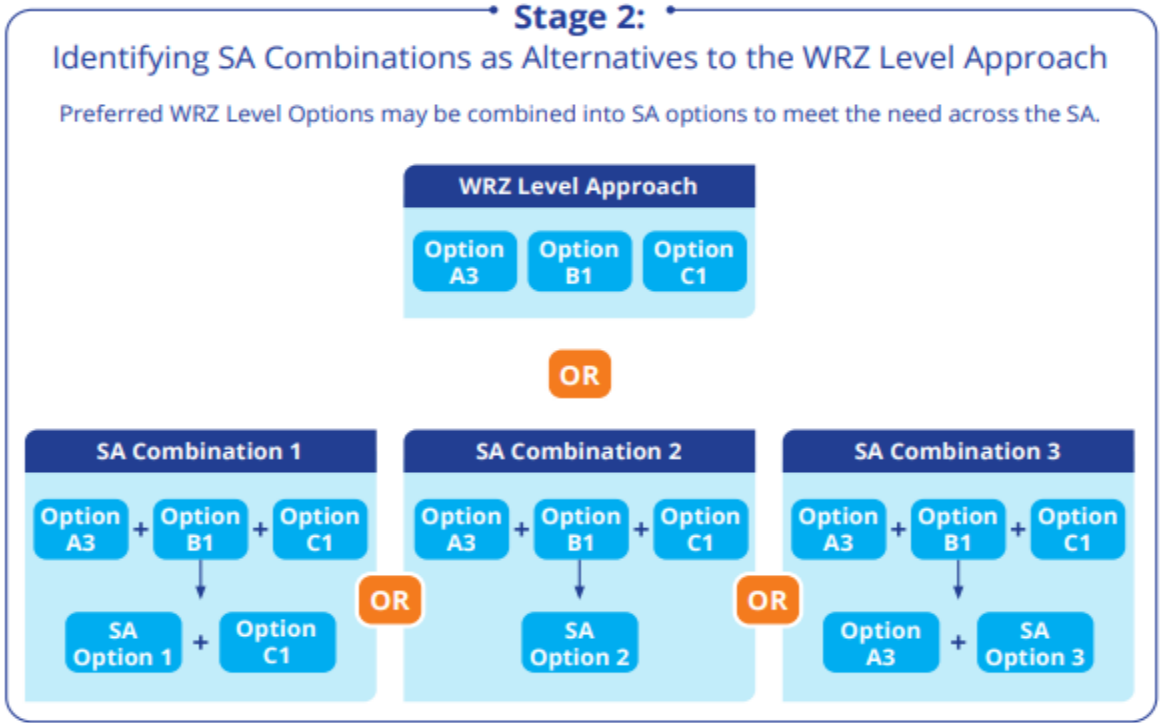


Figure 6.7 Preferred Approach Development Stage 2

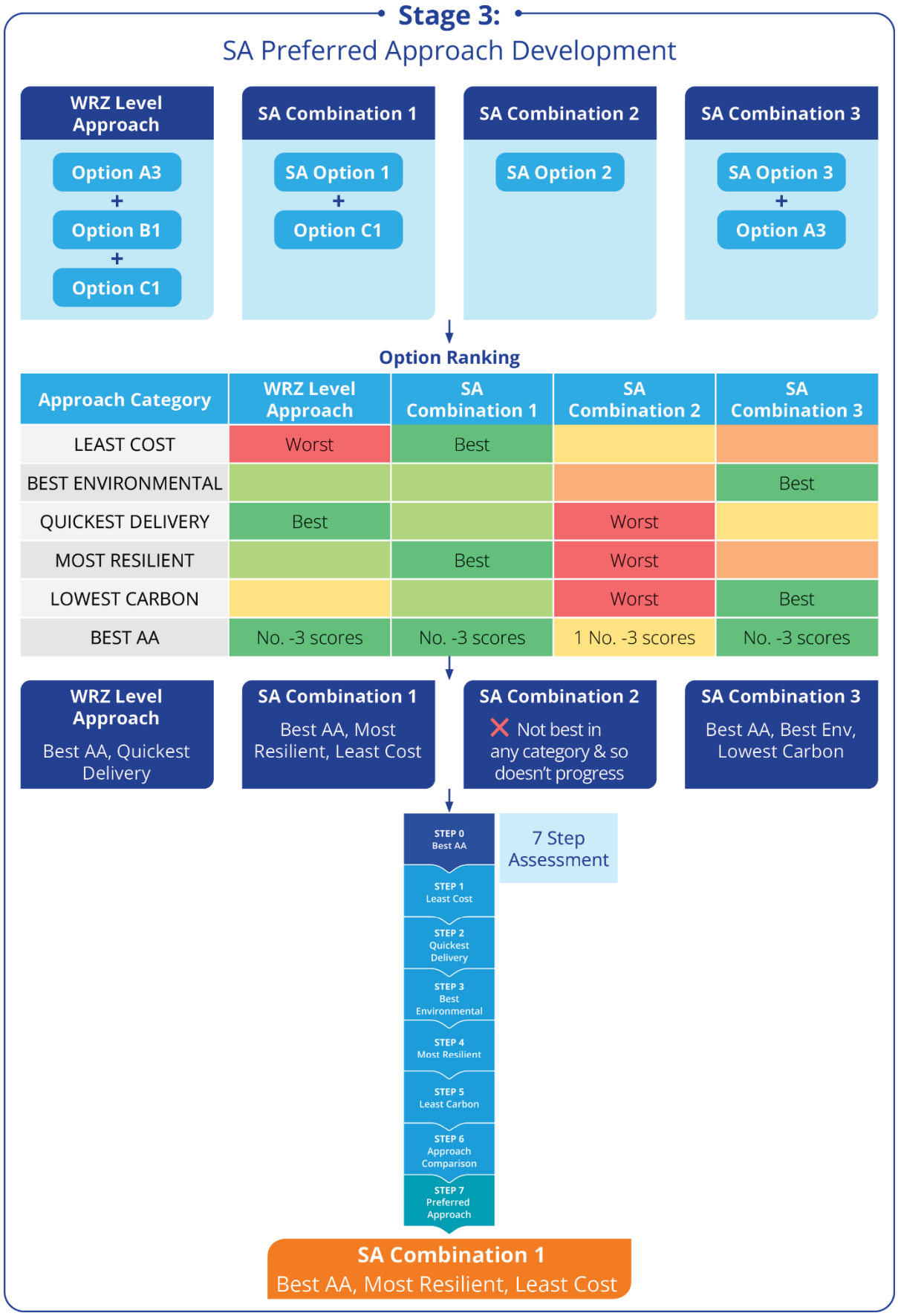


Figure 6.8 Preferred Approach Development Stage 3

Figure 6.8 illustrates how the Preferred Approach is selected from the options performing best against one or more of the approach criteria (assessed using the MCA scores and cost information) using the 7

step process that compares the possible approaches. The process is further described in RWRP-NW section 7.2.5, using an example.

6.10.1 Sensitivity Analysis

Uisce Éireann's supply demand forecast has been developed using the best available information and the application of best practice methods where they have the data to do so. Uisce Éireann has identified areas where they will focus improvements in data to improve the certainty of their forecasts. However, all long-term forecasts are subject to uncertainty.

Therefore, Uisce Éireann incorporates a sensitivity analysis check in the Approach Assessment Process to test the sensitivity of the Preferred Approach to a range of futures which could alter the SDB and impact on need. This will ensure that their decision making is robust and that the approaches developed are adaptable. Table 6.8 summarises the types of factors Uisce Éireann uses to test the sensitivity of Preferred Approaches developed in the RWRPs.

Table 6.8 Summary of Uisce Éireann Sensitivity Assessment

Uncertainty Factor	Likelihood	Impact on SDB	Impact on Deficit	Discussion
New abstraction legislation introducing sustainability limits on quantities to be abstracted	High (as Uisce Éireann current abstractions are large compared to the waterbodies from which they abstract)	Reduction in Deployable Output (DO)	Larger SDB deficit	The likelihood of this scenario is high as Uisce Éireann have indicated a number of abstractions as potentially at risk of exceeding sustainable abstraction thresholds based on a desktop assessment of Uisce Éireann's existing abstractions. However, potential impacts may be mitigated against by optimising their operations on a more environmentally sustainable basis across the range of supplies.
Climate change impacts on supplies are greater than anticipated	Moderate (central climate change estimate used)	Reduction in water availability at certain times of the year	Larger SDB deficit	Although the likelihood of this scenario is moderate based climate change allowances made in this Plan, potential impacts may be mitigated against by optimising their operations on a more environmentally sustainable basis across the range of supplies.
Domestic demand is lower than expected and/or	Low/Moderate (growth has	Growth in demand is lower than estimated	Smaller SDB deficit	The SDB deficit is driven by many factors including limitations in existing supplies,

Uncertainty Factor	Likelihood	Impact on SDB	Impact on Deficit	Discussion
Non-domestic demand is lower than expected	been based on policy)			the reliability of the overall supply and assumptions on demand growth. If demand does not grow as significantly as Uisce Éireann forecast there will still be a supply demand deficit in many WRZs. The required intervention to resolve the deficit may be smaller.
Uisce Éireann achieve good levels of effectiveness and efficiency in reducing leakage	Moderate/High (Uisce Éireann is focused on sustainability and aggressive leakage reduction)	Leakage reduces to below SELL within the period of the plan	Smaller SDB deficit	Uisce Éireann will strive to be progressive in leakage reduction plans. However, due to the supply and reliability issues Uisce Éireann have this will not negate the need for other interventions to address the supply demand deficits.
Ability to reduce leakage in accordance with targets, due to, lengths of networks, access to assets, need to maintain and budget constraints.	Moderate (the distribution network is extensive)	Leakage does not reduce to SELL within the period of the plan	Larger SDB deficit	Due to the length and condition of the networks, Uisce Éireann could potentially fail to achieve leakage targets in the timeframes set out. However, as Uisce Éireann is committed to achieving leakage reductions, the likely scenario would be an extension in the period of time taken to achieve leakage reductions as opposed to accepting lower targets.

A scenario where growth is higher than forecast, is not tested as Uisce Éireann considers the projections that are used in the SDB calculation reflect an optimistic growth forecast. Furthermore, the scenario of higher than forecast growth would have the same impact as a scenario where Leakage targets are not met.

In reality a combination of these scenarios may occur together. For example, Uisce Éireann may find growth in demand is lower and they achieve greater leakage reductions at the same time as the abstraction licensing regime limits their water availability. In this case reductions in demand would offset some of the increasing deficit due to abstraction sustainability reductions.

Should an outcome of the Sensitivity Assessment find that a preferred option will not be resilient or adaptable to changing future scenarios, Uisce Éireann will reassess it against the options identified for the six Approach Categories during the Approach Appraisal phase and consider if an alternative should be progressed.

As data and models improve over time Uisce Éireann will incorporate a more extensive approach to sensitivity analysis in the shape of Adaptive Planning. Adaptive Planning provides the flexibility to respond to uncertainty when it occurs (e.g. climate change impact increases).

6.10.2 Interim Solutions

As outlined in in section 8.3.7.6 of the Framework Plan, the NWRP provides for an "interim solution" approach, which allows shorter term interventions to be identified and prioritised, when needed. The Preferred Approach for each WRZ, study area and region will be delivered on a phased basis subject to budget and regulatory constraints. It will take many investment cycles to deliver the Preferred Approach across all WRZs, therefore, Uisce Éireann must have a means to continue delivering safe, secure and reliable water supplies (on a short to medium term basis) while they deliver the Preferred Approach.

On this basis, interim, short term capital maintenance solutions have been identified for all WTPs and will be utilised when needed. These solutions will allow Uisce Éireann time to deliver the Preferred Approach, while at the same time, maintaining a sustainable water supply. These interim solutions are generally smaller in scale and rely on making best use of already existing infrastructure. A decision to progress any interim solution will be based on urgent or priority need to address water quality risk or supply reliability e.g. RAL, drought issues or critical need. The RWRP-NW does not confer funding availability for any project and any interim measures will be subject to budget availability, relevant environmental assessment and other required consents in the normal way. These solutions, in most cases, will only be used to allow time to deliver the longer-term solution. The interim solutions are determined in line with the Preferred Approach and as such, they are considered "no regrets" infrastructure investment.

The RWRP will not confer funding availability or statutory consent on any interim solution. If an interim option is deemed necessary, funding approval in addition to all applicable consents would need to be obtained for it to progress.

6.11 Stage 8: Monitoring and Feedback into Plan

The Public Water Supply in Ireland is a live asset base and is subject to continuous change. New assets such as WTPs, storage reservoirs, trunk and distribution mains are continuously developed and upgraded. Knowledge and data relating to assets are improving and operational procedures are being standardised.

External factors can also influence the performance of water supplies, including:

- Changes in legislation and policy that impact the way Uisce Éireann operate their asset base or their interface with the natural environment;
- Reductions in water supply availability due to climate disruption and environmental impacts;
- Growth in demand for water for domestic and non-domestic use; and
- Funding availability and requirements to improve Levels of Service to water users.

All of these factors influence the need in terms of Quality, Quantity, Sustainability and Reliability, therefore, the SDB and Barrier Scores in the Plan represent a snapshot in time of live metrics.

Similarly, the development of the Preferred Approaches as part of the Regional Plans is influenced by evolving scientific data, understanding, and policy change in relation to the natural environment.

Uisce Éireann must be able to continuously adapt to these changes, which may be minor or material in nature. The RWRP-NW therefore commits to undertaking continuous monitoring and ensuring that there is a feedback mechanism within the Framework Plan and Regional Plans. The Regional Plans will be

subject to formal review every five years; however, this continuous monitoring process will ensure that material amendments are assessed for significant impacts on the environment.

An SEA Environmental Action Plan and Monitoring Plan are provided as draft plans in section 10 of this report. These will be finalised following consultation and will be included in the SEA Statement with a commitment to implement included in the RWRP-NW.

6.12 SEA and Consideration of Alternatives

This section focuses on the SEA requirements for the assessment of alternatives as well as cumulative effects which are addressed as part of the options and approach development methodology applied at each spatial level.

1) **Option level assessment**: all feasible options have been assessed as part of the MCA and scored against the SEA objectives (Table 6.2) and sub-criteria using the scoring guide (Appendix B). These are used to inform the selection of options and the approach comparisons. All feasible options are assessed as part of the MCA and scored against SEA objectives. This is a high-level assessment undertaken for each feasible option. The feasible options assessment information is fed into the approach workshop process.
   SEA option assessment summaries, which will record assessment against SEA objectives using a matrix-based approach, are provided for all Preferred Approach options for each study area and also for any regional level preferred options or alternatives. The nature of effects (temporary, permanent, short term or long term), significance of effects and level of certainty in assessment outcomes will be recorded as shown in Table 6.9. The significance of effect is determined in accordance with Table 6.10 and moderated by professional judgement where required. The assessment takes into account the value/sensitivity of affected receptors, as well as the magnitude of the impacts anticipated.

Table 6.9 Significance of Effect and Assessment Certainty (Option Level Assessments)

Type of effect		Potential significance of effect			
Long term (>15 years)	L	Major beneficial	+++	Major adverse	---
Short term (<5 years)	S	Moderate beneficial	++	Moderate adverse	--
Permanent	P	Minor beneficial	+	Minor adverse	-
Temporary	T	Neutral	0		
Assessment certainty		Low/Medium/High			

Table 6.10 Determination of Significance

Magnitude of impact	Baseline value/sensitivity					
	Low		Medium		High	
Major loss or change to receptor(s)	Minor adverse	-	Moderate adverse	--	Major adverse	---
Moderate loss or change to receptor(s)	Minor adverse	-	Moderate adverse	--	Moderate adverse	--

Magnitude of impact	Baseline value/sensitivity					
	Low		Medium		High	
Minor loss or change to receptor(s)	Minor adverse	-	Minor adverse	-	Moderate adverse	--
No impact or impact does not affect	Neutral	0	Neutral	0	Neutral	0
Minor enhancement to receptor(s)	Minor beneficial	+	Minor beneficial	+	Moderate beneficial	++
Moderate enhancement to receptor(s)	Minor beneficial	+	Moderate beneficial	++	Moderate beneficial	++
Major enhancement to receptor(s)	Minor beneficial	+	Moderate beneficial	++	Major beneficial	+++

Value/sensitivity of receptors

Low value receptors(s) = locally important and/or resilient to losses and substitution and/or limited capacity for enhancement

Medium value receptor = regionally important and/or with some resilience or capacity to accommodate losses of substitution or enhancement

High value receptor = nationally important and/or with very limited resilience or potential to accommodate losses or substitution or substantial capacity for enhancement

2) **Study area level assessment**: an assessment of each approach, including the 'Do Minimum' approach, will be prepared for each study area. Differences between the approaches will be explained and justification for the selected Preferred Approach will be set out. Mitigation measures associated with the individual options in the Preferred Approach will be provided.
3) **Study area level cumulative effects**: the potential for cumulative effects against the SEA objectives will be considered. This will include 'within plan' cumulative effects (i.e. between options or groups of options included within the Preferred Approach) and 'with other developments' cumulative effects (i.e with other developments within the study area).
4) **Regional level assessment**: an assessment of the potential cumulative effects arising from the Preferred Approaches identified at study area level, as well as any regional level options, will be undertaken. The assessment will be presented in matrix format, with the significance of effect recorded against each SEA objective as per Table 6.11.
5) **Regional level cumulative effects**: the SEA Environmental Report for the Framework Plan also refers to a further step which involves assessment of potential cumulative effects associated with either i) inter-regional options (such as transfers between regions) or ii) cumulative effects between Regional/Group Area Preferred Approaches. The RWRP-NW is the third Regional Plan to be developed, and therefore the information from the Eastern and Midlands region adjoining the North West region, and the South West region which is in proximity on the west, will be taken into account. However, limited information is likely to be available regarding approaches for the South East region. An inter-regional level assessment will be carried out to the extent possible, based on information currently available regarding approaches for the other regions. As subsequent Regional Plans are developed, the

Environmental Report which accompanies them will consider the inter-regional cumulative effects with all preceding Regional Plans including the RWRP-NW.

6) **Inter-regional level assessment**: in addition to assessing combined effects from options across all the study areas within the Preferred Approaches in a region/group area, the Regional Plans will need to consider potential for:

   - Inter-regional options, such as transfers between regions. These will be part of alternative approaches under consideration in Regional Plans;
   - Cumulative effects between Regional Preferred Approaches; and
   - Inter-regional options, which will need to be identified as the Regional Plans are prepared and will be addressed through the assessment of alternative approaches.

   Where Regional Plans are prepared in parallel cumulative effects of the Preferred Approaches can be considered together but where the Regional Plans are prepared sequentially, cumulative effects will need to be addressed for any preceding plans and reported in the SEA Environmental Report.
   The RWRP-NW as the third Regional Plan, will consider cumulative effects with the Eastern and Midlands Regional Plan and the South West Regional Plan.

Table 6.11 Significance of Effects (Regional Level Assessment)

Key			
Likely to have a positive effect	+	Likely to have a mixed positive and negative effect	+/-
Likely to have a negative effect	-	Likely to have mixed neutral and negative effect	0/-
Effects are uncertain or not applicable	? or N/A	Likely to have mixed neutral and positive effect	0/+
Likely to have a neutral effect	0		

6.13 Transboundary Issues

The potential for transboundary effects and cumulative effects with key relevant plans and proposed developments in Northern Ireland are considered as part of the options and approach assessment and results of these assessments are to be reported where these are identified based on potential pathways for effects. As the borders of the North West Region in the Republic of Ireland are shared with Northern Ireland potential for significant adverse effects have been scoped in for consideration.

In relation to the potential for transboundary effects, this will depend on the location and nature of proposed water supply and treatment options. As part of the assessment of option consideration will include identifying impacts related to proximity and through potential pathways.

6.14 Summary of Approach Appraisal and SEA

The Approach Appraisal incorporates SEA and AA requirements through:

- Comparison of the different approaches including three environmentally led approaches – Best AA, Best Environmental and Low Carbon – to determine the Preferred Approach through a structured, transparent and fully recorded process;
- Assessment of the alternative approaches including the three environmental approaches, most resilient, least cost and do minimum and quickest delivery approaches using a relative MCA based comparison and overall absolute assessment against SEA objectives;
- Process of avoiding high risk European sites or WFD options where possible and where needed identification of possible back up options. These are options that could be brought forward if project level studies on preferred options identify that AESI cannot be avoided or WFD water body status deterioration is likely, and time limited derogation is not available);
- Assessment of the selected Preferred Approaches through SEA and AA, including individual options assessment of the combined options within each approach (cumulative effects assessment and in combination assessment) within each study area and within Regional Plan and also with other proposed plans or developments. Feedback and reconsideration are included in the process if needed and the assessment involves identification of mitigation measures to be taken forward addressing individual option mitigation and mitigation for cumulative and in combination effects.
- Overall, the process provides an iterative process allowing testing and consideration of environmental performance and mitigation requirement at WRZ, study area, regional and inter-regional level; and
- The assessment provides a systematic and tracked process which can be applied consistently across the four Regional Group areas and will facilitate input from internal and external stakeholders.

6.15 Appropriate Assessment

The methodology for undertaking screening for AA can be applied at both a project and plan level assessment. The suitability of the data and information used and any decisions flowing from its use in the RWRP-NW assessment have to meet the provisions and requirements of the Habitats Directive. The strategic assessments at the plan level will inevitably be undertaken at a higher level than would be the case for projects. However, the RWRP-NW does not provide consent for any future projects arising from it or future iterations of the plan but, demonstrates that the protection for the European site network is suitably considered and achievable in the context of the remit of the plan. Also, any future project level AA screenings and/or NIS will have regard for the plan level AA screening as the projects have been identified or specified from the RWRP-NW. To note, all of Uisce Éireann's projects are screened for AA. Therefore, all projects arising from the RWRP-NW will additionally be required to go through individual environmental assessments (including AA screening and if needed AA). These will be obligatory in support of planning applications (where a project requires planning permission) or in support of licensing applications (for example, for new or increased surface or groundwater abstractions).

The NIS for the RWRP-NW describes how the identification of Likely Significant Effects (LSE) has been applied through the options assessment process. For the fine screening MCA the scoring for the European sites (biodiversity) question identifies at a high-level potential for LSEs from an option

(screening for AA - Stage 1 of the AA process). Any option with a score of -1 to -3 has identified LSEs and is taken forward to AA (Stage 2 of the AA process) and assessed within the NIS. The score essentially identifies LSEs with varying implications for European sites.

6.16 Limitations and Assumptions for the SEA

Given the high-level nature of a regional plan there are also uncertainties and limitations for the environmental assessment. These are recognised and summarised below:

Limitations include:

- High level nature of the assessment based on preliminary option concepts where locations of sites and routes for infrastructure are not defined and will be subject to further detailed studies and design;
- Data limitations on the existing baseline and effects of current abstractions, which are recognised and are addressed in the SEA recommendations;
- Yield assessments are based on estimated flows which will require further assessment at project level. Furthermore, at plan level information on all other non-Uisce Éireann abstractions may not be available therefore yield assessments undertaken as part of the Plan are based on the best information available to Uisce Éireann; and
- For many of the groundwater abstractions potential impacts from existing abstractions are not known or fully understood, while guidance for allowable abstraction limits from groundwater sources do not currently exist, therefore more uncertainty remains around the potential impacts from such options. An initial assessment on the potential cumulative impacts on groundwater bodies from groundwater abstractions proposed as part of the RWRP-NW, has been undertaken (Irish Water, 2022). The groundwater summary assessment considered the likely cumulative effects of groundwater abstractions on meeting WFD objectives; however, it did not consider potential impacts on European sites, in particular groundwater dependent habitats. In-combination effects on European sites from groundwater abstraction that are considered as part of the SEA and NIS, is based solely on the information available at plan level.

Assumptions include:

- Application of standard and accepted good practice mitigation through design and construction management (see Appendix D);
- Detailed site assessments will be required for all options where groundwater abstractions are proposed, to identify and define the Zone of Contribution (ZOC) and potential impacts on the ground; and
- Environmental assessments will be required to be undertaken on all options taken forward for feasibility studies and to inform detailed siting and routing and design alternatives and then to meet licensing and consenting requirements as well as commitments for performance and feedback identified through this SEA.

These limitations and uncertainties are built into the recommendations for mitigation and monitoring outlined in chapter 10 and these feed into the monitoring and feedback process for the implementation of the RWRP-NW.

7 Study Area Assessment Summaries

7 Study Area Assessment Summaries

This section provides a summary of the assessment for each study area. The individual assessments are provided in the Study Area Environmental Reviews provided as appendices to this Environmental Report (Appendix H: SA Environmental Reviews 1-7). The numbers and codes for the SEA objectives referred to throughout are provided in Table 7.1 below. A summary of the Preferred Approaches for each Study Area is provided in Appendix C.

Table 7.1 SEA Objectives and Reference Codes

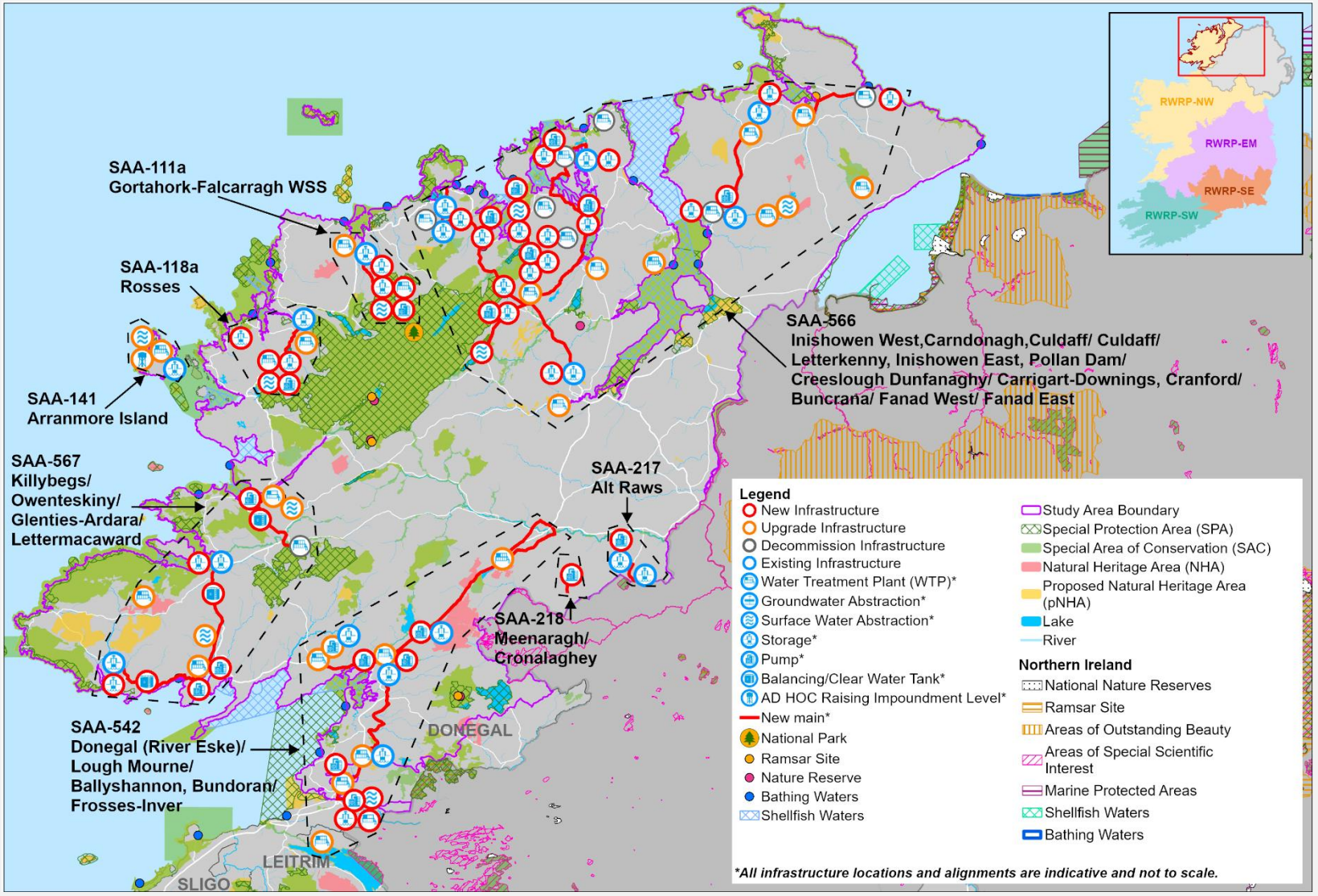
SEA Objectives	Code
Protect public health and promote wellbeing	Public Health
Protect and enhance biodiversity and contribute to resilient ecosystems	Biodiversity
To protect landscapes, townscapes and visual amenity	Landscape and Visual
Protect and where appropriate enhance, built and natural assets and reduce waste	Materials
Reduce greenhouse gas emissions	Greenhouse Gas
Contribute to environmental climate change resilience	Climate Change
Protect and improve surface water and groundwater status	Surface Water/Groundwater
Avoid flood risk	Flood Risk
Protect and where appropriate, enhance cultural heritage assets	Cultural Heritage
Protect quality and function of soils	Geology and Soils

7.1 Study Area A Summary of Assessment

The assessment undertaken for SAA is summarised in Table 7.2 below and more detailed information is provided in Appendix H: Study Area Environmental Review: SAA Environmental Review.

Table 7.2 Study Area A Summary of Assessment

Study Area A	
SAA lies within the county of Donegal, including Arranmore Island, and has a total area of approximately 4,650 km^2. The principal settlement (with a population of over 10,000) within SAA is Letterkenny (CSO, 2016).	
Unconstrained	350 options
Coarse & Fine Screening	191 options (159 rejected; 138 rejected on sustainability reasons)
Feasible Options	191 options



Approach Development

SAA had 13 feasible combinations and were ranked from Best to Worst. The best in each category was identified and brought forward for further comparison. Combinations which scored best in a category were brought forward for further comparison and assessment. For SAA this aligned as five approaches which were then ranked against each other (see table below).

Category	SA Approach 1	SA Approach 2	SA Approach 3	SA Approach 4	SA Approach 5 (Preferred Approach)
Least cost (LCo)			Best*		Worst
Quickest Delivery (QD)	Best				Worst
Best AA (BA)	One -3 Biodiversity Score	Two -3 Biodiversity Scores	One -3 Biodiversity Score	Two -3 Biodiversity Scores	One -3 Biodiversity Score
Lowest Carbon (LC)		Best		Worst	
Most Resilient (MR)		Worst		Best	
Best Environmental (BE)	Worst				Best

*Overall combination 5 is within 5% of the other lowest cost combination and performs better against other categories. Hence, it has been identified as the least cost approach.

Summary	SA approach 5 has been selected as the best performing approach overall across the different categories and therefore is the SAA Preferred Approach. It scored best under the BE category.

Preferred Approach Assessment

SEA objectives	Potential Construction Impact	Potential Operational Impact
1. Public Health	Minor Adverse to Moderate Adverse	Neutral to Moderate Beneficial
2. Biodiversity	Minor Adverse to Major Adverse	Neutral to Moderate Adverse
3. Landscape and Visual	Minor Adverse to Major Adverse	Minor Adverse to Moderate Beneficial
4. Materials	Minor Adverse to Major Adverse	Moderate Adverse to Neutral
5. Greenhouse Gas	Neutral to Major Adverse	Neutral to Major Adverse
6. Climate Change	Neutral to Moderate Adverse	Neutral to Moderate Adverse
7. Surface Water/ Groundwater	Neutral	Neutral to Major Adverse
8. Flood Risk	Minor Adverse to Minor Beneficial	Neutral to Minor Beneficial
9. Cultural Heritage	Minor Adverse to Moderate Adverse	Neutral

10. Geology and Soils	Minor Adverse to Moderate Adverse	Neutral to Minor Adverse

Preferred Approach

The SA Preferred Approach consists of WRZ options for five of the WRZs in the study area. The SA Preferred Approach includes three SA options (group options), these being **SA option 42** for four WRZs, namely Donegal (River Eske), Lough Mourne, Ballyshannon & Bundoran, and Frosses-Inver, **SA option 66** for eight WRZs, namely Inishowen West/Carndonagh/Culdaff, Culdaff, Letterkenny & Inishowen East & Pollan Dam, Creeslough Dunfanaghy, Carrigart-Downings & Cranford, Buncrana, Fanad West and Fanad East, and **SA option 67** for four WRZs, namely Killybegs, Owenteskiny, Glenties-Ardara, and Lettermacaward.

SA option 42 involves a new surface water abstraction and WTP on the River Knaddar, and interconnections to Donegal, Lough Mourne and Frosses-Inver WRZs. **SA option 66** rationalises Culdaff, Inishowen West/Carndonagh/Culdaff, Buncrana, Carrigart-Downings & Cranford, Fanad West, Fanad East, and Creeslough Dunfanaghy, and interconnects Inishowen West/Carndonagh/Culdaff to new sources developed near Letterkenny. **SA option 67** proposes to increase the existing surface water abstraction from Lough Derkmore. The SA Preferred Approach for the remaining WRZs involves new surface water abstractions, increased surface water abstractions and rationalisation.

*Note that **SA option 42, 66 and 67** are labelled on the Figure as **SAA-542, 566 and 567** respectively with the number 5 denoting a group option.

Summary of Assessment Findings

Key beneficial impacts assessed include, up to, moderate beneficial impacts for **SA options 42 and 66**, and minor beneficial impacts for **SA option 67**, and options **SAA-111a and 118a** associated with improving the quality of water supply for local communities; and the subsequent benefits of this for public health. There are minor beneficial impacts for **SA option 67** and moderate beneficial impacts for **SA option 66** associated with the decommissioning of WTPs reducing landscape and visual disruption in the localised area. There are also minor beneficial impacts associated with **SA option 67** and option **SAA-141** as these options provide additional flood storage and/or promote the retention of water in the upper catchment.

Key potential adverse impacts identified include:

- Moderate adverse effects during construction for **SA option 42 and 66** regarding public health and/or quality of life from dust, noise and/traffic in urban/rural areas, and temporary amenity area loss/loss of access to amenity area during construction;
- Major adverse effects during construction of **SA option 66** associated with the potential for impacts on numerous European designated sites. The option is within the Cloghernagore Bog and Glenveagh National Park SAC, Leannan River SAC, Magheradrumman Bog SAC and Derryveagh and Glendowan Mountains SPA. It is also hydrologically linked to North Inishowen Coast SAC, Horn Head and Rinclevan SAC, Mulroy Bay SAC, Kindrum Lough SAC, Sheephaven SAC, Lough Swilly SAC, Trawbreaga Bay SPA, Horn Head to Fanad Head SPA, Greers Isle SPA, Lough Fern SPA and Lough Swilly SPA. The Natura Impact Statement (NIS) identifies mitigation measures to be taken to avoid adverse effects on site integrity (AESI);
- Major adverse effects during construction of SA option 66 associated with the potential for impacts to the local landscape and visual amenity of the area;
- Moderate adverse effects to environmental climate change resilience for options **SA options 66 and 67**, and options **SAA-118a and 141** due to the level of increase or new abstraction required from their associated surface water sources;

- Potential for major adverse effects during operation for **SA option 66, 67** and option **SAA-141** due to the level of abstraction required from their associated surface water abstraction sources. Further studies are required to understand the impacts and develop mitigation;
- Major adverse effects for greenhouse gas emissions for **SA option 66** due to the emissions associated with abstracting and pumping water;
- Moderate adverse impacts for **SA options 42, 66 and 67** during construction associated with cultural heritage. These options are located at known archaeological sites. Further cultural heritage and archaeological assessment will be required to aid option alignment; and
- Moderate adverse impacts for **SA option 42** during construction associated with geology and soils as it is located within a known geological heritage site.

Summary of Cumulative Effects

Cumulative effects assessment identified potential significant effects in relation to carbon emissions, although the individual options are assessed only as neutral to moderate adverse in relation to this SEA. This is because potential increases in carbon emissions contribute to national emissions. The average carbon intensity from the individual options provides an indicator for the new options in SAA but does not provide a complete picture as it does not fully take account of efficiencies from replacement of failing infrastructure, treatment technology or potential for mitigation, such as increased use of renewable energy sources in relation to the whole network.

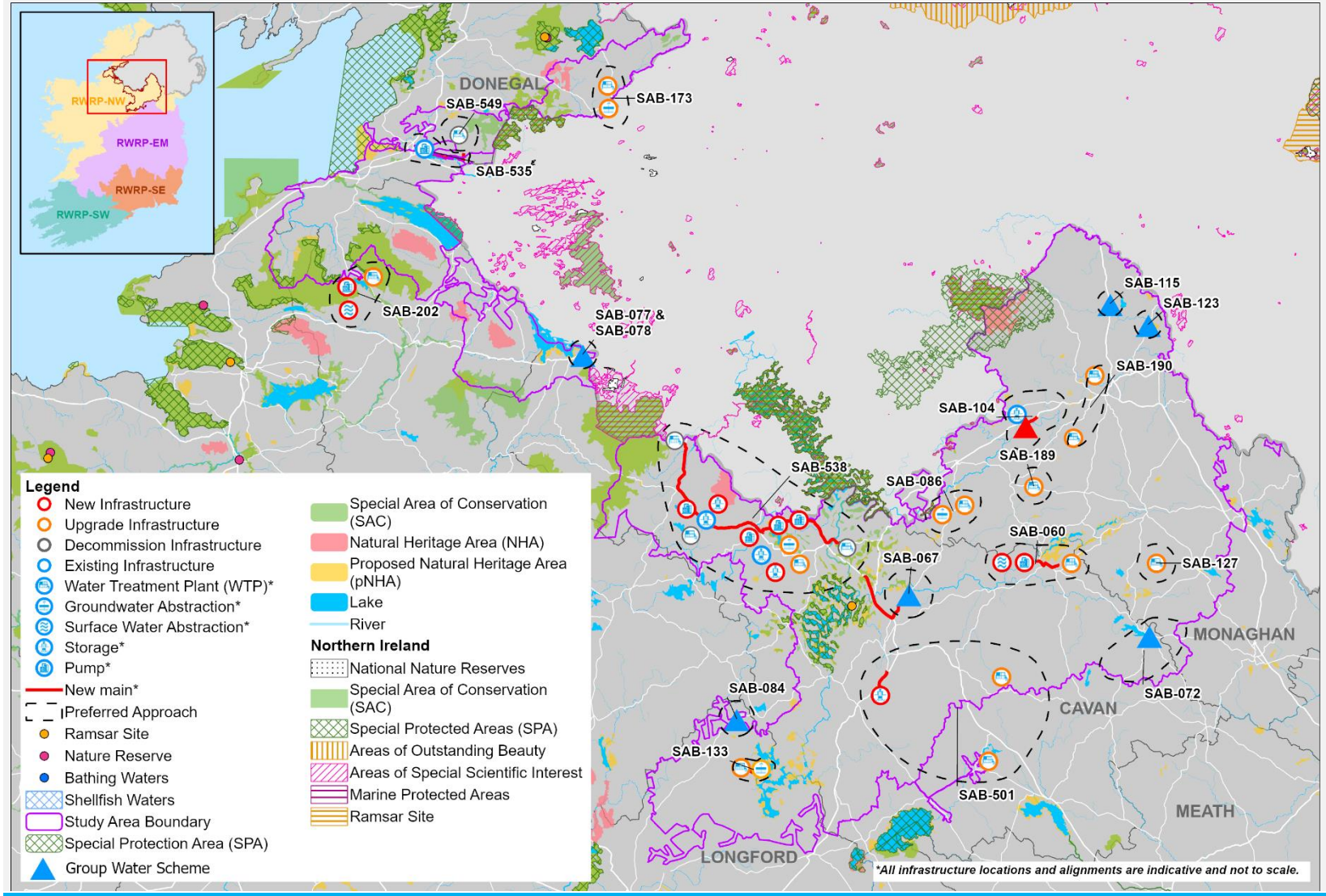
Recommendations are provided on mitigation and monitoring of potential effects, including cumulative effects, in Appendix D and the Environmental Action Plan and draft Monitoring Plan in section 10.

7.2 Study Area B Summary of Assessment

The assessment undertaken for SAB is summarised in Table 7.3 below and more detailed information is provided in Appendix H: Study Area Environmental Review: SAB Environmental Review.

Table 7.3 Study Area B Summary of Assessment

Study Area B	
SAB total area is approximately 2,780 km^2 and lies within the counties of Cavan, Monaghan, Leitrim, Longford, Donegal and Sligo. The principal settlement (with a population of over 10,000) within SAB is Cavan (CSO, 2016).	
Unconstrained	194 options
Coarse & Fine Screening	121 options (73 rejected; 22 rejected on sustainability reasons)
Feasible Options	121 options



Approach Development

SAB had six feasible combinations and were ranked from Best to Worst. The best in each category was identified and brought forward for further comparison. Combinations which scored best in a category were brought forward for further comparison and assessment. For SAB this aligned as two approaches which were then ranked against each other (see table below).

Category	SA Approach 1	SA Approach 2 (Preferred Approach)
Least cost (LCo)	Worst	Best
Quickest Delivery (QD)	Best	Worst
Best AA (BA)	No -3 Scores	No -3 Scores
Lowest Carbon (LC)	Worst	Best
Most Resilient (MR)	Worst	Best
Best Environmental (BE)	Worst	Best

Summary	SA approach 2 has been selected as the best performing approach overall across the different categories and therefore is the SAB Preferred Approach. It scored best under the LCo, BA, LC, MR and BE categories.

Preferred Approach Assessment

SEA objectives	Potential Construction Impact	Potential Operational Impact
1. Public Health	Neutral to Moderate Adverse	Neutral to Moderate Beneficial
2. Biodiversity	Neutral to Moderate Adverse	Neutral to Moderate Adverse
3. Landscape and Visual	Neutral to Minor Adverse	Neutral to Minor Beneficial
4. Materials	Neutral to Moderate Adverse	Neutral
5. Greenhouse Gas	Neutral to Minor Adverse	Neutral to Minor Adverse
6. Climate Change	Neutral to Moderate Adverse	Moderate Adverse to Moderate Beneficial
7. Surface Water/Groundwater	Neutral	Neutral to Major Adverse
8. Flood Risk	Neutral to Minor Adverse	Neutral
9. Cultural Heritage	Neutral to Moderate Adverse	Neutral
10. Geology and Soils	Neutral to Moderate Adverse	Neutral

Preferred Approach

The SA Preferred Approach consists of WRZ options for fifteen of the WRZs in the study area. The SA Preferred Approach includes four SA options (group options), these being **SA option 1,** for two WRZs, namely Cavan and Ballyjamesduff, **SA option 35** for one WRZ, namely Derrykillew, **SA option 38** for four WRZs, namely Belturbet PWS, Ballyconnell PWS, Bawnboy PWS and Swanlinbar PWS, and **SA option 49** for one WRZ, namely Cashilard.

SA option 1 proposes to interconnect the Cavan and Ballyjamesduff WRZs and upgrade the Lismean WTP. **SA option 35** proposes a new surface water abstraction, new WTP, and to rationalise Derrykillew to Ballyshannon WRZ. **SA option 38** proposes to increase groundwater abstraction and to rationalise Belturbet WRZ, Swanlinbar and Bawnboy to Ballyconnell WRZ. **SA option 49** proposes to rationalise Cashilard to Ballymagoarty (part of Ballyshannon/Bundoran WRZ). The SA Preferred Approach for the remaining WRZ options involves new and increased groundwater abstractions, new surface water abstractions, group water scheme interconnections and supplies, and WTP upgrades.

Summary of Assessment Findings (Residual Effect Following Mitigation)

Key beneficial impacts assessed include moderate beneficial impacts for **SA option 1**, associated with increasing resilience and the quality of water supply for local communities; and the subsequent benefits of this for public health. There are minor beneficial impacts for options **SAB-086, 189, 191, 190 and 127, and SA option 49** associated with the quality of water supply for local communities. There are also minor beneficial impacts for SA option 38 associated with the decommissioning of WTPs reducing visual, noise and traffic disruption in the localised rural area.

Key potential adverse impacts identified at plan level include:

- Moderate adverse effects during construction for **SAB-060** regarding public health and/or quality of life from dust, noise and/traffic in urban and rural areas;
- Moderate adverse effects during operation of **SA option 38** associated with potential impacts on European designated sites. The option is within the Lough Oughter and Associated Loughs SAC and there is the potential for habitat degradation and a reduction in flow and water availability;
- Moderate adverse effects during construction for **SAB-202** associated with potential impacts to European and nationally designated sites. The option is within the Glenade Lough SAC (also a pNHA), hydrologically linked to Lough Gill SAC and approximately 1km from Sligo/Leitrim Uplands SPA. During construction there is the potential for the loss (only Glenade Lough) and pollution of QI habitats and supporting habitats to the SACs. There is also the potential for disturbance to QI species to the SACs and SPA;
- Moderate adverse effects to environmental climate change resilience with options **SA option 38, and options SAB-086 and 173** due to the level of increase required for the existing groundwater abstractions;
- Potential for major adverse effects during operation for **SA option 38 and options SAB-086 and 173** due to the level of abstraction required from their associated groundwater abstraction sources. Although all of the WFD groundwater bodies affected by abstractions have a good quantitative status, further studies are required to understand the impacts and develop mitigation;
- Moderate adverse impacts for **SA options 35 and 38, and SAB-060** during construction associated with cultural heritage. These options are located at known archaeological sites. Further cultural heritage and archaeological assessment will be required to aid option alignment; and

- Moderate adverse impacts for **SAB-060 and 081** during construction associated with geology and soils. This option is located at a known geological heritage site.

Summary of Cumulative Effects

Cumulative effects assessment identified potential significant adverse effects in relation to carbon emissions, although the individual options are assessed as only neutral to moderate in relation to this SEA objective. This is because potential increases in carbon emissions contribute to national emissions. The average carbon intensity from the individual options provides an indicator for the new options in SAB but does provide a complete picture as it does not fully take account of efficiencies from replacement of failing infrastructure, treatment technology or potential for mitigation, such as use of renewable energy sources in relation to the whole network. Insufficient information is available for the cumulative effects assessment to consider how total study area carbon emissions will change overall and per ML of water.

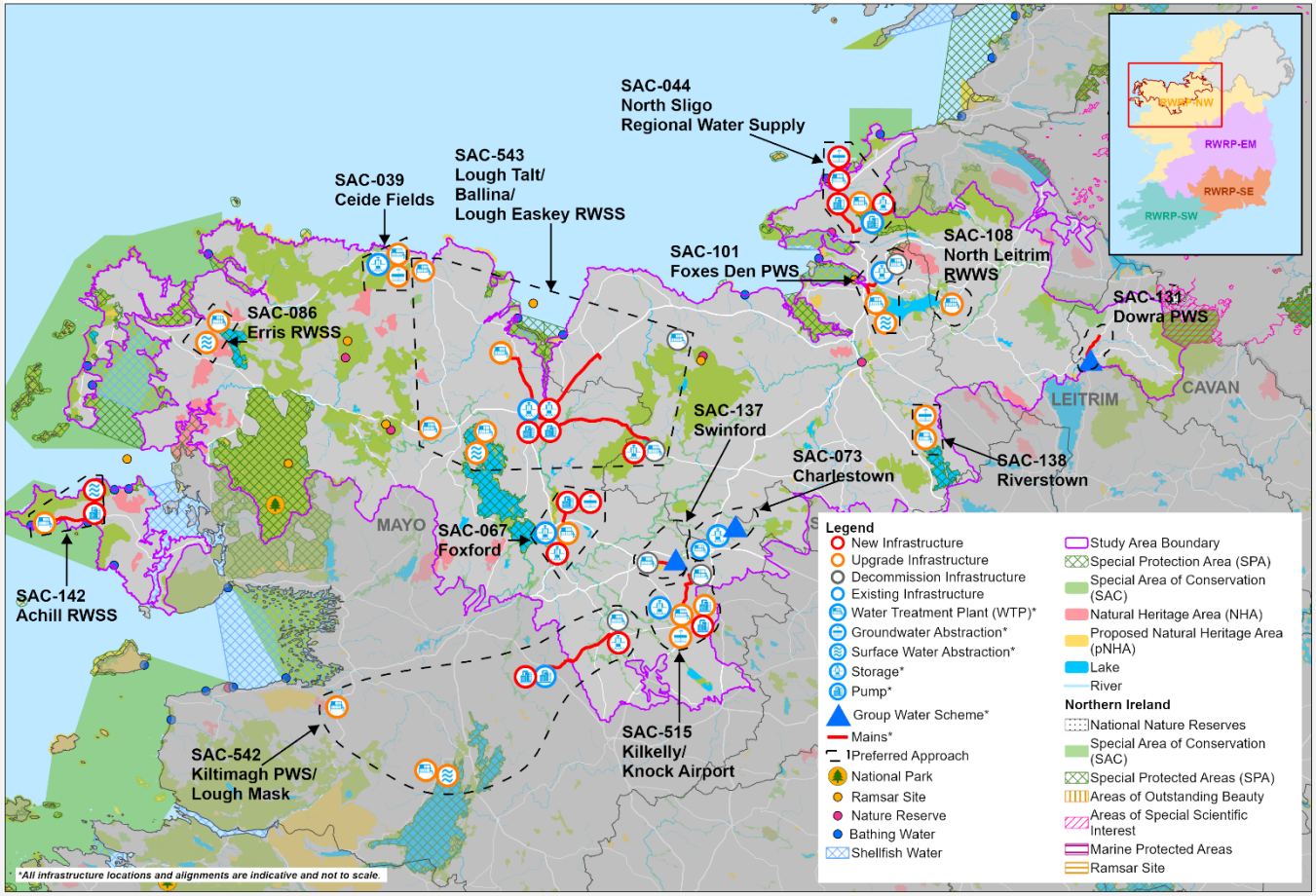
Recommendations are provided on mitigation and monitoring of potential effects, including cumulative effects, in Appendix D and the Environmental Action Plan and draft Monitoring Plan in section 10.

7.3 Study Area C Summary of Assessment

The assessment undertaken for SA-C is summarised in Table 7.4 below and more detailed information is provided in Appendix H: Study Area Environmental Review: SA-C Environmental Review.

Table 7.4 Study Area C Summary of Assessment

Study Area C	
SA-C total area is approximately 5,150 km^2 and lies within the counties of Mayo (including Achill Island), Sligo, Leitrim, Cavan, and Roscommon. There are three principal settlements (with a population of over 10,000) within SA-C, namely Sligo, Castlebar and Ballina (CSO, 2016).	
Unconstrained	214 options
Coarse & Fine Screening	136 options (78 rejected; 53 rejected on sustainability reasons)
Feasible Options	136 options
Approach Development	
For SA-C 12 feasible combinations were identified and were ranked from Best to Worst. Combinations which scored Best in a category were brought forward for further comparison and assessment. For SA-C this aligned as three approaches which were then ranked against each other (see table below).	



Category	SA Approach 1	SA Approach 2 (Preferred Approach)	SA Approach 3
Least cost (LCo)		Best	Worst
Quickest Delivery (QD)	Best	Worst	
Best AA (BA)	Two -3 Biodiversiy Scores	Two -3 Biodiversity Scores	One -3 Biodiversity Score
Lowest Carbon (LC)		Best	Worst
Most Resilient (MR)	Worst		Best
Best Environmental (BE)		Worst	Best
Summary	SA approach 2 has been selected as the best performing approach overall across the different categories and therefore is the SA-C Preferred Approach. This approach was assessed as best under LCo and LC.		

Preferred Approach Assessment

SEA objectives	Potential Construction Impact	Potential Operational Impact
1. Public Health	Minor Adverse to Moderate Adverse	Neutral to Moderate Beneficial
2. Biodiversity	Minor Adverse to Moderate Adverse	Neutral to Moderate Adverse
3. Landscape and Visual	Neutral to Moderate Adverse	Minor adverse to Minor Beneficial
4. Materials	Neutral to Major Adverse	Neutral to Minor Adverse
5. Greenhouse Gas	Neutral to Major Adverse	Neutral to Major Adverse
6. Climate Change	Neutral to Moderate Adverse	Neutral to Moderate Adverse
7. Surface Water/Groundwater	Neutral	Neutral to Major Adverse
8. Flood Risk	Neutral to Minor Adverse	Neutral
9. Cultural Heritage	Neutral to Minor Adverse	Neutral
10. Geology and Soils	Neutral to Minor Adverse	Neutral

Preferred Approach

The SA Preferred Approach consists of WRZ options for eleven of the WRZs in the study area. The SA Preferred Approach includes three SA options (group options), these being **SA option 15** for two WRZs, namely Kilkelly and Knock Airport, **SA option 42** for two WRZs, namely Kiltimagh PWS and Lough Mask, and **SA option 43** for three WRZs, namely Lough Talt, Ballina and Lough Easkey RWSS.

SA option 15 proposes to increase the existing GW abstraction, upgrade Kilkelly WTP, rationalise Knock Airport to Kilkelly WRZ and decommission Knock Airport WTP. **SA option 42** proposes to increase the existing abstraction from Lough Mask, decommission Kiltmagh WTP, upgrade Tourmakeady WTP Knappagh WTP, and rationalise Kiltimagh to Lough Mask WRZ. **SA option 43** proposes to increase the existing abstraction from Lough Conn, decommission Lought Talt WTP and Lough Easkey WTP, upgrade Lisglennon WTP, Crossmolina WTP and Ballycastle WTP, and rationalise Lough Talk to Lisglennon WTP. The SA Preferred Approach for the remaining WRZs involves new and increased groundwater/surface water abstractions, rationalisation and interconnection, and upgrades to existing WTPs.

Summary of Assessment Findings (Residual Effect Following Mitigation)

Key beneficial impacts assessed include, up to, moderate beneficial effects regarding the upgrade of the Wherrew, Crossmolina and Ballycastle WTPs to improve quality of water supply for public health and local communities (**SA option 43**). There is also the potential for minor localised benefits associated with decommissioning of WTPs (**SA option 43, SA option 15, SA option 42, SAC-131 & 101**).

Key potential adverse impacts identified include:

- Moderate adverse effects against biodiversity during construction because there is the potential for the pollution of QI habitats and supporting habitats within designated sites for **SA option 15** (River Moy SAC), **SA option 42** (River Moy SAC, Lough Carra/Mask Complex SAC and Lough Mask SPA, Balla Turlough SAC), **SA option 43** (River Moy SAC, Killala Bay/Moy Estuary SAC, Lough Hoe Bog SA, Lough Conn and Lough Cullin SPA, and Killala Bay/Moy Estuary SPA), **SAC-101** (Lough Gill SAC, Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC and Cummeen Strand SPA), and **SAC-142** (Keel Machair/Menaun Cliffs SAC and Croaghaun/ Slievemore SAC);
- Moderate adverse effects against biodiversity during operation because ther is the potential for habitat degradation and a reduction in flow and water availability for **SAC-39** (Glenamoy Bog Complex SAC), **SAC-44** (Bunduff Lough And Machair/Trawalua/ Mullaghmore SAC and Streedagh Point Dunes SAC), **SAC-73** (River Moy SAC), **SAC-108** (Lough Gill SAC), **SAC-131** (Boleybrack Mountain SAC), **SAC-138** (Unshin River SAC), and **SAC-142** (Keel Machair/Menaun Cliffs SAC and Croaghaun/ Slievemore SAC). There is also the potential potential for the loss of QI habitats and spread of invasive species to both SACs for **SAC-142**; The Natura Impact Statement (NIS) identifies mitigation measures to be taken to avoid adverse effects on site integrity (AESI);
- Moderate adverse effects during construction of option **SA option 43** associated with the potential for impacts to the local landscape and visual amenity of the area when installing/upgrading new/existing assets;
- Major adverse effects during construction for **SA option 43** against materials due to the option requiring approximately 55km of new pipeline;
- Moderate adverse effects to environmental climate change resilience with **SA option 15** and options **SAC-39, 44, 138 and 142** due to theTheir high abstraction rates; and
- Major adverse effects during operation for **SA option 15**, and options **SAC-39 and 138** as a result of potential risks to groundwater quality from increased groundwater abstractions.

Summary of Cumulative Effects

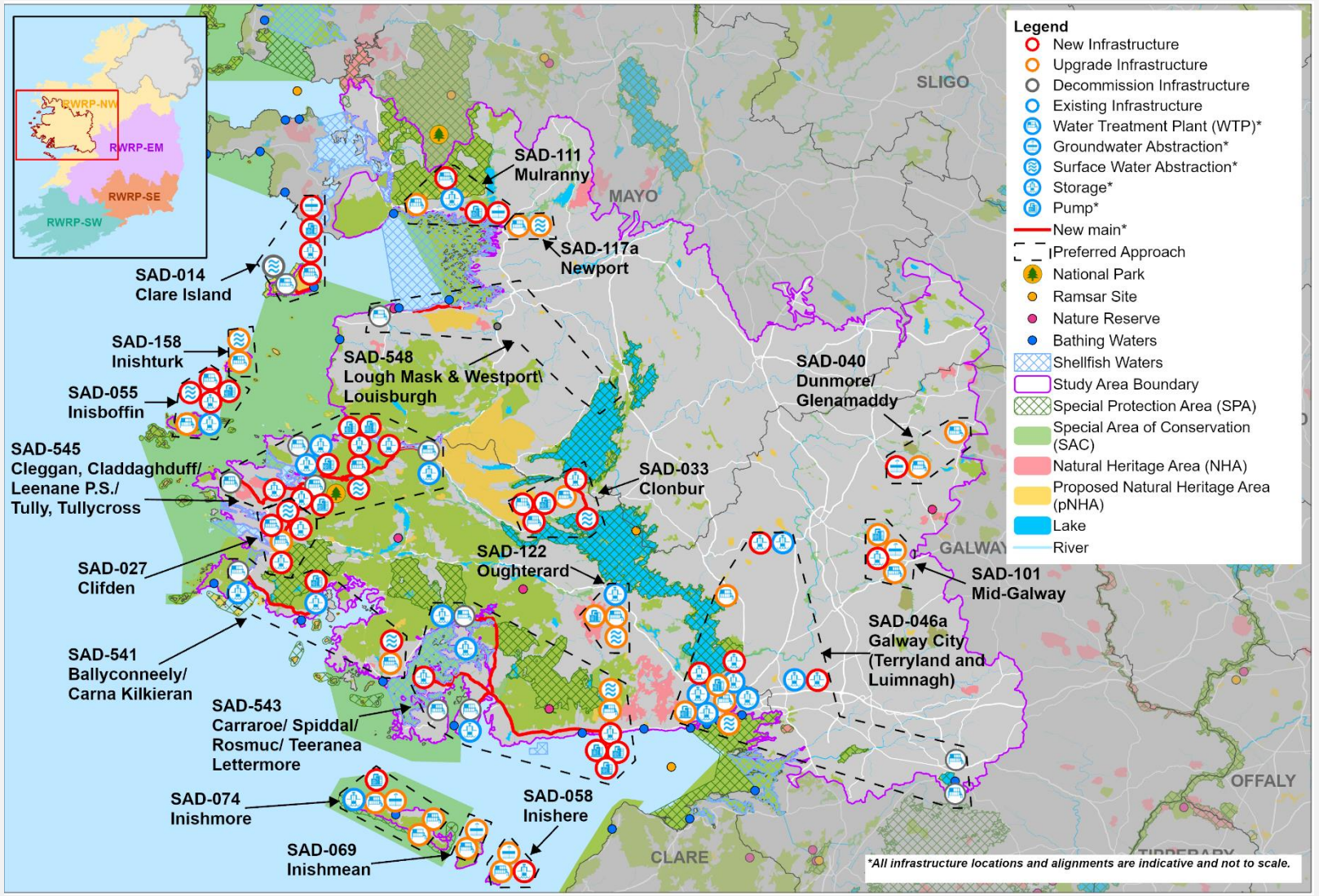
Cumulative effects assessment identified potential significant adverse effects in relation to carbon emissions, although the individual options are assessed as only neutral to moderate in relation to this SEA objective. This is because potential increases in carbon emissions contribute to national emissions. The average carbon intensity from the individual options provides an indicator for the new options in SA-C but does provide a complete picture as it does not fully take account of efficiencies from replacement of failing infrastructure, treatment technology or potential for mitigation, such as use of renewable energy sources in relation to the whole network. Insufficient information is available for the cumulative effects assessment to consider how total study area carbon emissions will change overall and per ML of water.

Recommendations are provided on mitigation and monitoring of potential effects, including cumulative effects, in Appendix D and the Environmental Action Plan and draft Monitoring Plan in section 10.

7.4 Study Area D Summary of Assessment

Table 7.5 Study Area D Summary of Assessment

Study Area D	
SAD lies within the counties of Galway, Galway City, Mayo and Roscommon, including several islands off of the coast of Ireland such as the Aran Islands (Inishmore, Inishmean, Inishere), Inisboffin, Inishturk and Clare Island, and has a total area of approximately 6,720 km^2. There are two principal settlements (with a population of over 10,000) within SAD, namely Galway city and suburbs, and Castlebar (CSO, 2016).	
Unconstrained	281 options
Coarse & Fine Screening	173 options (108 rejected; 33 rejected on sustainability reasons)
Feasible Options	173 options



Approach Development

SAD had 22 feasible combinations and were ranked from Best to Worst. The best in each category was identified and brought forward for further comparison. Combinations which scored best in a category were brought forward for further comparison and assessment. For SAD this aligned as five approaches which were then ranked against each other (see table below).

Category	SA Approach 1	SA Approach 2	SA Approach 3	SA Approach 4	SA Approach 5 (Preferred Approach)
Least cost (LCo)			Worst		Best*
Quickest Delivery (QD)	Worst	Best			
Best AA (BA)	Two -3 Biodiversity Scores	Seven -3 Biodiversity Scores	Seven -3 Biodiversity Scores	Three -3 Biodiversity Scores	Five -3 Biodiversity Scores
Lowest Carbon (LC)				Worst	Best
Most Resilient (MR)	Worst		Best		
Best Environmental (BE)	Worst			Best	

*Overall combination 21 is within 5% of the lowest cost combination and performs better against the carbon and environment criteria. Therefore, combination 21 is progressed as the Least Cost.

Summary	SA approach 5 has been selected as the best performing approach overall across the different categories and therefore is the SAD Preferred Approach. It scored best under the LCo and LC category.

Preferred Approach Assessment		
SEA objectives	**Potential Construction Impact**	**Potential Operational Impact**
1. Public Health	Minor Adverse to Moderate Adverse	Moderate Adverse to Moderate Beneficial
2. Biodiversity	Minor Adverse to Moderate Adverse	Neutral to Moderate Adverse
3. Landscape and Visual	Neutral to Moderate Adverse	Minor Adverse to Minor Beneficial
4. Materials	Neutral to Major Adverse	Neutral to Minor Adverse
5. Greenhouse Gas	Neutral to Major Adverse	Neutral to Major Adverse
6. Climate Change	Minor Adverse to Moderate Adverse	Minor Adverse to Moderate Adverse

7. Surface Water/ Groundwater	Neutral	Minor to Major Adverse
8. Flood Risk	Neutral to Minor Adverse	Neutral
9. Cultural Heritage	Minor Adverse to Moderate Adverse	Neutral
10. Geology and Soils	Neutral to Moderate Adverse	Neutral

Preferred Approach

The SA Preferred Approach consists of WRZ options for fourteen of the WRZs in the study area. The SA Preferred Approach includes four SA options (group options), these being **SA option 41** for two WRZs, namely Ballyconneely and Carna kilkieran RWSS, **SA option 43** for four WRZs, namely Carraroe, Spiddal, Rosmuc and Teeranea Lettermore, **SA option 45** for three WRZs, namely Tully-Tullycross, Cleggan Claddaghduff and Leenane, and **SA option 48** for two WRZs, namely Louisburgh and Lough Mask & Westport.

SA option 41 proposes to add a new SW abstraction, upgrade of Carna Kilkieran WTP, rationalisatioon of Carna Kilkieran, and decomissionng of Ballyconnelly WTP. **SA option 43** proposes to increase SW abstraction from Lough Boliska, rationalise Carraroe and Rosmuc to Spiddal, upgrade of Spiddal WTP, and Carraroe, Rosmuc and Tiernee WTP will be decommissioned. **SA option 45** proposes to add a new SW abstraction from Kylemore Lough, new watermains, a new WTP, and Cleggan, Leenane, Letterfrack and Tullycross WTP will be decommissioned. **SA option 48** proposes to increase SW abstraction from existing Lough Mask, an upgrade of Tourmakeady WTP, rationalise Louisburgh to group water scheme, Louisburgh WTP will be decommissioned, and Westport WTP will be upgraded. The SA Preferred Approach for the remaining WRZs involves new and increased groundwater abstractions, upgrades to existing WTPs, and the decommissioning of Hacketstown WTP.

Summary of Assessment Findings

Key beneficial impacts assessed include, up to, moderate beneficial impacts for **SAD-040 and 074** and minor beneficial impacts for **SAD-046a, 058 and 111** during operation associated with the quality of water supply for local communities; and the subsequent benefits of this for public health. There are also minor beneficial impacts during operation associated with **SA options 41, 43 and 48, and SAD-046a** through the decommissioning of WTPs reducing noise and traffic disruption in the localised rural area. There are minor beneficial impacts for landscape and visual against **SA options 41, 43, 45 and 48**, and **SAD-014 and 046a** during operation as a result of localised benefits associated with the decommissioning of WTPs.

Key potential adverse impacts identified include:

- Moderate adverse effects during construction for **SAD-046a** against public health as there is the potential for short-term adverse impacts to public health and/or quality of life from dust, noise and/traffic in urban and rural areas during the construction phase;
- Moderate adverse effects during operation for public health against **SAD-027 and SA option 45** as there are above ground assets located near sensitive receptors and the potential for the partial loss of recreational area;

- Moderate adverse effects during construction against biodiversity for **SA options 41, 43 and 48**, and **SAD-014, 033, 055, 058, 069, 074 and 117a** as the options are within/adjacent to the European designated sites with the potential for disturbance to QI species (excluding **SAD-058, 069**), and loss (excluding **SA option 41 and SAD-055, 058, 117a**) and pollution of QI habitats and protected/supporting habitats;
- Moderate adverse effects during operation against biodiversity for **SA option 41** and options **SAD-040, 046a, 055, 074, 101 and 122** as there is the potential for reduction in water availability/flow (excluding **SAD-055**) and habitat degradation within European designated sites. **SAD-055** will have ongoing operational discharges of brine and chemicals to marine biodiversity receptors as a result of the treatment of salt water. The full impact of brine release back into the sea is unknown but it is linked with potential adverse effects on biodiversity e.g. brine toxicity to some species. The long term effects of the brine discharge on biodiversity, including fisheries and associated livelihoods, will require further survey and assessment;
- Moderate adverse effects during construction of new above ground assets within options **SAD-033 and 046a** associated with the visual impact to landscape amenity areas;
- Major adverse effects associated with option **SAD-055** and **SA option 43** against materials due to the length of new pipeline required (**SA option 43**) and the new desalination plant (**SAD-055**);
- Moderate adverse effects to environmental climate change resilience with options **SAD-014, 040, 046a, 074, 158, 101 and 122**, and **SA option 41** associated with the rate of abstraction or the requirement for a new abstraction point;
- Major adverse effects against water as a result of potential risks to water quality, quantity and WFD status for **SAD-074, 122 and 158**, and **SA option 41**. This is associated with the rate of abstraction required for these options. Further studies are required to understand impacts and develop mitigation;
- Moderate adverse effects against cultural heritage associated with **SA options 43 and 45, and SAD-055** due to them being located at a known NIAH/SMR or archaeological site. Therefore, there is the potential for moderate short-term visual impacts during construction; and
- Moderate adverse effects against geology and soils associated with **SAD-033, 055 and 122** due to them being located at a known geological heritage site. There is also the potential risk of moderate damage to valuable soils with construction of the network.

Summary of Cumulative Effects

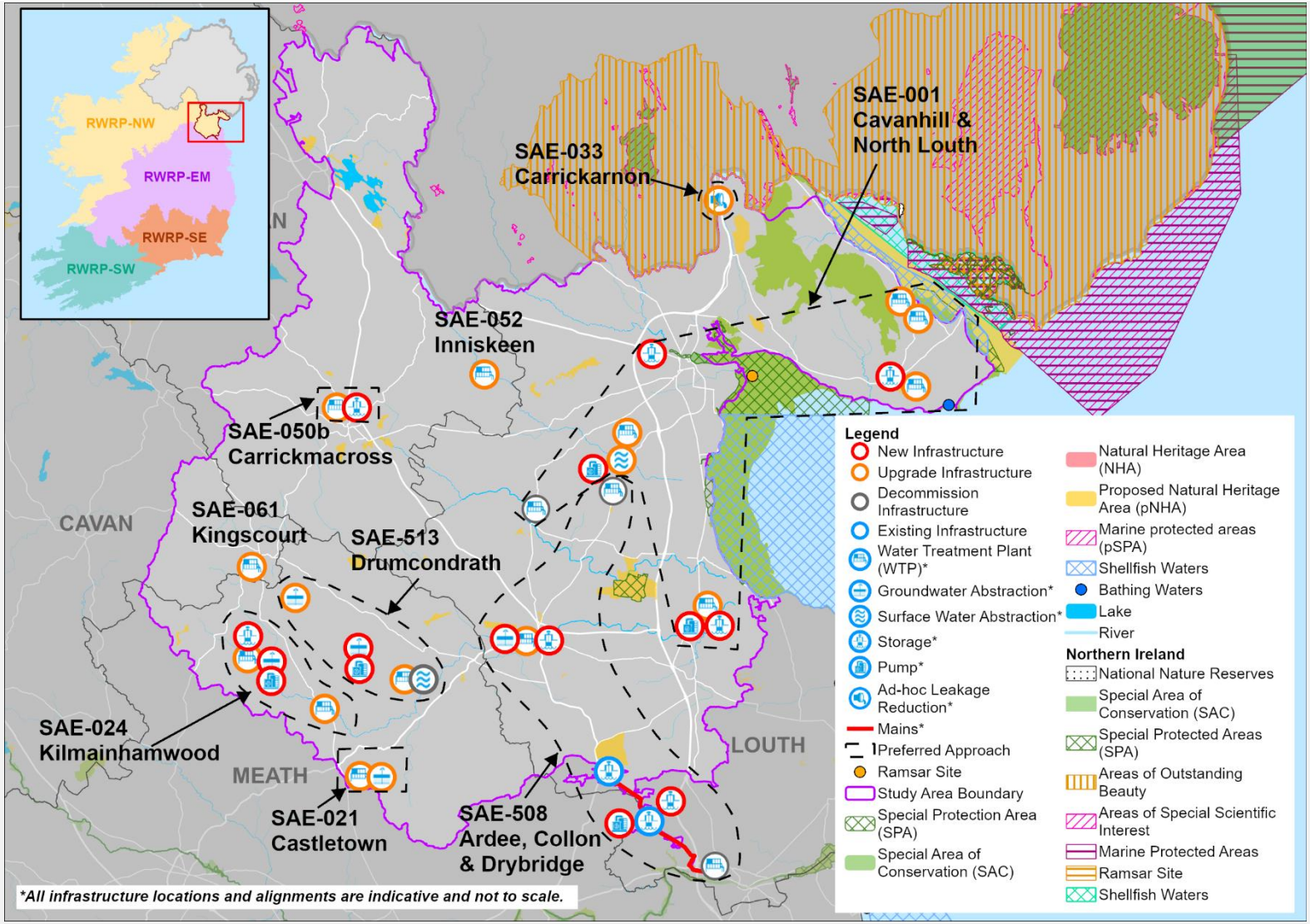
Cumulative effects assessment has identified a potential beneficial impact on the Slaney River Valley and salmonid and freshwater mussel pearl habitats as a result of the rationalisation of water abstractions from this waterbody. Cumulative effects assessment identified potential significant adverse effects in relation to carbon emissions, although the individual options are assessed as only neutral to moderate in relation to this SEA objective. This is because potential increases in carbon emissions contribute to national emissions. The average carbon intensity from the individual options provides an indicator for the new options in SAD but does provide a complete picture as it does not fully take account of efficiencies from replacement of failing infrastructure, treatment technology or potential for mitigation, such as use of renewable energy sources in relation to the whole network. Insufficient information is available for the cumulative effects assessment to consider how total study area carbon emissions will change overall and per ML of water.

Recommendations are provided on mitigation and monitoring of potential effects, including cumulative effects, in Appendix D and the Environmental Action Plan and draft Monitoring Plan in section 10.

7.5 Study Area E Summary of Assessment

Table 7.6 Study Area E Summary of Assessment

Study Area E	
SAE lies within the counties of Louth, Monaghan, Meath, and Cavan, and has a total area of approximately 1,260 km^2. There are two principal settlements (with a population of over 10,000) within SAE, namely Drogheda, and Dundalk (CSO, 2016).	
Unconstrained	63 options
Coarse & Fine Screening	38 options (25 rejected; 14 rejected on sustainability reasons)
Feasible Options	38 options



Approach Development

SAE had 12 feasible combinations and were ranked from Best to Worst. The best in each category was identified and brought forward for further comparison. Combinations which scored best in a category were brought forward for further comparison and assessment. For SAE this aligned as two approaches which were then ranked against each other (see table below).

Category	SA Approach 1	SA Approach 2 (Preferred Approach)
Least cost (LCo)	Worst	Best
Quickest Delivery (QD)	Worst	Best
Best AA (BA)	No -3 Biodiversity Scores	No -3 Biodiversity Scores
Lowest Carbon (LC)	Best	Worst
Most Resilient (MR)	Best	Worst
Best Environmental (BE)	Best	Worst

Summary	SA approach 2 has been selected as the best performing approach overall across the different categories and therefore is the SAE Preferred Approach. It scored best under the LCo, QD and AA category.

Preferred Approach Assessment

SEA objectives	Potential Construction Impact	Potential Operational Impact
1. Public Health	Minor Adverse to Moderate Adverse	Neutral to Moderate Beneficial
2. Biodiversity	Neutral to Minor Adverse	Neutral
3. Landscape and Visual	Neutral to Minor Adverse	Neutral to Minor Beneficial
4. Materials	Neutral to Minor Adverse	Neutral
5. Greenhouse Gas	Neutral to Minor Adverse	Neutral to Minor Adverse
6. Climate Change	Neutral to Moderate Adverse	Neutral to Moderate Adverse
7. Surface Water/ Groundwater	Neutral	Neutral to Major Adverse
8. Flood Risk	Neutral	Neutral
9. Cultural Heritage	Neutral to Minor Adverse	Neutral
10. Geology and Soils	Neutral to Moderate Adverse	Neutral

Preferred Approach

The SA Preferred Approach consists of WRZ options for all but one of the WRZs in the study area. This reflects the small scale of the supplies and difficulties in transporting small volumes of water over long distances. The other WRZ, Ardee, Collon and Drybridge, is covered by **SA option 8** (**SAE-049 and SAE-050**) and involves rationalising Collon Drybridge to South Louth East Meath (located in the Eastern and Midlands region - SA3) and a new partial groundwater supply at Ardee. The SA Preferred Approach for the remaining WRZs involves maintaining a North Ireland import, operational regime implementation, new and increased groundwater abstractions, and upgrades to existing WTPs.

Summary of Assessment Findings

Key beneficial impacts assessed include, up to, moderate (**SAE-001**) and minor (**SA option 13, and 8**, and options **SAE-024, 61, 50 and 52**) beneficial impacts associated with increasing the quality of water supply for local communities; and the subsequent benefits of this for public health. There are also minor beneficial impacts associated with the decommissioning of abstractions and WTPs in **SA option 8 and 13**, and **SAE-001**.

Key potential adverse impacts identified include:

- Moderate adverse effects during construction to public health and/or quality of life from dust, noise and/traffic in urban and rural areas during the construction phase associated with **SA option 8** and **SAE-024**;
- Moderate adverse effects to environmental climate change resilience associated with options **SAE-021, 024**, and **SA options 8 and 13** due to the new/increased rate of abstraction required for the new/existing groundwater abstractions;
- Major adverse effects during operation for **SA option 8** associated with the new groundwater abstraction. High level assessment indicates that the new abstraction could cause major adverse long-term impacts to groundwater. Further studies are required to understand impacts and develop mitigation;
- Moderate adverse effects during operation for **SA option 13, SAE-021 and 024** associated with the proposed rate of groundwater abstraction for the new/existing groundwater sources; and
- Moderate adverse effects during construction associated with potential damage to valuable soils with construction of the new storage (**SAE-050**) and network (**SA option 8**).

Summary of Cumulative Effects

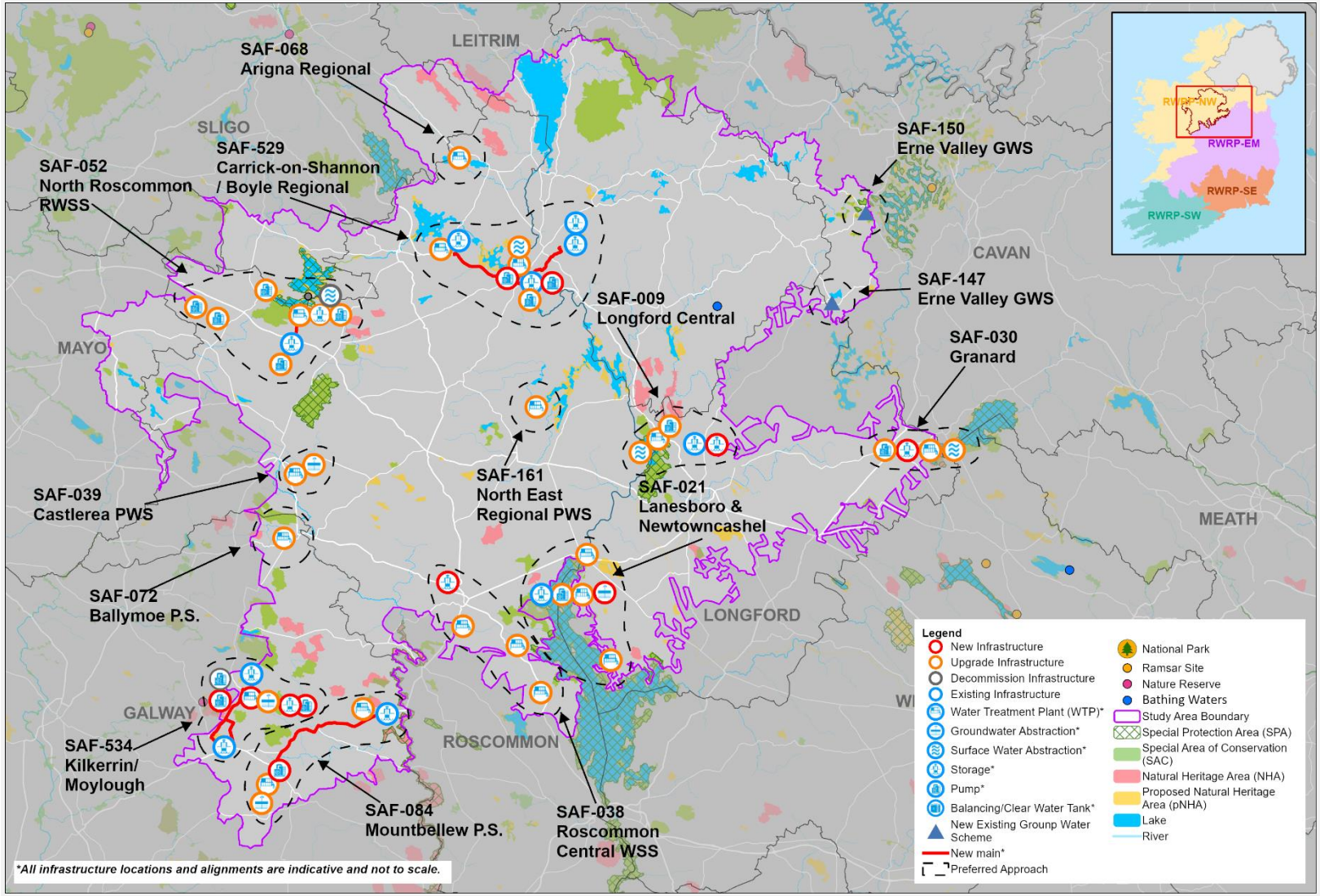
Cumulative effects assessment identified potential significant adverse effects in relation to carbon emissions, although the individual options are assessed as only neutral to moderate in relation to this SEA objective. This is because potential increases in carbon emissions contribute to national emissions. The average carbon intensity from the individual options provides an indicator for the new options in SAE but does provide a complete picture as it does not fully take account of efficiencies from replacement of failing infrastructure, treatment technology or potential for mitigation, such as use of renewable energy sources in relation to the whole network. Insufficient information is available for the cumulative effects assessment to consider how total study area carbon emissions will change overall and per ML of water.

Recommendations are provided on mitigation and monitoring of potential effects, including cumulative effects, in Appendix D and the Environmental Action Plan and draft Monitoring Plan in section 10.

7.6 Study Area F Summary of Assessment

Table 7.7 Study Area F Summary of Assessment

Study Area F		
SAF lies within the counties of Roscommon, Leitrim, Longford, Galway, Sligo, Cavan, Mayo and Westmeath, and has a total area of approximately 3,990 km^2. There is one principal settlement (with a population of over 10,000) within SAF, namely Longford (CSO, 2016).		
Unconstrained	175 options	
Coarse & Fine Screening	123 options (52 rejected; 14 rejected on sustainability reasons)	
Feasible Options	123 options	



Approach Development

SAF had 14 feasible combinations and were ranked from Best to Worst. The best in each category was identified and brought forward for further comparison. Combinations which scored best in a category were brought forward for further comparison and assessment. For SAF this aligned as four approaches which were then ranked against each other (see table below).

Category	SA Approach 1	SA Approach 2 (Preferred Approach)	SA Approach 3	SA Approach 4
Least cost (LCo)	Best			Worst
Quickest Delivery (QD)		Best		Worst
Best AA (BA)	One -3 Biodiversity Score	Two -3 Biodiversity Scores	No -3 Biodiversity Scores	One -3 Biodiversity Score
Lowest Carbon (LC)	Best			Worst
Most Resilient (MR)	Worst			Best
Best Environmental (BE)	Worst		Best*	

* Although SA approach 4 has a better environmental score, it also has a -3 biodiversity score. Therefore, SA approach 3 is selected as the best environmental as it has no -3 biodiversity scores and a similar environmental score overall.

Summary	SA approach 2 has been selected as the best performing approach overall after further consideration regarding the increased resilience offered through the use of Lough Gara as a source and the weaknesses affecting feasibility that have been identified with the local solution for the Kilkerrin Moylough WRZ. Therefore, SA approach 2is the SAF Preferred Approach. It scored best under the QD category.

Preferred Approach Assessment

SEA objectives	Potential Construction Impact	Potential Operational Impact
1. Public Health	Neutral to Minor Adverse	Neutral to Moderate Beneficial
2. Biodiversity	Neutral to Moderate Adverse	Neutral to Moderate Adverse
3. Landscape and Visual	Neutral to Minor Adverse	Neutral to Minor Beneficial
4. Materials	Neutral to Moderate Adverse	Neutral
5. Greenhouse Gas	Neutral to Moderate Adverse	Neutral to Moderate Adverse
6. Climate Change	Neutral to Moderate Adverse	Neutral to Moderate Adverse
7. Surface Water/ Groundwater	Neutral	Neutral to Major Adverse
8. Flood Risk	Neutral to Minor Adverse	Neutral

9. Cultural Heritage	Neutral to Minor Adverse	Neutral
10. Geology and Soils	Neutral to Moderate Adverse	Neutral

Preferred Approach

The SA Preferred Approach consists of WRZ options for twelve of the WRZs in the study area. This reflects the small scale of the supplies and difficulties in transporting small volumes of water over long distances. The SA Preferred Approach includes two SA options (group options), these being **SA option 29** for two WRZs, namely Boyle Regional and Carrick-on-Shannon, and **SA option 34** for one WRZ, namely Kilkerrin/Moylough.

SA option 29 proposes to interconnect Boyle Ardcarne with South Leitrim WRZ, increase the existing surface water abstraction and upgrade Carrick-on-Shannon WTP and Rockingham WTP. **SA option 34** proposes to rationalise to Dunmore Glenamaddy, increase existing groundwater abstraction at Gortgarrow Springs, upgrade Gortgarrow Springs WTP and decommission Kilkerrin Moylough WTP. The SA Preferred Approach for the remaining WRZs involves new and increased groundwater and surface water abstractions, group water scheme supplies, and upgrades to existing WTPs.

Summary of Assessment Findings

Key beneficial impacts assessed include, up to, moderate beneficial impacts for **SAF-021** during operation associated with improving the quality of water supply for local communities and the subsequent benefits of this for public health. **SA option 29 and 54, SAF-039, 068, 072 and 161**; and **SA option 34** and **SAF-052 and 084** have the potential for minor beneficial impacts during operation associated with improving the quality of water supply for local communities and the decommissioning of failing WTPs respectively. **SA option 34 and SAF-052 and 084** have minor beneficial impacts associated with the decommissioning of existing WTP/abstractions for landscape.

Key potential adverse impacts identified include:

- Moderate adverse effects during construction for **SA options 34 and SAF-009, 021, 030, 034, 052 and 084** due to the options being within (**SAF-009, 030 and 052**), within the zone of influence of (**SAF-009, 030, and SA option 34 and 084**), within the zone of contribution of (**SAF-021**), and/or hydrologically linked to (**SAF-030, and SA option 34, 052 and 084**) European designated sites. There is the potential for disturbance to QI species, loss (**SAF-030 and 052 only**) and pollution (**SAF-030, SA option 34, 052 and 084**) of protected and supporting habitats; The Natura Impact Statement (NIS) identifies mitigation measures to be taken to avoid adverse effects on site integrity (AESI);
- Moderate adverse effects during operation for **SA option 34** as it is within the ZOI of and is hydrologically linked to European designated sites with the potential for habitat degradation and a reduction in flow and water availability;
- Moderate adverse effects to environmental climate change resilience with options **SA option 29 and 34, and SAF-039** due to the requirement of increased surface water (**SA option 29 and 34**) and groundwater (**SAF-039**) abstraction at an unsustainable rate;
- Major adverse effects during operation for **SAF-039** as a result of potential risks to groundwater quality as high level assessment indicates that increase abstraction could cause major adverse long-term impacts to groundwater. Further studies are required to understand impacts and develop mitigation; and

- Moderate adverse effects for **SAF-030** during construction as the option is located at a known geological heritage site and there is potential risk of moderate damage to valuable soils with construction of the new asset.

Summary of Cumulative Effects

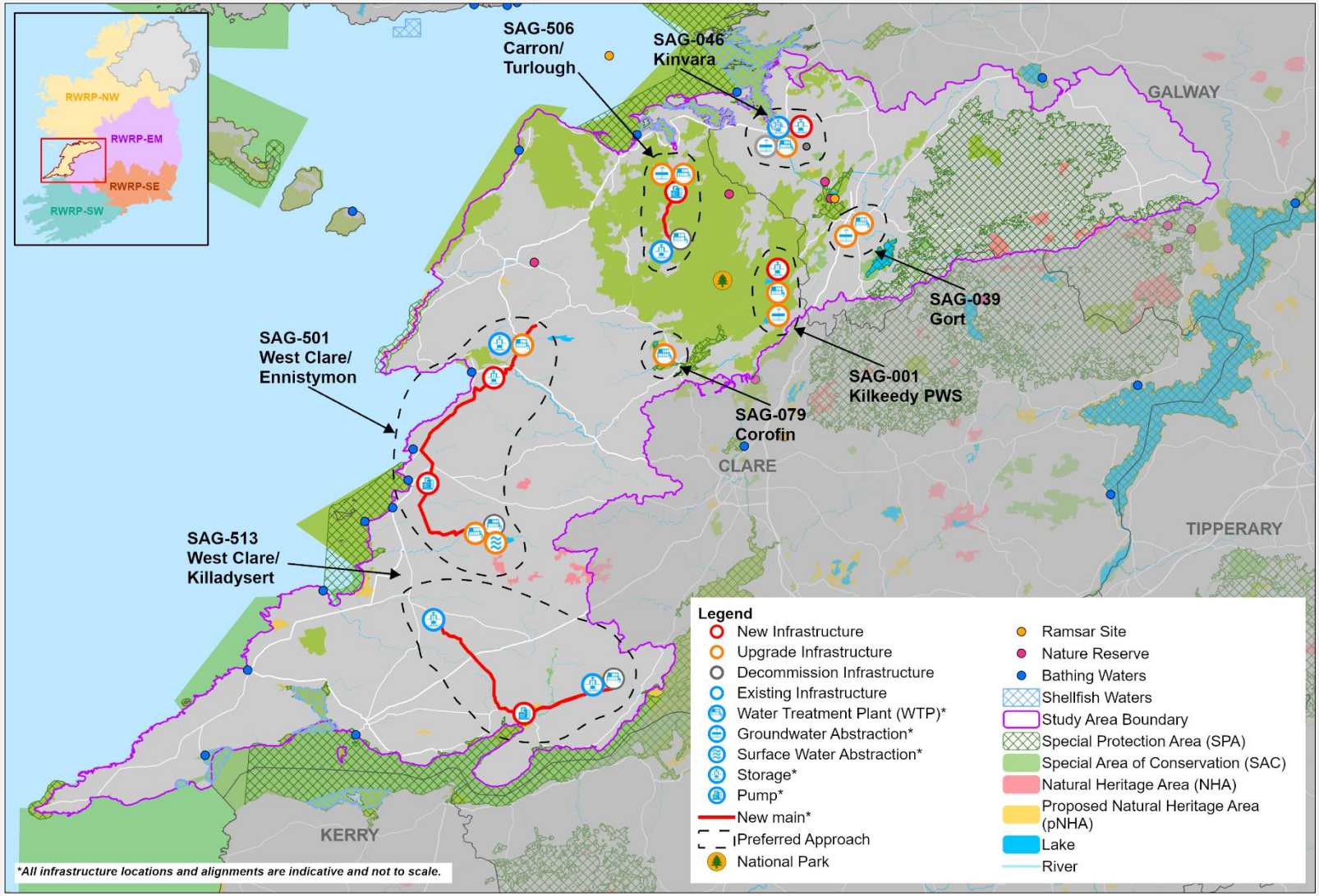
Cumulative effects assessment identified potential significant adverse effects in relation to carbon emissions, although the individual options are assessed as only neutral to moderate in relation to this SEA objective. This is because potential increases in carbon emissions contribute to national emissions. The average carbon intensity from the individual options provides an indicator for the new options in SAF but does provide a complete picture as it does not fully take account of efficiencies from replacement of failing infrastructure, treatment technology or potential for mitigation, such as use of renewable energy sources in relation to the whole network. Insufficient information is available for the cumulative effects assessment to consider how total study area carbon emissions will change overall and per ML of water.

Recommendations are provided on mitigation and monitoring of potential effects, including cumulative effects, in Appendix D and the Environmental Action Plan and draft Monitoring Plan in section 10.

7.7 Study Area G Summary of Assessment

Table 7.8 Study Area G Summary of Assessment

Study Area G	
SAG lies within the counties of Clare and Galway, and has a total area of approximately 2,390 km^2. The largest settlement is Gort, with a population of 2,994 settlement (CSO, 2016).	
Unconstrained	80 options
Coarse & Fine Screening	36 options (44 rejected; 19 rejected on sustainability reasons)
Feasible Options	36 options



Approach Development

SAG had nine feasible combinations, including the WRZ Level Approach, and were ranked from Best to Worst. The best in each category was identified and brought forward for further comparison. Combinations which scored best in a category were brought forward for further comparison and assessment. For SAG this aligned as four approaches which were then ranked against each other (see table below).

Category	SA Approach 1	SA Approach 2	SA Approach 3	SA Approach 4 (Preferred Approach)
Least cost (LCo)	Worst			Best
Quickest Delivery (QD)	Worst			Best
Best AA (BA)	No -3 Biodiversity Scores	No -3 Biodiversity Scores	No -3 Biodiversity Scores	No -3 Biodiversity Scores
Lowest Carbon (LC)			Best	Worst
Most Resilient (MR)	Worst	Best		
Best Environmental (BE)		Best		Worst

Summary	SA approach 4 has been selected as the best performing approach overall across the different categories and therefore is the SAG Preferred Approach. It scored best under the LCo, QD and AA category.

Preferred Approach Assessment

SEA objectives	Potential Construction Impact	Potential Operational Impact
1. Public Health	Minor Adverse	Neutral to Minor Beneficial
2. Biodiversity	Minor Adverse to Moderate Adverse	Neutral to Moderate Adverse
3. Landscape and Visual	Neutral to Minor Adverse	Neutral to Minor Beneficial
4. Materials	Neutral to Moderate Adverse	Neutral
5. Greenhouse Gas	Neutral to Moderate Adverse	Neutral to Moderate Adverse
6. Climate Change	Neutral to Moderate Adverse	Neutral to Moderate Adverse
7. Surface Water/ Groundwater	Neutral	Neutral to Major Adverse
8. Flood Risk	Neutral to Minor Adverse	Neutral
9. Cultural Heritage	Neutral to Moderate Adverse	Neutral
10. Geology and Soils	Neutral to Minor Adverse	Neutral

Preferred Approach

The SA Preferred Approach consists of WRZ options for four of the WRZs in the study area. The SA Preferred Approach includes three SA options (group options), these being **SA option 1** for two WRZs, namely Ennistymon and West Clare, **SA option 6** for two WRZs, namely Turlough and Carran PWS, and **SA option 13** for two WRZs, namely West Clare and Killadysart PWS.

SA option 1 proposes to increase SW abstraction from Doo Lough, upgrade New Doolough WTP and Ballymacraven WTP, interconnect Ennistymon and West Clare, and decommission Old Doolough WTP. **SA option 6** proposes to increase GW abstraction from Turlough borehole, rationalise Carran WRZ to Turlough WRZ, upgrade Turlough WTP, and decommission Carron WTP. **SA option 13** proposes to rationalise Killadysart PWS WRZ to West Clare and decommission Killadysart WTP. The SA Preferred Approach for the remaining WRZs involves increased groundwater abstractions and upgrades to existing WTPs.

Summary of Assessment Findings

Key beneficial impacts assessed include, up to, minor beneficial impacts for **SA option 1**, and **SAG-039 and 079** associated with improving quality of water supply for local communities; and the subsequent benefits of this for public health. Minor beneficial impacts for **SA options 6 and 13, and SAG-046** associated with decommissioning of WTPs/abstractions and the reduced noise and traffic disruption in the local area. Minor beneficial impacts against landscape for **SA options 1, 6 and 13, and SAG-046** associated with the decommissioning of WTPs/abstractions.

Key potential adverse impacts identified include:

- Moderate adverse effects during construction against biodiversity for **SA options 1, 6 and 13** which are within (**SA options 6 and 13**), hydrologically linked to (**SA options 1 and 13**), or within the zone of influence of (**SA options 1 and 6**), European designated sites. There is the potential for disturbance of QI species, and the loss (**SA option 13** only) and pollution of QI habitats and supporting habitats; The Natura Impact Statement (NIS) identifies mitigation measures to be taken to avoid adverse effects on site integrity (AESI);
- Moderate adverse effects during construction of **SA option 1 and 13** associated with the materials required for new assets. Both of these options require over 20km of pipeline, however, these are necessary to make use of the existing assets;
- Moderate adverse effects to environmental climate change resilience and major adverse effects to water quality and status (during operation) for **SA options 1 and 13**, and **SAG-039** due to the increase of existing surface water (**SA option 1 and 13**) and groundwater (**SAG-039**) abstractions at an unsustainable rate. Further studies are required to understand impacts and develop mitigation; and
- Moderate adverse effects associated with SA option 1 against cultural heritage as the option is located in a known archaeological site and there is potential for visual impacts during construction.

Summary of Cumulative Effects

Cumulative effects assessment identified potential significant adverse effects in relation to carbon emissions, although the individual options are assessed as only neutral to moderate in relation to this SEA objective. This is because potential increases in carbon emissions contribute to national emissions. The average carbon intensity from the individual options provides an indicator for the new options in SAG but does provide a complete picture as it does not fully take account of efficiencies from replacement of failing infrastructure, treatment technology or potential for mitigation, such as use of renewable energy sources in relation to the whole network. Insufficient information is available for the cumulative effects assessment to consider how total study area carbon emissions will change overall and per ML of water.

Recommendations are provided on mitigation and monitoring of potential effects, including cumulative effects, in Appendix D and the Environmental Action Plan and draft Monitoring Plan in section 10.

7.8 Comparison of Study Area Preferred Approaches with the WRZ Approaches

The application of the three stage Approach Development Process resulted in the selection of the Preferred Approach at study area level, which include a combination of local WRZ and SA options (grouped options) that is options supplying multiple WRZs.

The Preferred Approach includes 24 SA Grouped Options that collectively supply 119 WRZs across the North West Region (Table 7.9). This creates an interconnected network and allows Uisce Éireann to rationalise their infrastructure, providing a more resilient supply to customers. There is also the benefit of moving away from some potentially unsustainable abstractions by reducing abstraction points. The assessment of supplies at a Study Area Level allows consideration of the regional sustainability of the abstractions. This rationalisation is described further in section 7.3 of the RWRP-NW.

Table 7.9 SA Preferred Approach

Study Area	Number of WRZs	SA Preferred Approach		Number of WRZs benefitting from a SA Option (Grouped Option)
		WRZ Option	SA Option (Grouped Option)	
SAA	21	5	3	16
SAB	23	17	4	8
SAC	17	11	3	6
SAD	25	14	4	11
SAE	9	7	2	2
SAF	15	12	2	3
SAG	9	4	3	5
Region Total	**119***	**70**	**21**	**51**

Option types include new and/or increased groundwater and surface water abstractions, interconnections, rationalisations (connection of WTPs and/or WRZs, usually accompanied by decommissioned abstractions and WTPs), Group Water Scheme imports and maintenance of supply, desalination, transboundary imports (from Northern Ireland), and/or transfers from sources within or outside of the study area. The number of options that only comprise a WTP water quality upgrade is also presented for those WRZs that are not in deficit and therefore do not require a new or upgraded resource supply.

7.9 Assessment against the Six Approach Categories

The infrastructure comparison in Table 7.10 details the infrastructure components associated with the Options identified for each Study Area. Overall, the SA Preferred Approach across the seven Study Areas of the North West Region requires13 fewer new WTPs, 18 fewer WTP upgrades, and 29 fewer

new or increased abstraction sources, than the WRZ Level Preferred Approach. The SA Options making up the SA Preferred Approach will also eventually result in the decommissioning of 25 more WTPs and the abandonment of 23 more abstractions, presenting the potential to deliver improved environmental outcomes. The higher interconnectivity created by the SA Preferred Approach requires approximately 310 kilometres more pipeline compared with the WRZ Level Approach and 9 more water storages.

Table 7.10 Infrastructure Component Summary

SA	Approach Type	Infrastructure Component						
		New Pipeline (km)	New WTPs	Upgrade WTPs*	New/ Upgraded Abstractions	Decommissioned WTPs	Decommissioned Abstractions	Water Storages
SAA	SA Preferred Approach	278	3	21	9	8	10	25
	WRZ Level Approach**	146	7	23	15	0	3	13
SAB	SA Preferred Approach	47	0	13	6	4	4	1
	WRZ Level Approach**	25	3	16	10	1	1	3
SAC	SA Preferred Approach	90	1	13	8	6	6	6
	WRZ Level Approach	83	3	14	18	5	4	6
SAD	SA Preferred Approach	149	6**	21	20	12	12	17
	WRZ Level Approach**	43	8	28	25	4	8	17
SAE	SA Preferred Approach	30	0	13	6	3	5	7
	WRZ Level Approach	34	0	15	5	1	2	6

SA	Approach Type	Infrastructure Component						
		New Pipeline (km)	New WTPs	Upgrade WTPs*	New/ Upgraded Abstractions	Decommissioned WTPs	Decommissioned Abstractions	Water Storages
SAF	SA Preferred Approach	39	0	16	7	2	2	5
	WRZ Level Approach**	32	0	17	9	1	0	6
SAG	SA Preferred Approach	59	0	7	4	3	3	3
	WRZ Level Approach	20	2	9	7	1	1	4
Total	SA Preferred Approach	692	10	104	60	38	42	64
	WRZ Level Approach	383	23	122	89	13	19	55
Difference		**+310**	**-13**	**-18**	**-29**	**+25**	**+23**	**+9**

* Includes WTP upgrades for both Water Quality only (for those WRZs that are not in Deficit) and WTPs with capacity upgrades.

**Includes one new desalination plant

Table 7.11 compares the relative Multi Criteria Assessment (MCA) scores of the Preferred Approaches at study area level against the WRZ Level Approach for each of the six Approach Categories. Further justification for the selection of the SA Preferred Approach is set out in detail in the supporting Study Area Technical Reports (Appendices 1-7) (Technical Appendices to the RWRP-NW). The ranking (colour coding) presented in Table 7.11 is relative to all SA Combinations identified for the Study Area and the comparison against the best feasible approaches is provided for SAA-SAG in sections 7.1-7.7 respectively with a summary of their comparative environmental performance. Table 7.12 summarises the selection of the SA Preferred Approaches.

In some study areas there may be no local WRZ Options available for some WRZs. For example, there are four WRZs in SAA that do not have a feasible local Option. The Technical Report for Study Area A (Appendix 1 of the RWRP-NW) provides further details. Therefore, for the purpose of Table 7.11 below and as part of the SA Preferred Approach Development process they are greyed out and excluded from comparison.

Table 7.11 SA Preferred Approach (PA) and WRZ Level Approach Assessment – MCA Scores

Study Area	Approach Type	Approach Category					
		Least Cost	Quickest Delivery	Best AA*	Lowest Carbon	Most Resilient	Best Env.
SAA	SA Preferred Approach		Worst	One -3 scores			Best
	WRZ Level Approach						
SAB	SA Preferred Approach	Best		No -3 Scores	Best	Best	Best
	WRZ Level Approach		Best	No -3 Scores	Worst	Worst	Worst
SAC	SA Preferred Approach	Best		Two -3 Scores	Best		
	WRZ Level Approach						
SAD	SA Preferred Approach	Best		Five -3 Scores	Best		
	WRZ Level Approach						
SAE	SA Preferred Approach	Best	Best	No -3 Scores		Worst	
	WRZ Level Approach						
SAF	SA Preferred Approach		Best	Two -3 Scores			
	WRZ Level Approach	Best		One. -3 Score	Best		

Study Area	Approach Type	Approach Category					
		Least Cost	Quickest Delivery	Best AA*	Lowest Carbon	Most Resilient	Best Env.
SAG	SA Preferred Approach	Best	Best	No -3 Scores			
	WRZ Level Approach			No -3 Scores			

* A Best AA score of -3 equates to Likely Significant Effects (LSEs) that may be harder to mitigate or require significant project level assessment.

** The WRZ Level Approach did not meet the Deficit for SAA, SAC, SAD, and SAE. For this reason, the WRZ Level Approach has not been assessed and assigned a score for the purpose of determining the best performing alternative within each Approach Category.

Table 7.12 SA Level Preferred Approach (PA) Selection

Study Area	SA Preferred Approach Selection Summary
SAA	**The PA is the Best Environmental Approach.** • The PA for SAA includes 3 SA options and 5 WRZ options that supply the deficit across all WRZs. There are no feasible WRZ Options for four WRZs in the Study Area. For this reason, the WRZ Level Approach can meet the deficit for only 17 of the 21 WRZs. • The PA decommissions 10 abstraction sources compared with three decommissioned abstractions under the WRZ Level Approach. The PA has the advantage of requiring 6 fewer new or increased abstractions. Therefore has a lower impact on biodiversity and the water environment. • The interconnected Options of the PA will require an estimated 132 km more pipeline than the WRZ Options and will reduce the number of WRZs from 21 to 6. • The PA has an estimated NPV cost that is 11% higher than WRZ Level Approach. The increased costs are associated with the additional pipeline length and water storage infrastructure and the additional works required to secure supply to four more WRZs. • The PA has one high-risk Option under the Appropriate Assessment that will require further assessment at project level to confirm mitigation opportunities. This includes the rationalisation and interconnection of seven WRZs to Letterkenny, which involves an increased abstraction from the River Crana and new abstractions from Gartan Lough and Glen Lough. • The better environmental score for the PA is associated with the lower materials and waste impacts due to the rationalisation of assets. The PA is also likely to have a lower landscape impact as it requires less abstractions and WTPs. Benefits to the water environment are also achieved through the abandonment of 10 abstractions (nine of which may not meet sustainability guidelines during dry weather flows). Cessation of abstractions from these sources are likely to improve water quality and benefit water dependent biodiversity including aquatic ecology.

Study Area	SA Preferred Approach Selection Summary
SAB	**The PA is the Least Cost, Lowest Carbon, Best Environmental and Best AA Approach.** • The PA for SAB comprises 4 SA options and 17 WRZ options compared with 25 WRZ Options for the WRZ Level Approach. Both approaches can meet the deficit across all WRZs in the study area. • The PA provides the following advantages compared to the WRZ Level Approach: four fewer new or upgraded abstractions, three more decommissioned WTPs and three more decommissioned abstractions. Additionally, the PA Approach requires three fewer upgraded WTPs and no new WTPs. • The interconnected Options of the PA will require an estimated 22 km more pipeline than the WRZ Options and will reduce the number of WRZs from 23 to 18. The PA will require two fewer water storages. • The PA has been selected as the Lowest Carbon, Best Environmental and Best AA Approach due to the reduced infrastructure requirements. The Best AA score is based on the PA having the lowest number of negative AA impacts. • The NPV cost is estimated to be 10% less than the WRZ Level Approach. This cost benefit is the result of lower capital expenditure due to fewer new and increased WTPs; as well as lower operational costs associated with the reduced number of WTP • The PA has no high-risk Option that could impact on European sites, which will require further assessment at project level. • The better environmental score for the PA is associated with the lower materials and waste impacts due to the rationalisation of assets. The PA is also likely to have a lower landscape impact as it requires fewer water storages and abstractions. Benefits to the water environment are also achieved through the abandonment of four abstractions (one of which may not meet sustainability guidelines during dry weather flows). Cessation of abstractions from these sources has potential to improve water quality and benefit water dependent biodiversity including aquatic ecology. • The PA has a relatively long delivery timescale when compared with the other SA combinations. However, the low score in this category is outweighed by the significant gains in overall environmental improvement, ranking highest for carbon. • The SA options of the PA merge WRZs through interconnections and rationalisation. This improves the resilience score of the PA compared with the independent local solutions that make up the WRZ Level Approach.
SA-C	**The PA is the Least Cost and Lowest Carbon Approach.** • The PA for SA-C includes 3 SA options and 11 WRZ options that supply the deficit across all WRZs. The WRZ Level Approach can only meet the deficit for 16 of the 17 WRZs, as there are no feasible WRZ Options for one of the WRZs. • The PA decommissions two additional abstraction sources and one additional WTP. It also has the advantage of requiring 10 fewer new or increased abstractions and two fewer new WTPs. The PA Approach therefore has a lower impact on biodiversity and the water environment. The PA requires only 7 km additional pipeline compared to the WRZ Level Approach.

Study Area	SA Preferred Approach Selection Summary
	• The PA has been selected as the Least Cost Approach. The NPV cost is estimated to be 6% lower than the WRZ Level Approach. This is mostly attributed to the lower capital expenditure, due to the PA requiring fewer new and upgraded WTPs and abstractions. • The PA has only two high-risk Options that could impact on European sites, which will require further assessment at project level to confirm mitigation opportunities. The first Option involves an increased groundwater abstraction from Belmullet groundwater body to supply the deficit in Ceide Fields WRZ. The second Option involves a new surface water abstraction from Keel Lough to supplement Accorymore Lake during dry periods. • The high environmental score for the PA is associated with the lower materials and waste impacts due to the reduction in water storage requirement and reduced requirement for new abstractions. Benefits to the water environment are also achieved through the abandonment of six abstractions, particularly as four of these abstractions may not meet sustainability guidelines during dry weather flows. Cessation of abstractions from these sources has potential to improve water quality and benefit water dependent biodiversity, including aquatic ecology.
SAD	**The PA is the Least Cost and Lowest Carbon Approach.** • The PA for SAD includes 4 SA options and 14 WRZ options that supply the deficit across all WRZs. The WRZ Level Approach can meet the deficit for only 24 of the 25 WRZs, as there were no feasible WRZ Options for one of the WRZs. • The PA requires seven fewer WTP upgrades and two fewer new WTPs and decommissions an extra eight WTPs and four additional abstraction sources. It also has the advantage of requiring five fewer new or increased abstractions and therefore has a lower impact on biodiversity and the water environment. • The PA has been selected as the Least Cost Approach compared with other study area Option combinations. Compared with the WRZ Level Approach, the estimated NPV cost is 6% higher. The increased costs are associated with the 106 km additional pipeline length and water storage infrastructure and the additional works required to secure supply for one more WRZ. • The PA has five high-risk Options that could impact on European sites, which will require further assessment at project level to confirm mitigation opportunities. This is associated with four new/increased abstractions which could impact SAC's/SPA's and the construction of a desalination plant which could have impacts on mobile marine mammals. • The better environmental score for the PA is associated with the lower materials and waste impacts due to the rationalisation of assets. Substantial benefits to the water environment are also achieved through the abandonment of 12 abstractions, particularly as 11 of these abstractions may not meet sustainability guidelines during dry weather flows. Cessation of abstractions from these sources has potential to improve water quality and benefit water dependent biodiversity including aquatic ecology. • The PA has increased risks due to the number of high-risk Options when compared across all 21 SA Combinations; however, all combinations were associated with at least two -3 Scores and the risk of the PA SA Combination is outweighed by the significant benefits relating to reduced carbon, cost and delivery time.
SAE	**The PA is the Least Cost, Quickest Delivery and Best AA Approach.**

Study Area	SA Preferred Approach Selection Summary
	• The PA for SAE, includes 2 SA options and 7 WRZ options, that supply the deficit across all WRZs. The WRZ Level Approach can only meet the deficit for 8 of the 9 WRZs, as there are no feasible WRZ Options for one of the WRZs. • The PA provides the following advantages compared to the WRZ Level Approach: it requires approximately 4 km less of pipeline, decommissions two additional WTPs and three abstraction sources and requires 2 less WTP upgrades. • The PA has been selected as the Least Cost Approach overall when performance against other Approach Categories is also considered. Although the NPV is higher than WRZ Level Approach, it is within 5% and the PA secure the supply to one additional WRZ. • There are no high-risk Options that could impact on European sites associated with the PA. Four of the Options have a -1 AA score while the remaining five Options have been assessed to have no AA impacts. For this reason, when compared with the other Option combinations, the PA was selected as the Best AA Approach. • The approach is comparable to the WRZ Level Approach in terms of numbers of new and decommissioned abstractions/WTPs but the Approach can be delivered on a shorter timescale at less cost. Substantial benefits to the water environment are also achieved through the abandonment of four abstractions. One of these abstractions may not meet sustainability guidelines during dry weather flows. Cessation of abstractions from these sources has potential to improve water quality and benefit water dependent biodiversity including aquatic ecology. • The PA is less resilient when compared across all 12 SA Combinations; however, the low score in this category is outweighed by the significant gains in terms of environmental benefits, delivery and cost.
SAF	**The PA is the Quickest Delivery Approach.** • The PA for SAF includes 2 SA options and 12 WRZ options that supply the deficit across all WRZs. • The PA decommissions one more WTP and two more abstraction than the WRZ Level Approach. It requires one less WTP upgrade and two fewer new/upgraded abstractions and therefore has a lower impact on biodiversity and the water environment. It also requires one less water storage. The PA requires a similar length of pipeline as the WRZ Level Approach. • Compared with the WRZ Level Approach, the estimated NPV cost is 7% higher. The increased costs are associated with the additional pipeline length required to interconnect supply systems. • The PA has two high-risk Options that could impact on European sites, which will require further assessment at project level to confirm mitigation opportunities. This is associated with the increased groundwater abstraction at Gortgarrow Spring and the rationalisation of Kilkerrin/Moylough and Dunmore/Glenmaddy P.S, as well as the construction of a new intake from the middle Lake to meet the demand in North Roscommon RWSS. • The PA has two more Options with -3 AA scores than the combination of options selected as the Best AA Approach; however, this is outweighed by the significant gains in cost and delivery. Although the Best AA Approach had no -3 AA impacts, it was associated with the development of a more vulnerable local groundwater source for Kilkerrin. The PA allows the development of a more secure source for Kilkerrin, which is also proposed as a solution for

Study Area	SA Preferred Approach Selection Summary
	Glenamaddy in Study Area D and hence the risk is only counted once across the region. The other -3 AA impact is related to an abstraction at Lough Gara which is linked to an existing abstraction and so mitigations can be developed at short, medium and long timescales.
SAG	**The PA is the Least Cost and Quickest Delivery Approach.** • The PA for SAG, includes 3 SA options and 4 WRZ options, compared with 9 WRZ Options for the WRZ Level Approach. Both approaches can meet the deficit across all WRZs in the study area. • The PA decommissions two additional WTPs and two additional abstraction points. It requires two fewer new WTPs, two fewer WTP upgrades, three fewer new/upgraded abstractions and one less water storage. The PA therefore has a lower impact on biodiversity and the water environment. The PA requires approximately 39 km more of pipeline compared to the WRZ Level Approach. • The PA has been selected as the Least Cost Approach overall. The total NPV cost is estimated to be 16% less than WRZ Level Approach due to the smaller infrastructure requirements. • The PA has no high-risk Options that could impact on European sites. • The PA has a slightly lower environmental score than the Best AA Approach, however, the Best AA Approach would require boring through rock over a long distance and so the PA was maintained as this was considered more problematic than the increased cost and carbon. The PA is also likely to have a lower landscape impact as it requires less abstractions and decommissions more existing abstractions. Benefits to the water environment are achieved through the abandonment of three abstractions, particularly as two of these abstractions may not meet sustainability guidelines during dry weather flows. Cessation of abstractions from these sources has potential to improve water quality and benefit water dependent biodiversity including aquatic ecology.

7.10 Leakage Proposals

Uisce Éireann's current leakage targets are targeted to reduce leakage in supplies with demand greater than 1.5Ml/d. Supplies of greater than 1.5Ml/day are found in various locations around the North West Region and the leakage targets equates to a total leakage reduction of 102 Ml/day, which will reduce leakage to 26% of demand across the entire region. The reduction targets are explained further in section 7.4.3 of the RWRP-NW.

These leakage targets will be reviewed annually and will be subject to further modification. At project level, when Uisce Éireann proceed to develop the preferred approach, they will review the supply demand balance and subtract the target leakage reductions from the deficit at this stage. This ensures that the preferred approaches are not oversized, or that the needs are over emphasized.

The leakage reductions are assessed as contributing to meeting SEA objectives, especially for climate change and carbon, through energy and treatment savings and through reducing water required for abstraction. Construction impacts for works such as mains replacement can include traffic disruption, community disturbance and temporary land take, landscape and biodiversity impacts and water pollution risks but these are generally short term and mitigatable with appropriate construction management and reinstatement commitments.

7.11 WFD and Surface Water Abstractions

Uisce Éireann's assessment identified 72 existing surface water sites where potential abstraction reductions may be required in the future, based on conservative estimates of what a future regime may require.

Twenty-eight of the 72 surface water abstractions, which have been identified as potentially exceeding sustainable abstraction thresholds, are intended to be decommissioned as part of the Preferred Approach. These sites are shown in Figure 7.1 which presents the changes to surface water abstractions under the Preferred Approach development, including new abstractions and existing abstractions which will be maintained, upgraded or abandoned. The decommissioning of potentially unsustainable abstractions has the potential to improve the environmental outcomes at these sites and reduce the uncertainty to supply posed by the future legislation.

The remaining 44 surface water abstractions that may not meet sustainability guidelines during dry weather flows, (as assessed by Uisce Éireann using the UKTAG guidelines and explained in section 6.5). While the plan level assessment has identified that these abstractions may not meet sustainability guidelines during dry weather flows, further project level assessments will need to be carried out in the context of applications for planning permission and/or abstraction licences under the new legislative regime. The Preferred Approach, however, does improve or avoid further deterioration at these sources by reducing existing abstractions or developing additional sources to support growth.

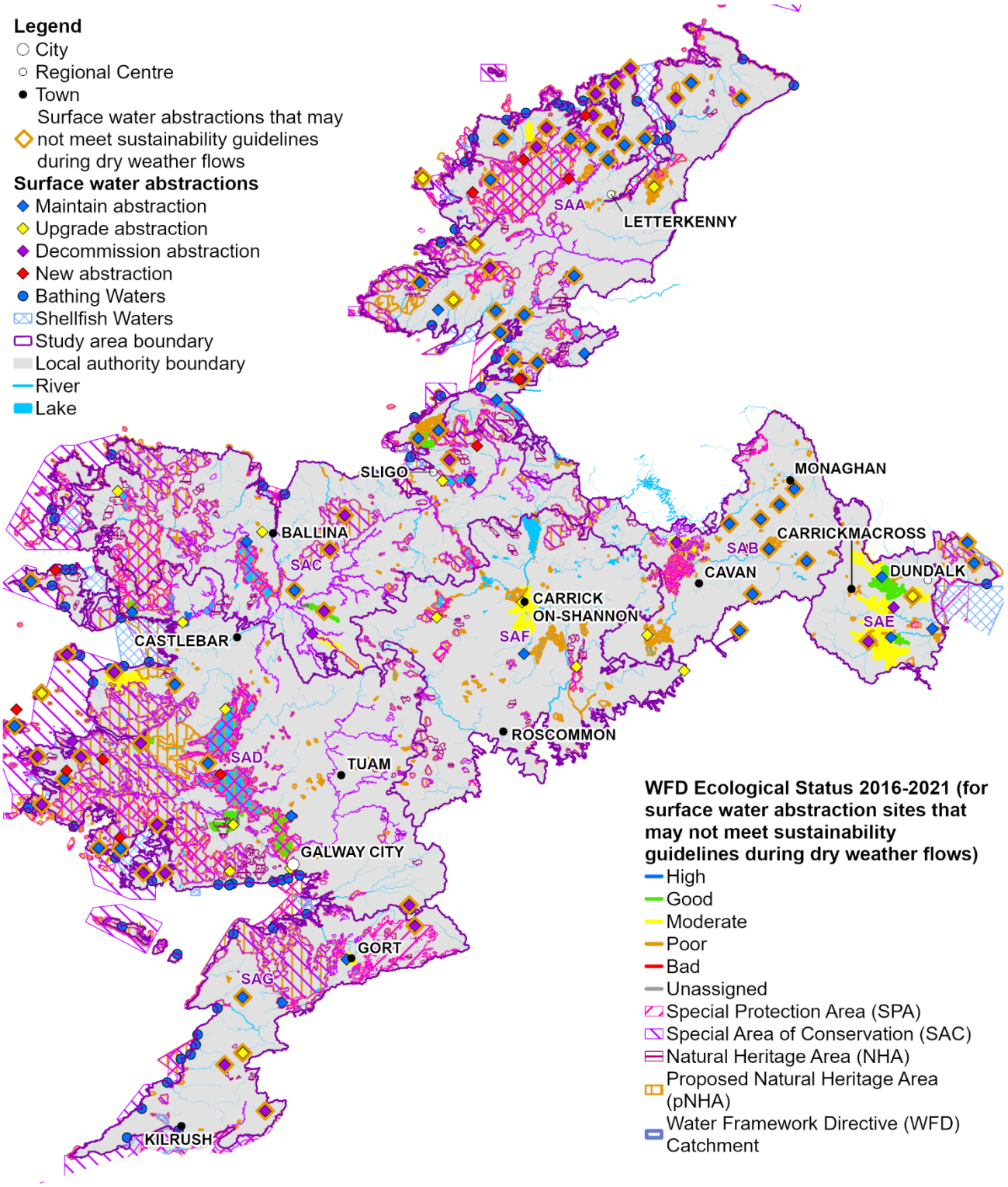


Figure 7.1 Preferred Approach – Surface Water Abstractions

The actual reductions that may be needed in future will depend on the specific requirements of the future legislation. Uisce Éireann will update the Regional Plan as appropriate to account for these requirements, once known, using the monitoring and feedback process set out in section 9 of the Plan. These sources the status of the waterbodies and the associated WRZ are listed in Table 7.13.

Table 7.13 Preferred Approach – Existing Surface Water Abstractions Potentially Exceeding Sustainable Abstraction Thresholds

Preferred Approach Outcome	Abstraction Sites	
	Decommission	**Maintain**
SAA	**High Status** Lough Doo (Buncrana) Lough Anna (Glenties-Ardara) **Good Status** Shannagh Lake (Fanad East) Lough Naglea (Fanad West) Lough Nameeltoge (Carrigart-Downings & Cranford) Muckish (Creeslough Dunfanaghy) Lough Agher (Creeslough Dunfanaghy) **Moderate Status** Lough Nambraddan (Carrigart-Downings & Cranford **Poor Status** Lough Nacreaght (Carrigart-Downings & Cranford	**High Status** Lough Nalughraman (Owenteskiny) **Good Status** Lough Fad (Inishowen West & Carndonagh & Culdaff) Gort Lough (Letterkenny & Inishowen East & Pollan Dam) Lough Salt (Letterkenny & Inishowen East & Pollan Dam) Lough Mourne (Lough Mourne) Lough Keel (Letterkenny & Inishowen East & Pollan Dam) Lough Greenan (Letterkenny & Inishowen East & Pollan Dam) Lough Lagha (Gortahork-Falcarragh) St. Peters Lough 2 (Frosses-Inver) River Eske (Donegal) Lough Aderry Intake (Killybegs) Glencoagh Lough (Frosses-Inver) Lough Derkmore-Impoundment (Letternacaward) Lough Unshin (Ballyshannon & Bundoran) Lough Gorman (Ballyshannon & Bundoran) **Moderate Status** Lough Keel Intake (Rosses) Crana River / Pollan Dam (Letterkenny & Inishowen East & Pollan Dam) **Poor Status** Lough Columbkille (Letterkenny & Inishowen East & Pollan Dam) Lough Fad (Letterkenny & Inishowen East & Pollan Dam) ND1 - Lough Shore (Arranmore Island)
SAB	**Good Status**	**Good Status**

Preferred Approach Outcome	Abstraction Sites	
	Decommission	**Maintain**
	St. Columbkill Lake (Cashilard)	Feagh Lough (Newbliss) **Moderate Status** Corconnonlly Lake (Clones) Lough Acanon Dam (Cavan RWSS) Nadrageel Lough (Ballyjamesduff RWSS) **Poor Status** Lough Bawn (Ballybay (Lough Egish)) Corcaghan Lough (Monaghan) Coragh Lough (Cootehill PWS) Greagh Lough (Monaghan)
SAC	**Good Status** Kilsellagh Impounding Reservoir (Sligo Town & Environs) Lough Talt (Lough Talt Regional Water Supply) Lough Easkey (Lough Easky Regional Water Supply) Carrowcanada Spring (Stream) (Swinford)	**High Status** Lough Muck Intake (Foxford) **Good Status** Accorymore Lake Intake (Achill) **Poor Status** Lyle (North Sligo Regional Water Supply) Gortnaleck (North Sligo Regional Water Supply)
SAD	**High Status** Lough Illauntrasna (Teeranea_Lettermore P.S) **Good Status** Mountain Stream (unnamed) (Leenane P.S.) Lough Courhoor (Cleggan_Claddaghduff) Diamond Hill Stream (Tully-Tullycross) Lake Anaserd (Ballyconnely P.S) Lough Rea – Lake Road PWS (Lough Corrib (Galway City, Tuam, Lough Rea)) Lough Rea – Knockanaima PWS (Lough Corrib (Galway City, Tuam, Lough Rea)) Loughuanwillan (Carraroe) **Moderate Status** Bunnahowen River (Louisburgh) **No Data** Lough Aroolagh (Rosmuc P.S)	**Good Status** Lough Fawna (Inisboffin P.S.) Moher Lake (Lough Mask & Westport) Coolin Lough (Clonbur P.S.) Lough Nambrackeagh (Clifden) Loughaunore Intake (Carna_Kilkieran RWSS) Lough Lerin (Carna_Kilkieran RWSS) **No Data** Coolacknick Lake Intake (Inishturk)

Preferred Approach Outcome	Abstraction Sites	
	Decommission	**Maintain**
	Knockmore (Clare Island)	
SAE	**Moderate Status** Lough Brackan (Drumcondrath)	**Good Status** Carlingford Mountain (unnamed stream) Barnavave (Cavanhill & North Louth) River Fane (Stephenstown) (Cavanhill & North Louth)
SAF	No abstractions identified	No abstractions identified
SAG	**Good Status** Gortglass Lough (Killadysert PWS) **Moderate Status** Doo Lough – Old WTP (West Clare)	**Moderate Status** Doo Lough – New WTP (West Clare) **Bad Status** Licken Lake (Ennistymon)

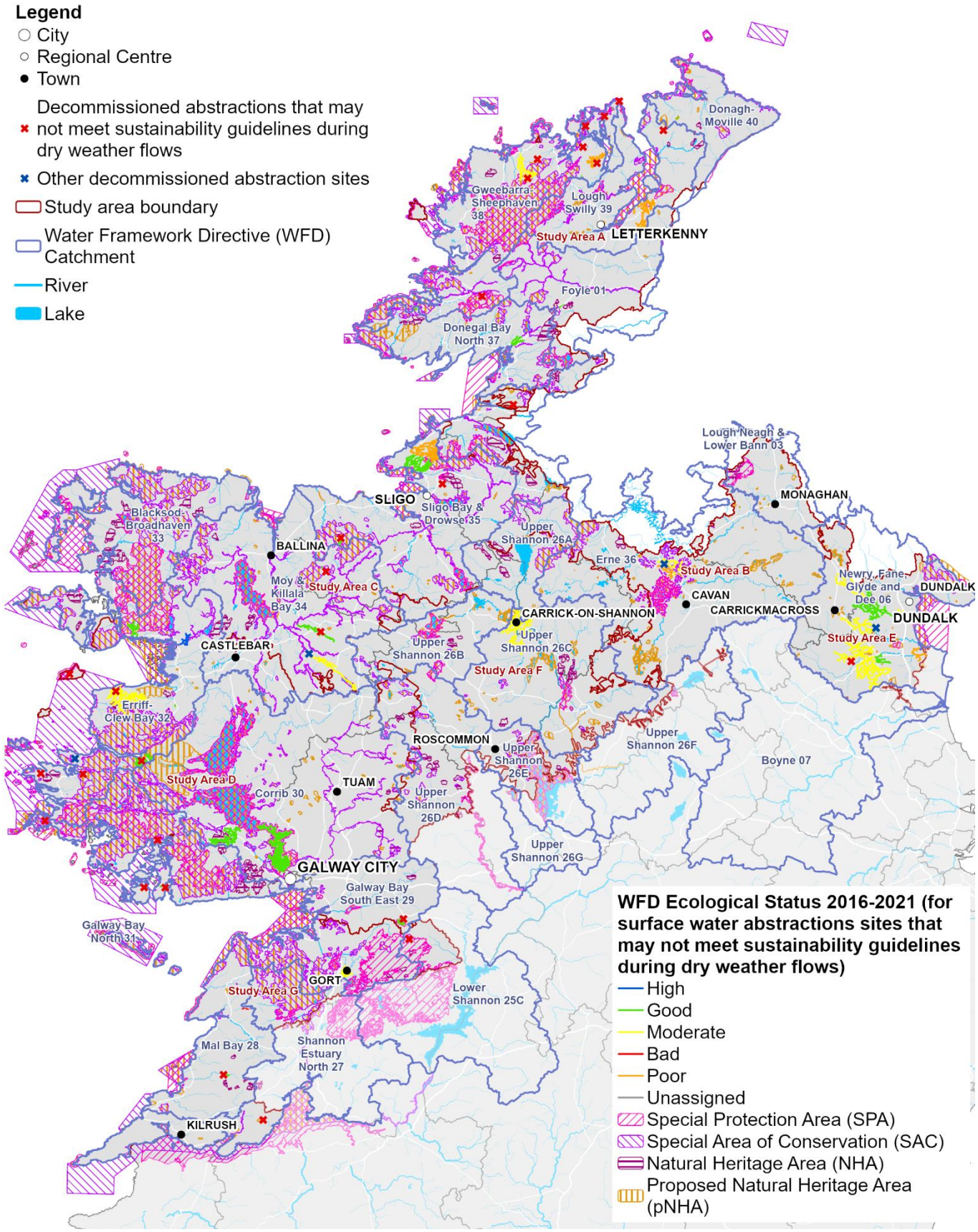


Figure 7.2 The Ecological Status of Surface Waterbodies that will Benefit from Proposed Decommisioning

Figure 7.2 shows the surface water abstractions to be decommissioned once the replacement sources and rationalisation required as part of the Regional Preferred Approach is in place, and the waterbodies that will benefit from proposed decommissioning.

Groundwater abstractions will need to conform to the proposed new abstraction licencing regime as well. Due to the limited long-term records on pumping and drawdown of water levels for many of Uisce Éireann's groundwater supplies, it is difficult to present robust desktop assessments of water availability for their existing groundwater abstractions. Until site-specific studies of groundwater availability are completed, Uisce Éireann have developed an initial assessment for existing abstractions based on best available information. More information on these assessments is provided in Appendix C Supply Assessment and Appendix G Regulatory and Licensing Constraints of the NWRP - Framework Plan. Over the coming years, Uisce Éireann will work with the environmental regulator EPA and the Geological Survey of Ireland, to develop desktop and site investigation systems to better understand the sustainability of their groundwater sources. Uisce Éireann are not in a position to estimate changes to the groundwater availability until better data is available.

Figure 7.3 shows the groundwater abstraction sites in the Preferred Approaches that will benefit from proposed decommissioning.

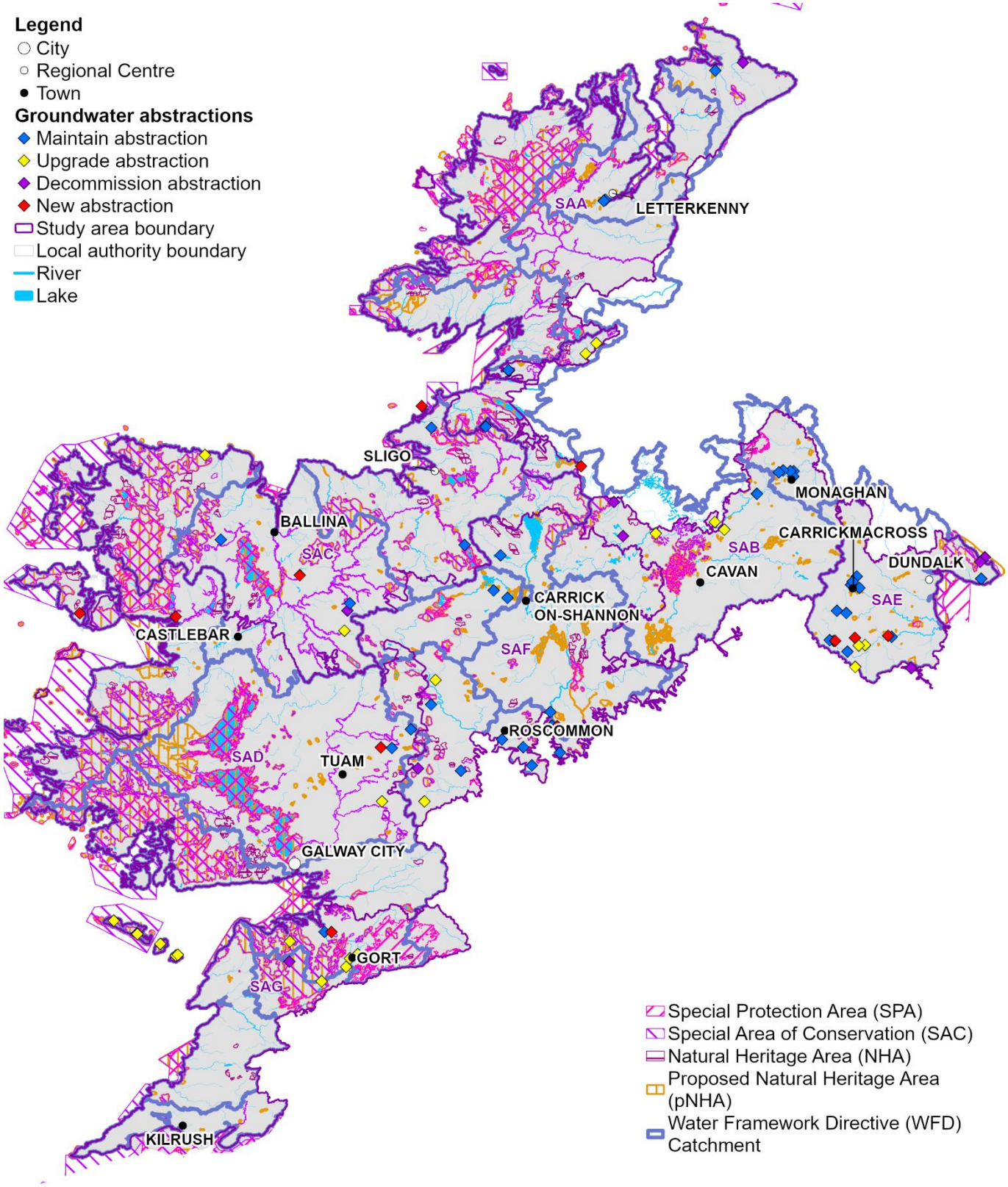


Figure 7.3 Preferred Approach – Groundwater Abstractions

7.12 Appropriate Assessment for the Study Area Preferred Approaches

Study area approaches for four of the seven Study Areas have -3 scores, indicating there are options with the potential for Likely Significant Effects (LSEs) on European Sites that cannot be ruled out without

further detailed site level assessments. These options have been assessed as -3 either because the mitigation may be complex or there is uncertainty around potential impacts. However, with the mitigation proposed in the NIS, these have been assessed at plan level as being expected to have no adverse effects on site integrity (AESIs).

The Preferred Approach for SAA has one -3 score associated with the following SA combination:

- The rationalisation and interconnection of seven WRZs to Letterkenny (SA option 66). The Option requires the completion of works within or crossing a number of SACs which could lead to construction impacts. In addition, abstractions have the potential to impact a number of SPAs and SACs.

The Preferred Approach for SAC has two -3 scores associated with the following SA combinations:

- The increased groundwater abstraction from the Belmullet groundwater body to supply the deficit to Ceide Fields WRZ with an associated upgrade to the WTP (Option SAC-039). The works withing the Glenamoy Bog complex SAC may lead to construction impacts whilst the abstraction may impact Groundwater Dependent Terrestial Ecosystems (GWDTE); and
- The new surface water abstraction from Keel Lough and raw water transfer to the existing WTP requiring upgrades (Option SAC-142). Whilst the new source will only be used to supplement Accorymore Lake during dry periods the required construction works and subsequent abstraction may impact Keel Machair/Menaun Cliffs and Croaghaun/Slievemore SAC.

The Preferred Approach for SAD has five -3 scores associated with the following SA combinations:

- The formation of the New Connemara Regional Water Supply System which requires a new SW abstraction from Kylemore Lough and a new WTP. Construction impacts may be realised through works within and/or crossing The Twelve Bens/Garraun Complex SAC, Maumturk Mountains SAC and West Connacht Coast SAC. Abstraction impacts may also be seen in Twelve Bens/Garraun Complex. Potential impacts could be seen in the Illaunnanoon SPA;
- The new surface water abstraction from Lough Corrib (Option SAD-033). Works within the Lough Corrib SAC and near Lesser Horseshoe Bat foraging ranges designated within Lough Carra/Mask Complex SAC and Ballymaglancy Cave, Cong SAC could sever commuting routes and foraging habitats. Abstraction has the potential to impact the Lough Corrib SAC. Potential impacts are also possible to Lough Corrib SPA and Lough Mask SPA;
- The new groundwater abstraction from Gortgarogh groundwater body spring (Option SAD-040). Construction impacts may arise due to works near Lough Corrib SAC and Lough Lurgeen Bog/Glenamaddy Turlough SAC. Abstraction may impact GWDTE in the SACs and there are potential impacts to Lough Corrib SPA and Lough Mask SPA;
- The rationalisation of Carraroe, Rosmuc and Teeranea Lettermote to Spiddal (Lough Bouliska) involving an increased abstraction from Lough Bouliska (SA Option 43). Works within and or crossing Connemara Bog SAC and Kilkeiran Bay and Islands SAC may lead to construction impacts. The abstraction may also impact the Connermara Bog Complex SAC whilst there are also potential impacts to the Connemara Bog Complex SPA; and
- The construction of a desalination plant to supply the deficit to Inisboffin (Option SAD-055). Construction works may lead to impacts within Inishbofin and Inishshark SAC. Effects of desalination due to brine discharge and chemical use may affect mobile marine mammals in SACs up to 100 km away, notably Inishbofin and Inishshark SAC and West Connacht Coast SAC. Potential impacts could also impact Inishbofin, Omey Island and Turbot Island SPA and High Island, Inishshark and Davillaun SPA.

The Preferred Approach for SAF has two -3 score associated with the following SA combinations:

- Increased groundwater abstraction at Gortgarrow Spring WTP and rationalisation of Kilkerrin/Moylough and Dunmore/Glenamaddy P.S (SA Option 34). Works near the Lough Corrib SAC and Shankill West Boy SAC may result in construction impacts. The abstraction may impact GWTDE in the Lough Corrib SAC. Potential impacts may occur to the River Suck Callows SPA; and
- The construction of a new intake from the middle lake to meet the demand in the North Roscommon RWSS (Option SAF-052). The work required in and near Callow Bog SPA and Tullaghan Bog SAC could lead to construction impacts. Additionally, the works and abstraction may have impacts within the Lough Gara SPA.

There are options with -1 and -2 scores across all seven study areas and as such there is the potential for Likely Significant Effects (LSEs). However, the potential for LSEs for these options is generally associated with construction related impacts and it is also considered that these LSEs will not result in Adverse Effect on Site Integrity (AESI) with the mitigation proposed in place.

7.13 Carbon Costs for the Preferred Approaches

The Preferred Approaches for SAB, SAC and SAD are the Lowest Carbon Approach. For the remaining study areas, the carbon score was similar to the combination of Options selected as the Lowest Carbon Approach. For these study areas, the Preferred Approach was selected in preference to the Lowest Carbon Approach as it had a lower NPV cost, and for SAF offered greater resilience.

There is noted to be scope for improving performance against SEA climate change carbon criteria significantly through energy efficient design and investigation of low carbon opportunities as identified as part of the process for developing future projects in the Environmental Action Plan in section 9. Also, further work on future operational modes will allow Uisce Éireann to optimise the interconnected supplies, in order to provide resilience and environmental benefit whilst balancing energy and carbon impacts.

7.14 SEA and Selection of the Study Area Preferred Approaches

The Preferred Approach for SAA is assessed as the Best Environmental. Similarly, SAB is the Best Environmental as well as the Least Cost, Most Resilient, Best AA and Lowest Carbon. The environmental benefits include improvement to the reliability of supply and reduced long term impact that is achieved through the rationalisation of assets. The Preferred Approach for SAC and SAE are both assessed as the Least Cost Approach and their environmental scores was similar to Option combination selected as the Best Environmental Approach. For SAE, the Preferred Approach is also the Best AA Approach, with no high risk Options that could impact on European sites. The Preferred Approach for SAD, and SAG are considered to be the Least Cost and Quickest Delivery. As with SAC and SAE, the Least Cost and Quickest Delivery Approaches scored similarly in terms of environmental considerations. The Preferred Approach for SAF is the Quickest Delivery Approach after further consideration regarding the increased resilience offered through the use of Lough Gara as a source and the weaknesses affecting feasibility that have been identified with the local solution for the Kilkerrin Moylough WRZ used in other potential approaches.

When considering local circumstances it may be more appropriate to take through the Least Cost or Quickest Delivery Approach. For example, for SAG the Best Environmental Approach included the provision of a pipeline over a long distance, which was associated with a high degree of uncertainty with

respect to timelines and costs. Therefore, taking the Least Cost and Quickest Delivery Approach was considered to be the most appropriate approach. Further detail of these comparisons is presented in the SEA Environmental Reviews.

The Preferred Approach for all seven study areas includes the eventual decommissioning of 38 WTPs and 42 abandoned abstractions, of which 32 are surface water sources. Twenty-eight of the abandoned surface water sources are abstractions that may not meet sustainability guidelines under dry weather flows (as assessed by Uisce Éireann using the UKTAG guidelines). Cessation of abstractions from these surface water sources has potential to benefit ecology and support WFD objectives as well as supporting the SEA water and biodiversity objectives.

Uisce Éireann have also determined that 44 of the surface water abstractions that will be maintained under the Preferred Approach may not meet sustainability guidelines during dry weather flows. While the plan level assessment has identified that these abstractions may not meet sustainability guidelines, further project level assessments will need to be carried out in the context of applications for planning permission and/or abstraction licences under the new legislative regime. While the plan level assessment has identified that these abstractions may not meet sustainability guidelines during dry weather flows, further project level assessments will need to be carried out in the context of applications for planning permission and/or abstraction licences under the new legislative regime.

The Preferred Approach improves or avoids further deterioration at these sources by reducing existing abstractions or developing additional sources to support growth. Reduced abstractions have the potential to benefit aquatic ecology and contribute to the meeting of WFD objectives for these sources. Many of Uisce Éireann's existing abstractions will require a licence under the new abstraction legislation. Detailed environmental assessments will be submitted with the licence applications which will be assessed and adjudicated by the EPA. The SEA and AA set a framework for identifying mitigation and monitoring so that these can be part of the decision-making and inform option design and development. This is further discussed in section 9.

7.15 Sensitivity Testing of the Preferred Approaches

The Uisce Éireann supply demand forecast has been developed using the best available information and application of best practice methods where the data available allows.

Future events that could alter the Supply Demand Balance and impact on Need, such as climate change and new abstraction legislation, introduce uncertainty to long-term forecasts. The draft RWRP section 7 outlines the sensitivity analysis that Uisce Éireann has undertaken to stress test the Preferred Approaches against a range of possible futures. This aims to ensure that decision making is robust and that the Preferred Approaches are adaptable.

Future scenarios are considered in relation to five uncertainty factors:

- **Sustainability:** New abstraction legislation introducing sustainability limits on quantities to be abstracted, increasing the SDB Deficit;
- **Climate change:** Climate change reduction in water availability at certain times of the year is greater than anticipated, increasing the SDB Deficit;
- **Growth forecast:** Growth in demand is lower than forecast, reducing the SDB Deficit;
- **Leakage targets exceeded:** Uisce Éireann achieve better than expected levels of effectiveness and efficiency in reducing leakage, reducing the SDB Deficit; and
- **Leakage targets not met:** Leakage does not reduce to target levels within the planning period, increasing the SDB Deficit.

A scenario where growth is higher than forecast is not considered as Uisce Éireann consider the projections used in their SDB calculation to reflect an optimistic growth forecast. Furthermore, the scenario of higher than forecast growth would have the same impact as a scenario where leakage targets are not met. Uisce Éireann will update the SDB with the 2022 census data. Updated data and information such as new census data, will be incorporated via the monitoring and feedback process as set out in section 8.3.8 of the Framework Plan. As a headroom allowance has been provided in Uisce Éireann's Supply Demand Balance to allow for uncertainty in the data they do not anticipate any update to the Supply Demand Balance will significantly change their predictions.

These scenarios are considered in terms of how whether then might have negatively affect meeting SEA objectives (amber) or be supportive in contributing to meeting them (green) and are shown in Table Table 7.14.

Table 7.14 Sensitivity Analysis of the Preferred Approach

Sensitivity Criteria	Impact on the SA Preferred Approach						
	SAA	SAB	SAC	SAD	SAE	SAF	SAG
Sustainability Impact*							
Status of abstraction potentially impacted by new legislations with PA in place	Decommission 9 Maintain 21	Decommission 1 Maintain 8	Decommission 3 Maintain 5	Decommission 10 Maintain 10	Decommission 1 Maintain 3	Decommission 0 Maintain 0	Decommission 2 Maintain 2
Likelihood	Moderate/High	Moderate/High	Moderate/High	Moderate/High	Moderate/High	Moderate/High	Moderate/High
Change in Deficit (m^3/day)	+38,000	+8,000	+10,000	+10,000	+20,000	+0	+21,000
SEA objectives Impact							
This would involve reducing existing abstraction where required in addition to the abandoned abstractions and reductions in the Preferred Approaches – this can benefit the environment where needed but could require increased abstraction from other sources within sustainability and licence requirements, but also potentially other actions to reduce demand or leakage. For SAF there are no foreseen sustainability issues with current sources. Although additional sustainability reductions could add pressure for additional supply from outside the study area the proposed Preferred Approach is expected to improve resilience and reduce pressure overall.							
Climate Change Impact							
Likelihood	High	High	High	High	High	High	High
Change in Deficit (m^3/day)	+2,000	+200	+600	+400	+300	+0	+600
SEA objectives Impact							
Reduced availability indicating higher pressure on the environment for abstractions but effect likely to be accommodated through additional operational actions							

Sensitivity Criteria	Impact on the SA Preferred Approach						
	SAA	SAB	SAC	SAD	SAE	SAF	SAG
Demand Growth Impact							
Likelihood	Low/Moderate	Low/Moderate	Low/Moderate	Low/Moderate	Low/Moderate	Low/Moderate	Low/Moderate
Change in Deficit (m^3/day)	-40,455	-2,274	-26,817	-29,504	-1,233	-15,823	-5,946
SEA objectives Impact							
Reduced demand growth can reduce energy and carbon emissions and reduce abstraction pressure							
Leakage Targets Not Met							
Likelihood	Low	Low	Low	Low	Low	Low	Low
Change in Deficit (m^3/day)	+634	+96	+578	+1,448	+40	+513	+231
SEA objectives Impact							
Reduced benefits compared to meeting leakage targets with associated increased energy and carbon but effect likely to be accommodated through additional operation actions							
Leakage Targets Exceeded							
Likelihood	Moderate/High	Moderate/High	Moderate/High	Moderate/High	Moderate/High	Moderate/High	Moderate/High
Change in Deficit (m^3/day)	-20,605	-1,142	-11,961	-40,107	-4,945	-10,431	-9,156

Sensitivity Criteria	Impact on the SA Preferred Approach						
	SAA	SAB	SAC	SAD	SAE	SAF	SAG
SEA objectives Impact							
Reduded demand growth can reduce energy and carbon emissions and reduce abstraction pressure							

Key		
SEA objectives impact	+ve impact	-ve impact

= Reduced SDB Deficit

= Increased SDB Deficit

* Number of abstractions potentially impacted by new legislation that are proposed to be decommissioned in the Preferred Approach. Abstractions which will be potentially impacted by the new legislation are set out in 4.3.2. These impacts are based on conservative estimates of what a future regulatory regime may require. The actual reductions that may be needed in future will depend on the specific requirements of that legislation.

In reality, a combination of these scenarios may occur together. For example, growth in demand might be lower if Uisce Éireann achieve greater leakage reductions. However, if this coincided with a reduction in permitted abstraction volume under the new abstraction licensing regime, the reduction in demand may offset some or all of the loss in supply availability due to abstraction sustainability reductions.

Overall, the sensitivity assessment of the Interim and Preferred Approach indicates they are highly adaptable to a broad range of futures, and therefore represent 'no regrets' infrastructure. More information on the sensitivity analysis is given in the Environmental Reviews in Appendix H.

7.16 Future Project Level Assessment

The assessments for the Preferred Approaches, and the options identified within them at this stage are at plan level. Environmental impacts and costing of options are further reviewed at Project level. No statutory consent or funding consent is conferred by inclusion in the NWRP (National Water Resource Planning) Framework. Any options that are progressed following this Plan will require individual environmental assessments, including Environmental Impact Assessment and Appropriate Assessment (as required), in support of planning applications (for example, for new abstractions). Any such applications will also be subject to public consultation. Typical types of project level assessment are outlined below.

In parallel to the development of the project scope, design feasibility and environmental assessments will be required. The level of assessments required will depend on the size and scale of the solutions. Assessments at project level will typically include:

- Hydrological and hydrogeological assessments of yield. These will include the collection of specific data. A critical aspect of the project level yield assessments will be to ensure that the impact of the development of a new source for water supply will not impact other existing sources or other water users. For example, if Uisce Éireann are looking to develop a new groundwater source, it would need to determine that these sources do not impact any existing abstraction, for example, an existing Uisce Éireann or Group Water Scheme groundwater source or an existing abstraction required for industry or agricultural use. This would be assessed by installing water level monitors on existing boreholes that could be impacted by the new source, for the duration of the pump testing.
- Environmental assessments, including an Appropriate Assessment (AA) screening, Environmental Impact Assessment (EIA) screening and WFD assessments. Outputs from the hydrological and hydrogeological assessments will be a key factor in the determination of the level of environmental assessments required as these will provide more information on the boundary of any potential environmental impacts. For example, pumping tests may indicated that the zone of contribution for an aquifer is larger than initially anticipated and confirm a link with a SAC. In such a scenario any potential impact to the SAC will need to be considered as part of the environmental assessment for the project. Where the requirement for AA or EIA is identified, further site-specific environmental assessments will be required, and the scope of these works will need to be developed in consultation with the relevant stakeholders;
- Water Quality Assessments. These will include the collection of samples of raw water from the proposed source to determine the required treatment process.
- Site selection and route selection assessments. While the indicative locations of infrastructure have been provided in the plan, the actual routes and location of assets will need to be considered in more detail at project level. At this stage details of all existing infrastructure,

including underground services, will be obtained. This, along with environmental constraints, will be considered in the determination of the preferred route/site.

Stakeholder engagement is also an important aspect to project development. The extent of engagement will be dependent on the size and scale of the project, but will typically include environmental stakeholders, landowners, the general public, Local Authorities and asset owners (Group Water Schemes, ESB, Bord Gáis etc).

8 SEA Regional Level Assessment

8 SEA Regional Level Assessment

8.1 Regional Level Alternatives

As identified in section 7, the WRZ and Study Area Level approach alternatives have been considered. During the study area level assessment process, the Feasible Options were compared to see whether any SA or Regional options were available to meet the Need across multiple WRZs. For some study areas this led to the identification of Preferred Approaches which involve an external transfer i.e. from a supply in adjacent regions.

For the Regional Level assessment, the potential Preferred Approach has been reviewed further to consider potential for any additional alternative combinations at this level.

During that process Uisce Éireann assessed the Feasible Options to determine whether any SA options were available to meet the Need across multiple WRZs (SA options). This process identified 21 SA options. Four SA options involve an interconnection with an external transfer i.e. from a supply in another study area (Cross Study Area Transfer). One of these involves a transfer from a WRZ located in the Eastern and Midlands Region (SA option 8 from SAE transfer from South Louth East Meath Eastern and Midlands to Drybridge Collon/Ardee North West). There is also a WRZ option which mantains and exisiting import from Northern Ireland (SAE-050).

The transfer from the South Louth East Meath transfer relies on the New Shannon Source detailed in the RWRP-EM. In the case that the New Shannon Source does not go ahead there is an alternative option which has been assessed as part of the SEA for the RWRP-EM.

The potential for large feasible options with the capability to provide regional interconnectivity is limited by the terrain across the North West Region and constrained by the location of environmentally sensitive site and the sustainability of the water sources. The Preferred Approach for each study area does however comprise large, interconnected supplies within the study area boundaries and in this way provides the benefit of resilience and improved environmental outcomes, through the decommissioning of unsustainable sources and interconnection of supplies. The assessments for these are included in the study area Environmental reviews for SAA-G, summarised in section 7.1-7.7 and detailed in Appendix H. These also assess potential for cumulative effects within each study area. The small Cross Study Area Transfers, including the one connection to the Eastern and Midlands region, are further considered as part of the whole plan cumulative assessment in section 9.

There are topographical constraints in the North West region and a high number of waterbodies not currently meeting WFD ‘good’ status objectives limits the volume of water that can be sustainably abstracted from many water sources in the North West. These constraints combined with the many small isolated settlements mean that large feasible options with the capability to provide regional interconnectivity (across Study Area boundaries) have not been identified for the North West region. This is further explained in section 8.2 of the RWRP-NW.

8.2 The Regional Preferred Approach

For the Regional Level assessment, the potential Preferred Approach has been reviewed further to consider potential for any additional alternative combinations at this level.

The Option Development Process for the North West Region did not identify any feasible options with the potential, in terms of quantity and distribution of supply, for a large-scale interconnection of multiple WRZs across the study area boundaries. For this reason, the Study Area Preferred Approach that is

presented in section 7 is identified as the 'Best Value' solution to address the regional water supply Need. The Regional Preferred Approach is therefore defined as the combination of the 7 Study Area Preferred Approaches for the North West Region.

8.2.1 Interconnected WRZs

Although the Preferred Approach does not involve a large-scale regional interconnected supply, the Preferred Approach does comprise large, interconnected supplies within the study area boundaries. The benefits of interconnecting supplies are outlined in section 8.3.1 of the RWRP-NW. These are all assessed within the Study Area Environmental Reviews Appendix H SAA-G and are summarised in section 7 of this SEA Environmental Report.

Interconnecting supplies include (in most cases) interconnected WRZs, and the rationalisation of one or more existing water supply systems. They also provide additional benefits which are identified in the RWRP-NW and include:

- Smaller and/or unsustainable abstraction sources to be decommissioned (once alternatives are in place) - these have potential benefits for aquatic ecology and can contribute to meeting WFD objectives;
- Decommissioning of WTPs for improving reliability of supply and delivers efficiencies through the reduced number of assets to operate and maintain. Improved minimum Level of Service of 1 in 50 across all WRZs in the North West Region during normal, dry, drought and winter conditions – Operational flexibility and increased resilience by enabling supply to be delivered from other connected WTPs or storages during drought periods and at times of supply outages resulting from maintenance or operational failure. These can all provided wider associated community benefits;
- Larger supply systems are therefore less sensitive to peaks in demand during critical events. For this reason, peaking factors (used to estimate design capacity) are lower for larger WRZs, offering increased resilience through large, interconnected supplies;
- Uncertainty and sensitivity to demand is reduced and one of the key benefits for merging WRZs is this reduction in the design capacity resulting from the increased resilience of larger water supply systems. For RWRP-NW an estimated reduction in abstraction volume of 74.7 Ml/d is achieved compared with the alternative of maintaining fragmented supply systems - this can help reduce pressure for abstraction; and
- Increased efficiency and economies of scale in delivering leakage reduction measures compared with fragmented systems also enabling environmental benefits from energy and carbon savings and reducing pressure for abstraction.

These interconnection benefits also support SEA objectives during operation, although, the additional pipeline network involved is associated with local environmental construction impacts.

Table 8.1 Regional Preferred Approach

Study Area	Regional Preferred Approach
SAA	**5 WRZ Options:** 3 Options with increased/new GW/SW abstractions 2 Options involving 'within WRZ supply rationalisations

Study Area	Regional Preferred Approach
	3 SA Options: 1 Option interconnecting 4 WRZs 1 Option rationalising and interconnecting 8 WRZs (two of which are located in SAB) 1 Option rationalising 1 WRZ (Glenties Adara) to Lettermacaward and interconnecting Owenteskiny and Killybegs
SAB	**17 WRZ Options:** 5 options with increased/new GW/SW abstractions 4 Options with WTP upgrades (Water Quality (WQ) only) 7 Options maintaining supply from a Group Water Scheme (GWS) 1 Option involving a GWS import **4 SA Options:** 1 Option interconnecting Cavan and Ballyhaise to Ballyjamesduff 1 Option involving the interconnection of 2 WRZs 2 Options involving the rationalisation of 2 WRZs each 1 Option involving the rationalisation of 4 WRZs and an increased GW abstraction
SA-C	**11 WRZ Options:** 6 Options with increased/new GW/SW abstractions 2 Options with a WTP upgrade (WQ only) 1 Option involving a GWS import 2 Options rationalising to a GWS **3 SA Options:** 2 Options including rationalisation of WRZs, collectively rationalising 3 WRZs to 2 WRZs 1 Option rationalising 1 WRZ to SAD and increasing the SW abstraction
SAD	**14 WRZ Options:** 13 Options with increased/new GW/SW abstraction 1 desalination Option **4 SA Options:** 2 Options including rationalisation with increased SW/GW abstractions collectively rationalising 3 WRZs to 2 WRZs 1 Option with a rationalisation to a new community scheme/GWS 1 Option with a new abstraction creating a new RWSS
SAE	**7 WRZ Options:** 3 Options involving a WTP upgrade for WQ 1 Option involving a Northern Ireland import

Study Area	Regional Preferred Approach
	3 options involving new/increased SW/GW abstractions **2 SA Options:** 1 Option involving rationalisation of Collon Drybridge to South Louth East Meath (in the Eastern and Midlands region) and associated new GW abstraction 1 Option involving a new groundwater abstraction
SAF	**12 WRZ Options:** 6 Options involving new/increased SW/GW abstractions 4 Options involving WTP upgrades for WQ 2 Options maintaining supply from a GWS **2 SA Options:** 1 Option interconnecting 2 WRZs and increasing a SW abstraction 1 Option rationalising to SAD and increasing GW abstraction
SAG	**4 WRZ Options:** 2 Options involving WTP upgrades (for WQ) 2 Options involving new/increased SW/GW abstractions **3 SA Options:** 2 Rationalisation Options with increased GW abstraction, collectively rationalising 2 WRZs to 2 WRZs 1 interconnection Option with an increased SW abstraction

8.2.2 Cross Study Area Transfers

The Regional Preferred Approach includes five SA options which involve an interconnection with an external transfer i.e. from a supply in another study area (Cross Study Area Transfer); one of these involves a transfer from a WRZ located in the Eastern and Midlands Region. There is also a WRZ option that involves a Northern Ireland import.

Table 8.2 lists the 'Source' and 'Destination' study area, the 'parent' WRZ (i.e., the WRZ which is to supply the other WRZ) and the rationalised WRZs (i.e. the WRZs which will be receiving a supply from the parent' WRZ). These transfers are shown in Figure 9.3 with the letter references listed in Table 8.2.

Table 8.2 Cross Study Area Transfers

Source SA (Source Region)	'Parent' WRZ	Destination SA	Rationalised WRZs	Figure 9.3 Reference
SAA (North West)	Ballyshannon/ Bundoran	SAB	Derrykillew	A

Source SA (Source Region)	'Parent' WRZ	Destination SA	Rationalised WRZs	Figure 9.3 Reference
SAA (North West)	Ballyshannon/ Bundoran	SAB	Cashilard	B
SAD (North West)	Lough Mask	SAC	Kiltimagh	C
SAD (North West)	Dunmore Glenamaddy	SAF	Kilkerrin/Moylough	D
SA3 (Eastern & Midlands)	South Louth East Meath	SAE	Drybridge Collon/Ardee	E
Northern Ireland source	NI Source	SAE	Carrikkarnon	F

The largest transfer is approximately 3,800 Ml/d to the Drybridge Collon/Ardee WRZs from the New Shannon source. The remaining transfers range between <1 Ml/d and 2,240 Ml/d.

The impact of the abstraction volumes required to supply both the WRZs in the 'Source' study area and the WRZs in the 'Destination' study area, is considered in combination. As with all new and upgraded abstractions, the volume is limited to the estimated dry year sustainable abstraction threshold and this is taken into account in the assessments for each option. Other potential in-combination and cumulative impacts are considered for these transfers in section 9 of this report.

8.2.3 Option Types and Component Summary

The Regional Preferred Approach provides a solution to address an estimated 2044 DYCP Deficit of 141 Ml/d. This is achieved through a combination of small Cross Study Area interconnections, interconnected SA Options within study Areas, two small supplies from Group Water Schemes, and local groundwater and surface water sources. It also includes WTP upgrades to reduce water quality risks identified through Uisce Éireann's barrier assessment. Table 8.3 summarises the option type and the deficit that will be supplied for the North West Region.

Table 8.3 Preferred Approach Option Types

Option Type	No. of Existing Benefitting WRZs	Deficit Supplied (m^3/day)	Percentage of Regional Deficit Supplied (%)
Local source (GW)	19	9,180	7
Local source (SW)	20	42,080	30
Within SA interconnection	49	86,800	61
Cross SA interconnection	5	1,950	1

Option Type	No. of Existing Benefitting WRZs	Deficit Supplied (m^3/day)	Percentage of Regional Deficit Supplied (%)
Group Water Scheme	12	1.550	1
Northern Ireland Import*	1	<1	<1
WTP upgrade (WQ only)	14*	N/A	N/A

*This is the number of WTPs that will be upgraded for water quality only. It does not include the existing WTPs that will be upgraded for both water quality and capacity, as these form part of the other Option Types.

When the options within the Regional Preferred Approach are delivered, the number of WRZs across the region will be reduced from 119 to 81 through the development of interconnected systems. 15 new WRZs will be formed via 692 km of trunk mains (>300mm diameter).

Table 8.4, Figure 7.1 and Figure 7.3 summarise changes to Uisce Éireann's WTPs and abstractions.

Table 8.4 WTP and Abstraction Summary

Option Component	No. of Water Treatment Plants	No. of Surface Water Abstractions	No. of Groundwater Abstractions
New	10	13	9
Increased capacity	45	20	18
Maintained (WTP upgrade for quality only)	59	50	29
Decommissioned	38	32	10

8.3 The Regional Preferred Approach Summary

The options included in the Preferred Approach are listed in Appendix C for each study area.

The Regional Preferred Approach considers, at a plan level, what projects/solutions might work best to meet the overall deficit in the North West Region. Taking a holistic view of the region presents opportunities to improve the sustainable water resources management and increase operational flexibility and resilience.

While some small Cross Study Area Transfers were identified, including an inter-regional supply, the potential for a large feasible option with the capability to provide regional interconnectivity (across study area boundaries) was considered limited due to the terrain across the North West Region and constrained by the location of environmentally sensitive site and the sustainability of the water sources. However, the Approach Development Process at Study Area Level, identified large, interconnected supplies within the study area boundaries which will ultimately increase resilience of supply for customers and support environmental sustainability in the long term. These works are associated with extensive construction works which will have environmental impacts and risks. These have been assessed for each option and mitigation measures are identified in the Study Area Environmental

Reviews in Appendix H. Further consideration of the combined and cumulative effects of the Regional Preferred Approach is set out in section 9 of this report.

The projects and options identified in the Regional Preferred Approach will be subject to their own planning and regulatory processes and these will be delivered on a phased basis and will progress based on a risk-based prioritisation of capital investment, allowing Uisce Éireann to address Need accordingly. It will take a number of investment cycles to progress these projects and they may change in later iterations of the plan. Over time, the intention is to ensure the delivery of a more Sustainable, Resilient and cost-effective water supply service.

9 Cumulative Effects at Regional Level

9 Cumulative Effects at Regional Level

Article 3(5) of the SEA Directive states that it should be determined "*whether plans or programmes … are likely to have significant environmental effects".* Annex II (2) details the criteria for determining the likely significance of effects referred to in Article 3(5), including the need to take into consideration "*the cumulative nature of the effects*".

The EPA (2020) describes cumulative effects in SEA as:

"effects on the environment that result from incremental changes caused by strategic actions together with other past, present, and reasonably foreseeable future actions. These effects can result from individually minor but collectively significant actions taking place over time or space."

A cumulative effects assessment for a water resource management plan should include:

- Effects of measures/options proposed within a plan or programme; and
- Effects between the measures/options proposed within the plan or programme and other projects, plans and programmes.

At the Regional Level, cumulative effects need to be considered in relation to the combined effects from proposals in the seven component study areas of the North West regional group area 'within plan' and includes consideration of the transfers across study areas and inter regional transfers.

For cumulative effects to occur, there needs to be an overlap of temporal periods in some way for the impacts and/or the effect. For example, two strategic-level schemes being constructed at the same time could result in cumulative traffic movements, while two schemes being operated together could result in a drawdown of groundwater levels. A precautionary approach has been taken for the cumulative effects assessment, which assumes that all options could be constructed at the same time and then all options would be operated at the same time.

The assessment has considered the cumulative effects across all SEA topics to identify those interactions that are likely to generate significant effects. These are likely to be related to:

- Biodiversity – for example, a cumulative loss or fragmentation of habitats or changes to a habitat quality through changes in water quality or groundwater levels. Across the North West Region, there are approximately 634,435 ha of peat bogs, 71,800 ha of waterbodies and 559 ha of water courses – some of the habitats associated with these could be vulnerable to changing water levels or water quality changes;
- Water environment (surface water and groundwater WFD status) – for example, changes to water quality due to multiple construction projects;
- People and health – for example, nuisance or physical health impacts caused by multiple construction works taking place at the same time;
- Landscape and visual – for example, if there are a number of options located close together that could alter the landscape character or views;
- Cultural heritage – for example, if the same cultural heritage features are affected by above ground infrastructure in close proximity or the combined effect of loss to undesignated archaeological assets or from combined impacts resulting in additional changes to water levels affecting archaeological resources; and
- Climate change – combined carbon emissions for the approach as a whole have been considered through the approach selection process and are reported here also to identify potential requirements for mitigation. Combined effects on climate change adaptation are also considered.

9.1 Cumulative Effects 'Within Plan'

9.1.1 Overview

The Preferred Approaches across the seven study areas are shown in relation to environmental constraints in Figure 9.1 and Figure 9.2. This identifies option locations and transfer routes.

The Corine land analysis[16], as shown on Figure 9.2, shows that the largest land uses across the North West Region potentially affected by options within the Study Area Preferred Approaches are pastures, and peat bogs. All of these land uses and habitats could be temporarily disturbed, for example, through vegetation clearance within the 15m construction buffer zone around pipelines and site areas. For pipelines this will depend on route alignment and location within or along-side roads. Some land uses will also be permanently lost within construction footprints for infrastructure such as WTPs.

[16] Since the land cover analysis was undertaken for the NWRP, OSI has published the National Land Cover Map. The analysis will be updated as part of the data review process as outlined in section 9 of the RWRP-NW. The National Land Cover data is identified as a source of baseline information in the SEA monitoring plan to be used for project development and assessments going forward.

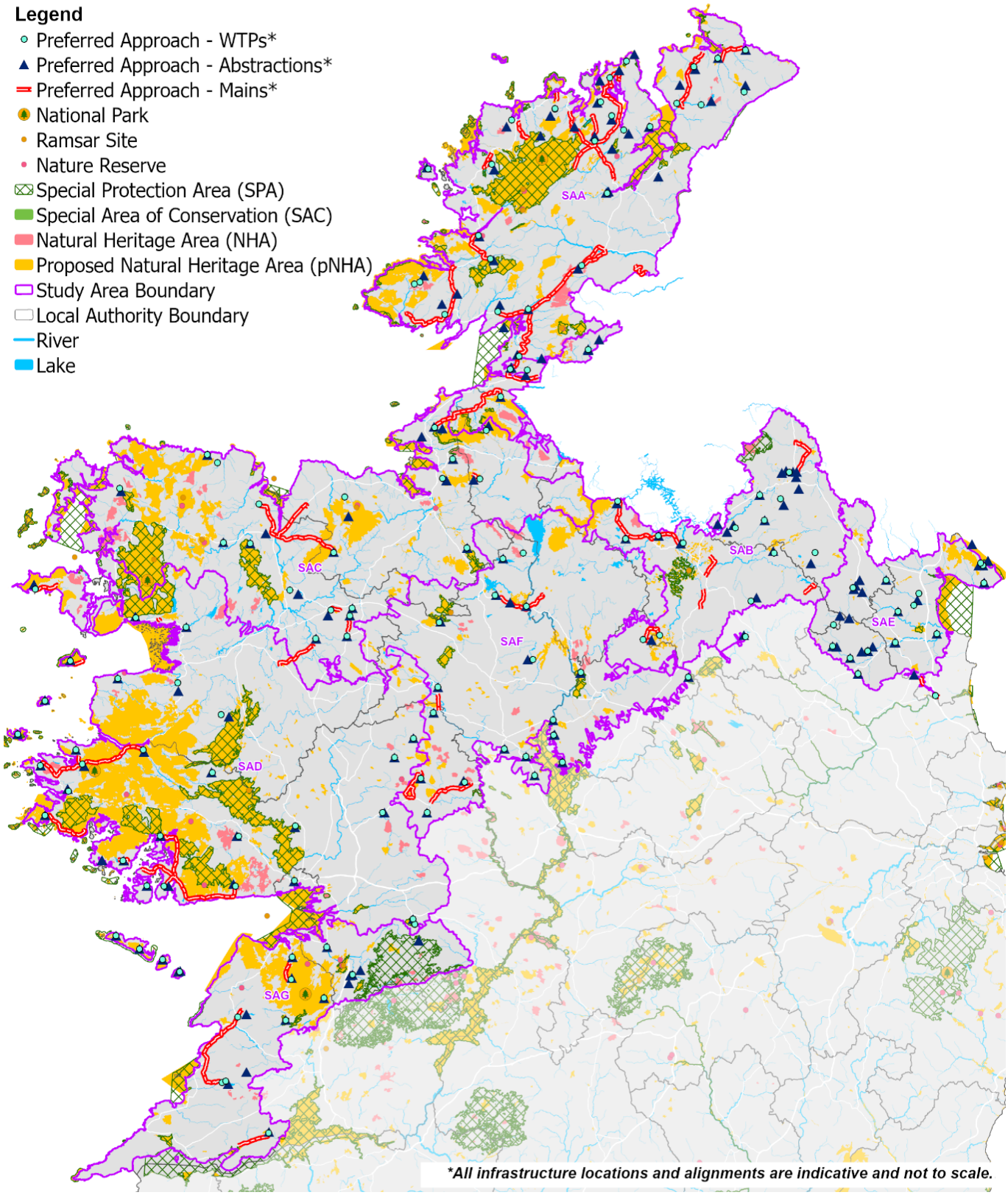


Figure 9.1 Environmental Designations for the North West Region

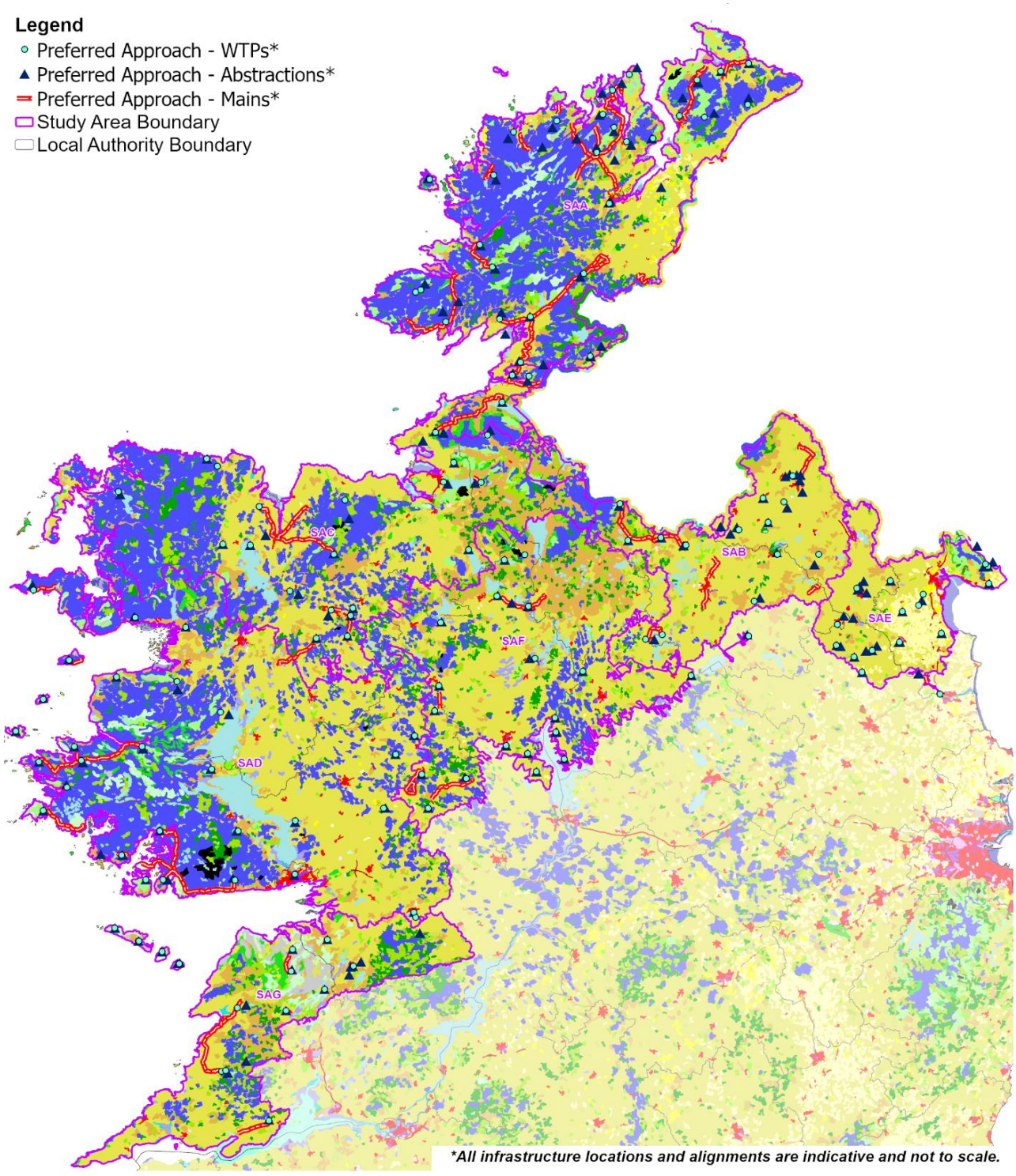


Figure 9.2 Corine Land Cover Analysis for the North West Region

Sustainability analysis for groundwater and surface water abstraction has already taken account of combined effects from other Uisce Éireann abstractions within and across study area or region boundaries. Therefore, the components of Preferred Approaches most likely to lead to within-plan cumulative effects are the construction of pipelines and associated works, such as new WTPs and pumping stations. The pipelines for smaller water transfers are likely to be road-based. The pipelines will vary in size but there are five small SA options that involve interconnections across Study Area boundaries (Cross Study Area Transfer); four of which are within the North West Region and one of which is within the Eastern and Midlands Region. There is also one WRZ option that maintains an existing import from Northern Ireland as a transboundary transfer (SAE-050 - see F in Figure 9.3). The largest Cross Study Area Transfer is within the Easten and Midlands Region, from the New Shannon source (South Louth East Meath) in SA3 to the Drybridge Collon/Ardee WRZs in SAE; transferring water at approximately 3,800 Ml/d. The five cross study transfers and the Northern Ireland transboundary transfer are identified in Figure 9.3 below:

A - SAA to SAB (North West)

B - SAA to SAB (North West)

C - SAD to SAC (North West)

D - SAD to SAF (North West)

E - SA3 to SAE (Eastern & Midlands)

F - Northern Ireland to SAE (Northern Ireland Import)

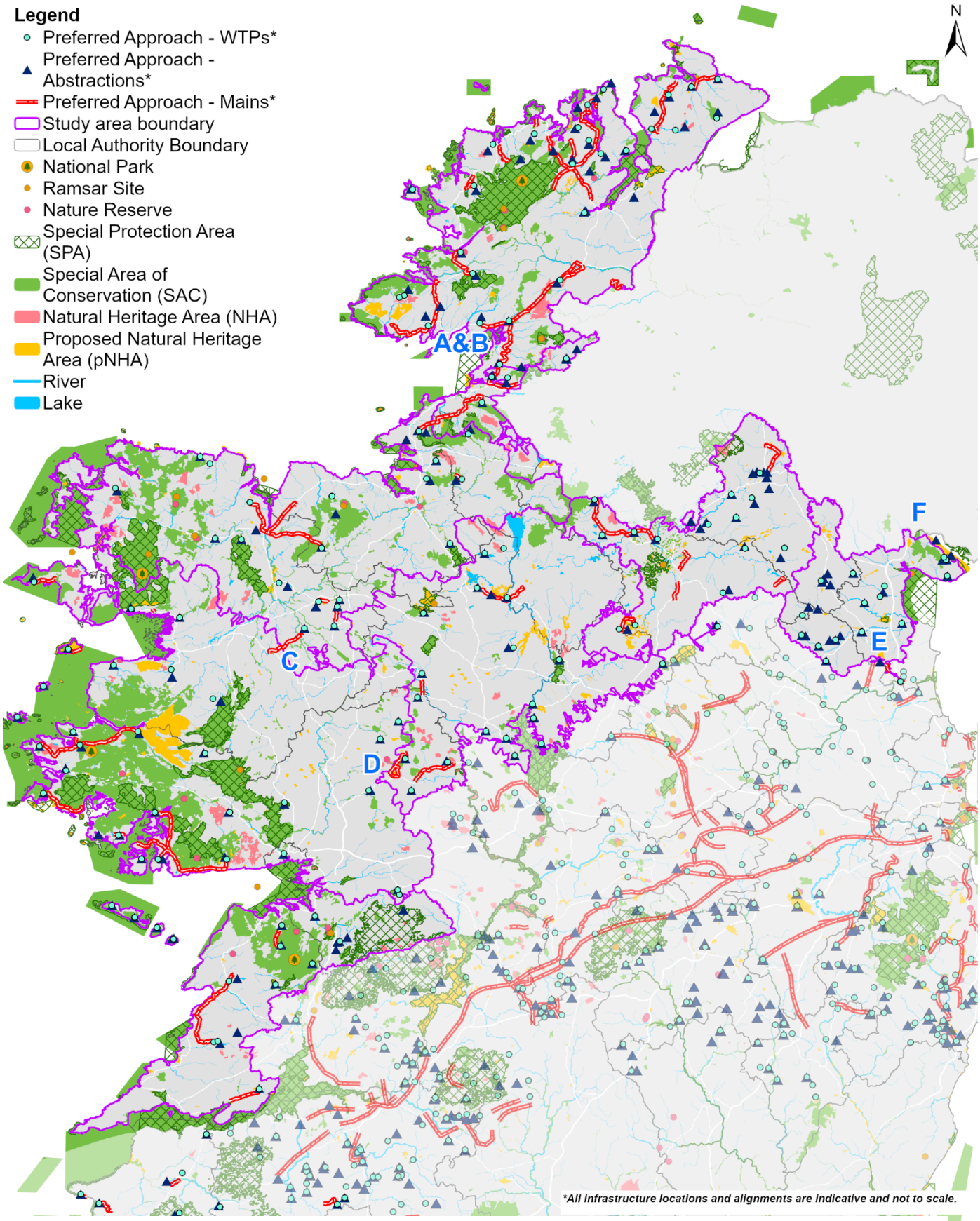


Figure 9.3 Cross Study Area Transfers

9.1.2 Within-plan cumulative effects

The ‘within-plan’ cumulative effects across the seven study areas are summarised in Table 9.1 below.

Table 9.1 ‘Within-Plan’ Cumulative Effects Across the Study Areas

Study Area	Population, Economy, Tourism and Recreation, and Human Health	Water Environment	Biodiversity, Flora and Fauna	Material Assets	Landscape and visual amenity	Climate change	Cultural heritage	Geology and soils
SAA								
SAB								
SAC								
SAD								
SAE								
SAF								
SAG								

Key	
Construction Phase	
Operation Phase	
Construction and Operation	

Potential significant cumulative effects identified in Table 9.1, in relation to each SEA topic, are described in sections 9.1.3 to 9.1.8.

9.1.3 Cumulative Effects on Population, Economy, Tourism and Recreation, and Human Health

Potential cumulative effects include possible combined effects for disruption to traffic if the construction of the options associated with the Preferred Approaches were to occur at the same time and affect the same location, with potential secondary impacts on local businesses and tourism in some locations. There could also be cumulative effects on air quality and noise disturbance should this occur. However, all of these effects are unlikely to be significant at the North West Region level as the implementation of the Preferred Approaches will be temporally and spatially distant from each other.

Rationalisation and improvements to WTPs across the North West Region (to meet WFD objectives) are likely to have a positive cumulative effect on access to water quality, with associated improvements to levels of service and drinking water quality and benefits to wellbeing and human health.

9.1.4 Cumulative Effects on Water Environment

Cumulative construction works activities could affect water quality through increasing surface water runoff or increasing the risk of pollution (accidental spillage) during works. Application of standard mitigations measures should minimise risk. The rationalisation of abstraction and WTPs are in some

cases likely to result in positive cumulative effects on the water environment with benefits for aquatic ecology and contributing to meeting WFD objectives. Twenty-eight of the abandoned surface water abstractions sources will benefit from reduced abstraction pressure as they are currently assessed by Uisce Éireann as being unable to meet sustainability guidelines during dry weather flows.

The cumulative effects on groundwater and waterbody quantity status from abstraction are not expected to adversely impact on WFD objectives for water quality and water resource quantity based on the hydrogeological assessment commissioned by Uisce Éireann (Irish Water, 2022). There are likely to be additional cumulative benefits from the cessation of 8 small groundwater abstraction where these support surface water flow. However, the interaction between groundwater and surface water in terms of negative and positive cannot be taken into account at this level as more detailed studies would be required where risks are identified.

9.1.5 Cumulative Effects on Biodiversity, Flora and Fauna

The construction of new infrastructure could have impacts on water quality and hence aquatic biodiversity and SACs. Operational impacts from groundwater abstraction may occur to groundwater dependent habitats, such as peat bogs. Operational impacts of surface water abstraction may occur on aquatic habitats such as SAC designated rivers. Across the North West Region, there are approximately 634,435 hectares of peat bog (23.6% of all land use), 71,800 ha of waterbodies and 559 ha of water courses.

The water used for all transfers will be treated as this is part of the design. Raw water transfers were ruled out before or during Coarse Screening, therefore, no cumulative effects are identified for INNS transfer during scheme operation. Mitigation measures for managing INNS risk during construction will avoid cumulative effects for spreading INNS.

Improvements through rationalisation of the network including decommissioning of local abstractions across the North West (to meet WFD objectives) are likely to have a positive cumulative effect on water quantity, with associated benefits to water quality and water-dependent biodiversity. This includes benefits for surface and groundwater abstractions and associated protected sites that identified as under pressure or at risk based on initial sustainability reviews.

9.1.6 Cumulative Effects on Climate Change

There are potential cumulative effects on greenhouse gas emissions across the North West Region's Preferred Approaches for the construction and operational periods (whole life carbon).

This includes the embodied carbon associated with construction materials, greenhouse gas emissions associated with construction and maintenance vehicle traffic and the energy and emissions required for water pumping. The carbon emissions are based on estimates from individual schemes, however, the overall carbon footprint for the study areas and the North West Region will also be influenced by the replacement of less efficient infrastructure and WTPs and potential improvements to operational efficiency and the extent demand management measures are applied across the region. There is considerable scope to reduce carbon emissions especially associated with energy use from sustainable sources and also potential for contribution to carbon off setting initiatives with biodiversity and soil nutrient, flood risk reduction and raw water quality benefits. Potential for including renewable energy sources should be considered as part of project design such as solar panels. Approaches to reduce waste and to reuse and recycle materials during construction and demolition to reduce carbon emissions should also be included as part of the project designs. There may be opportunities to consider efficiencies in material use and waste across multiple projects.

9.1.7 Cumulative Effects on Landscape

There may be potential cumulative effects on landscape and visual amenity during the construction phase if groups of Preferred Approach options are constructed concurrently. However, these are unlikely to be significant cumulative effects as they are likely to be spatially and temporally separate. Many of the preferred options involve upgrades to existing WTPs which would likely not represent a significant new impact on landscape or visual amenity. The construction of the pipelines within the approach are unlikely to involve any interaction due to distance between options. Therefore, cumulative effect on landscape and visual amenity across the preferred options are unlikely to be significant.

9.1.8 Cumulative Effects on Cultural Heritage

There may be potential cumulative effects on the visual setting of cultural heritage assets (such as heritage buildings) during the construction phase if clusters of Preferred Approach options are constructed concurrently. However, these are unlikely to be significant cumulative effects as they are likely to be spatially and temporally separate. Many of the preferred options are also upgrades to existing WTPs which wouldnot represent a new impact on the setting of heritage assets.

9.2 Transboundary Effects

The potential for transboundary effects have been considered through identification of potential options with impacts through proximity or pathways to receptors. The options locations are shown in Figure 9.4 in relation to common catchments and biodiversity and landscape designations and in Figure 9.5 in relation to cultural heritage assets. Only one option was identified as having potential impacts on the marine environment. This is a small scale desalination option in Study Area D SAD-055. Impacts are expected to be relatively local and will be subject to further study and mitigation. The option is remote to the Northern Ireland water and no significant transbounday impacts are expected. There is one WRZ option that maintains an existing import from Northern Ireland as a transboundary transfer (SAE-050) but there is no change involved to the existing supply arrangement, so no transboundary effects to the baseline environment will occur as a result. Five options are identified as having proximity to Northern Ireland or potential to impact receptors through hydrological pathways. These are identified in Figure 9.6 and summarised below.

- SAA-217: Rationalisation scheme involving a new or upgraded pipeline and no increased abstraction;
- SAB-535: Rationalisation with new surface water abstraction from Assaroe lake, a regulated HMWB, including new WTP (planning permission granted);
- SAB-173: Increase groundwater abstraction from existing source Ballyshannon East GWB (good status) with an upgrade to an existing WTP;
- SAB-081: New groundwater source from Marble Arch (good status) including a new WTP and pipeline; and
- SAB-538: Rationalisation scheme with an existing source (Newtown-Ballyconnell WB - good status) including upgrade of existing WTP, new pipeline and decommissioning of a WTP and abstraction.

The potential for significant effects on Water and Biodiversity objectives has been considered in terms of impacts on migration of fish, water quality and water resources. One option involves a surface water abstraction but from a regulated water body and within abstraction sustainability limits, replacing another abstraction which would be decommissioned. Two options are groundwater abstractions, one a new abstraction and one an increase. Two options just involve rationalisation, including decommissioning two

existing abstractions. No likely significant impacts are identified for the operation of these schemes once constructed for water, biodiversity and landscape within Northern Ireland. Construction effects could potentially include noise, dust, traffic and water pollution risk but all are expected to be avoided through the application of standard good practice measures.

Although there are noted to be cultural heritage interests near to SAB-081 in the Lough Maclean Lower area and potential for impacts on riverine cultural heritage assets within Northern Ireland, the risk of effects is considered to be low given the type and location of the proposed options. There are no schemes directly increasing surface water abstraction and given rationalisation infrastructure largely involves underground pipelines or small scale above ground infrastructure, significant effects on setting of existing hertige assets are considered unlikely. Detailed siting studies will be required for all new infrastructure works and this will take account of local constraints and consider detailed setting impacts.

The options are also identified in relation to waterbody status in an overview in Figure 9.7 and more detailed view in Figure 9.8 below.

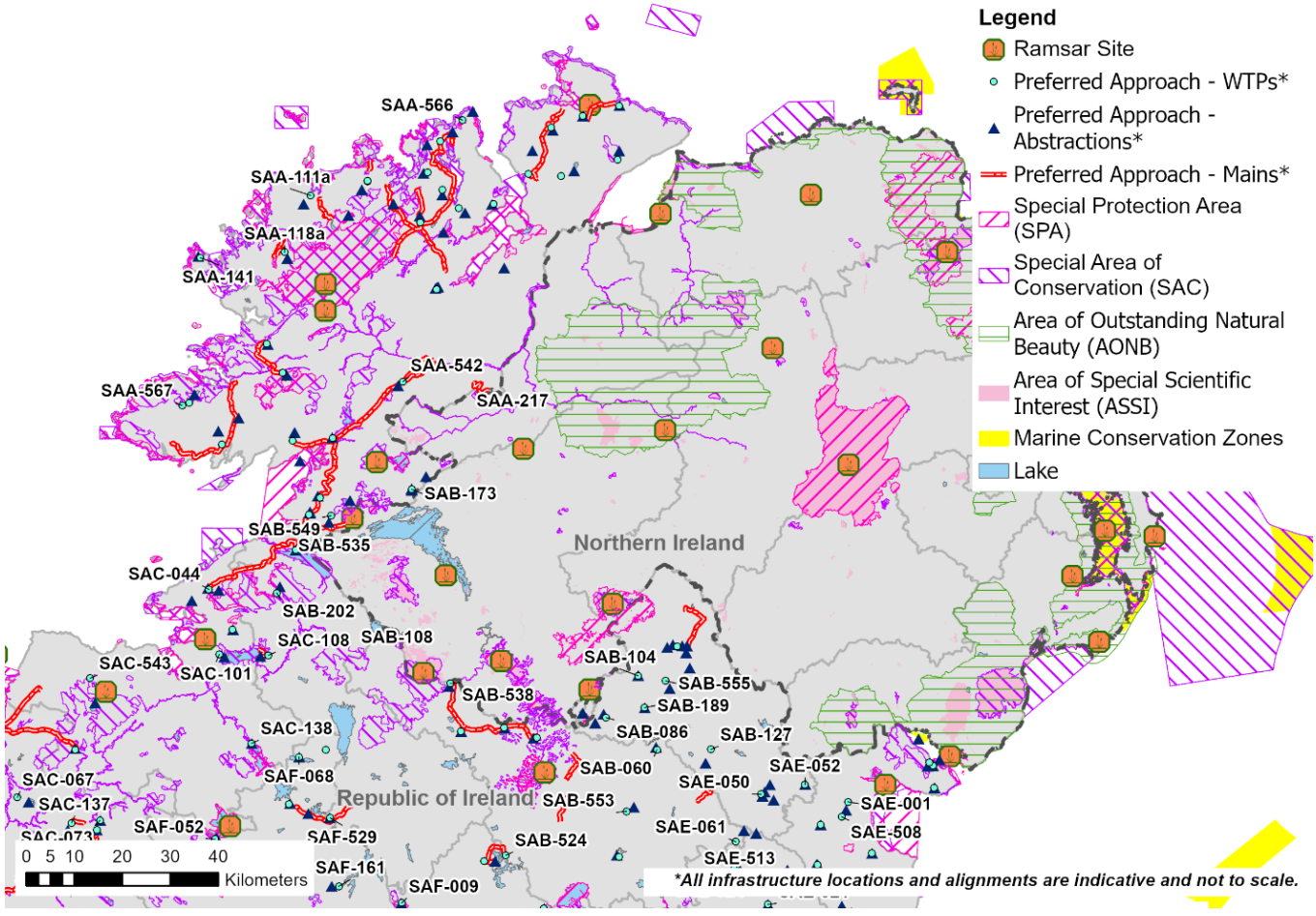


Figure 9.4 Transboundary: Environmental Designations and Preferred Approach

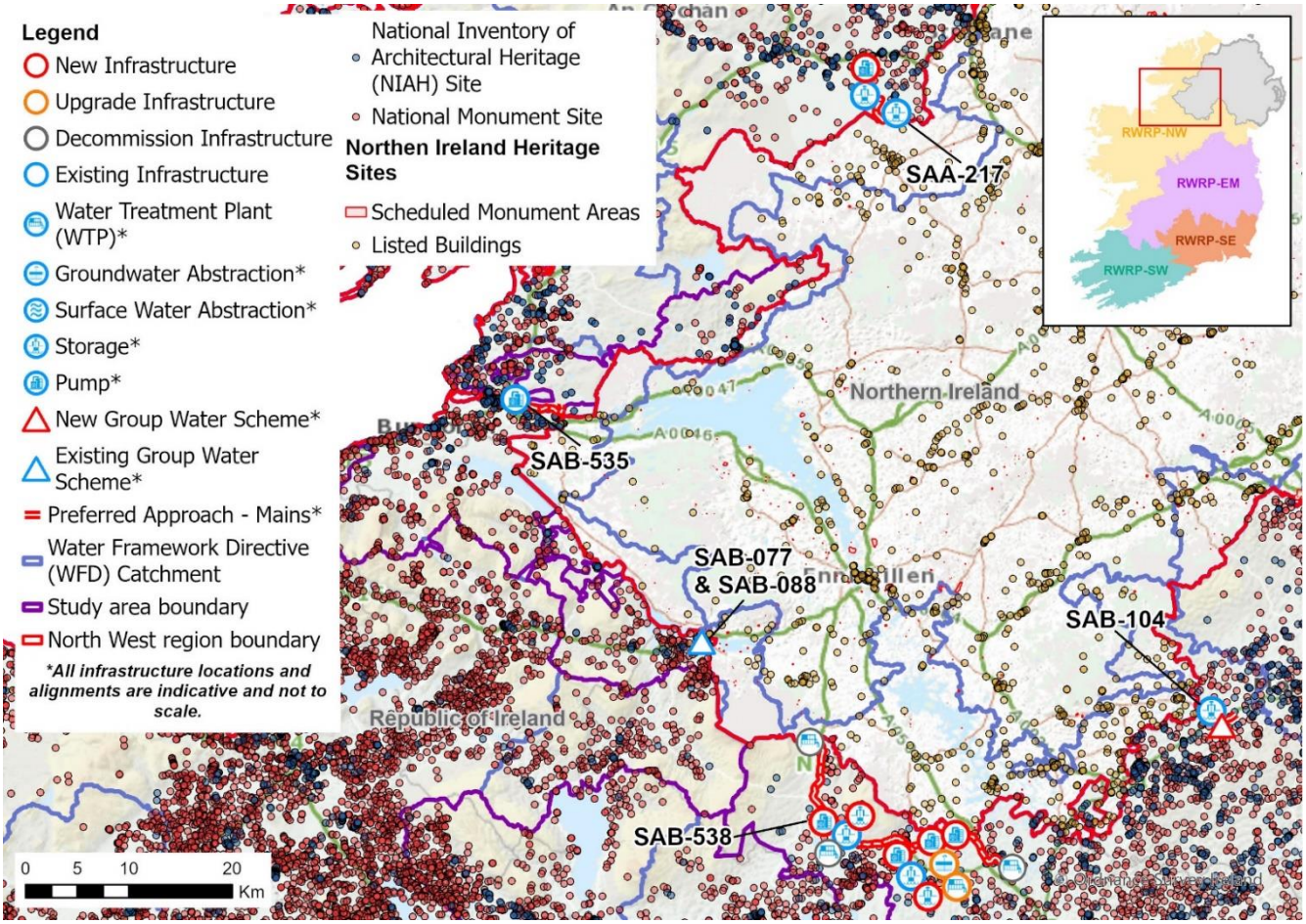


Figure 9.5 Transboundary: Preferred Approach and Cultural Heritage

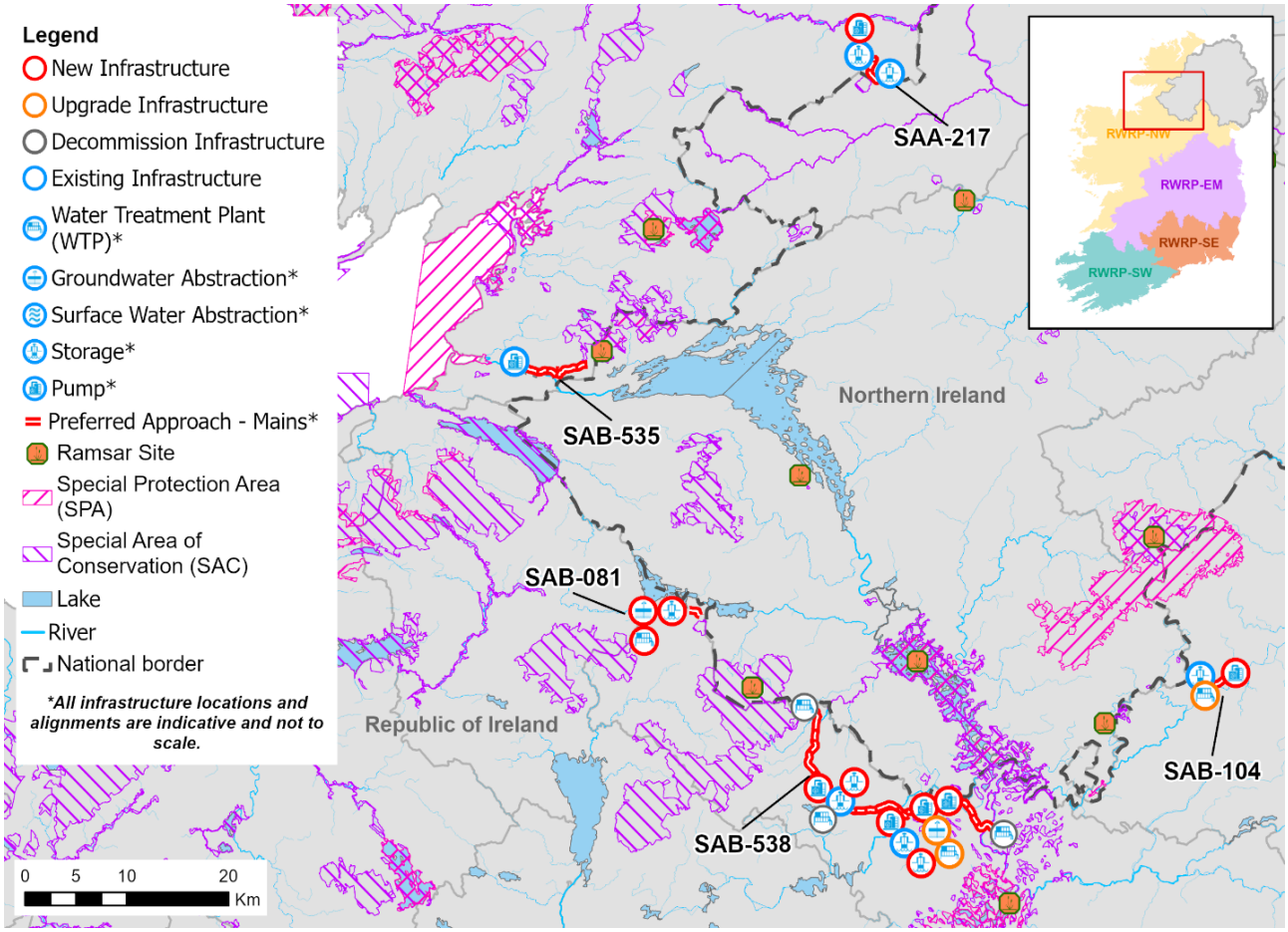


Figure 9.6 Transboundary: Environmental designations and Preferred Approach Infrastructure

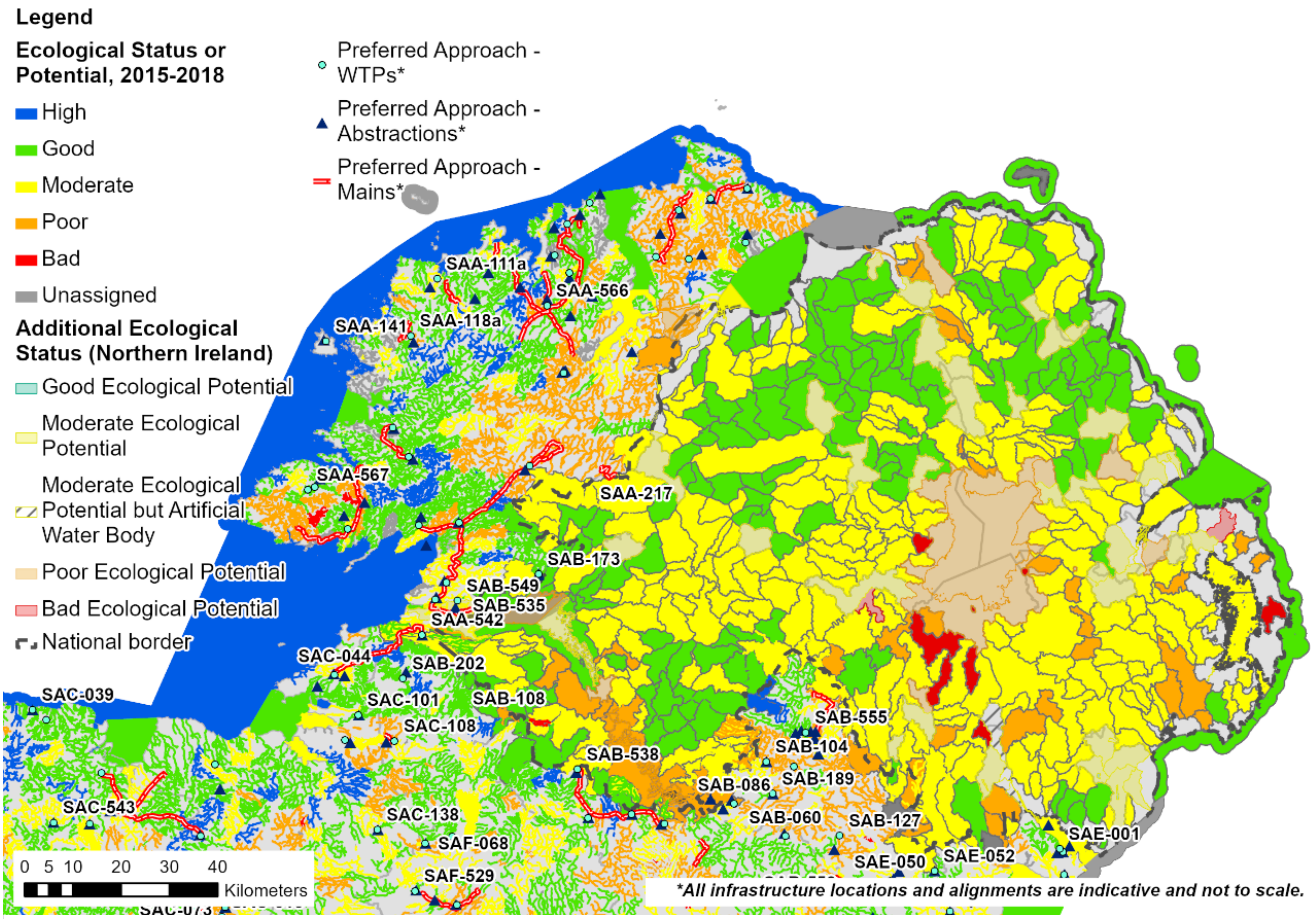


Figure 9.7 Transboundary: WFD Waterbody Status and the Preferred Approach

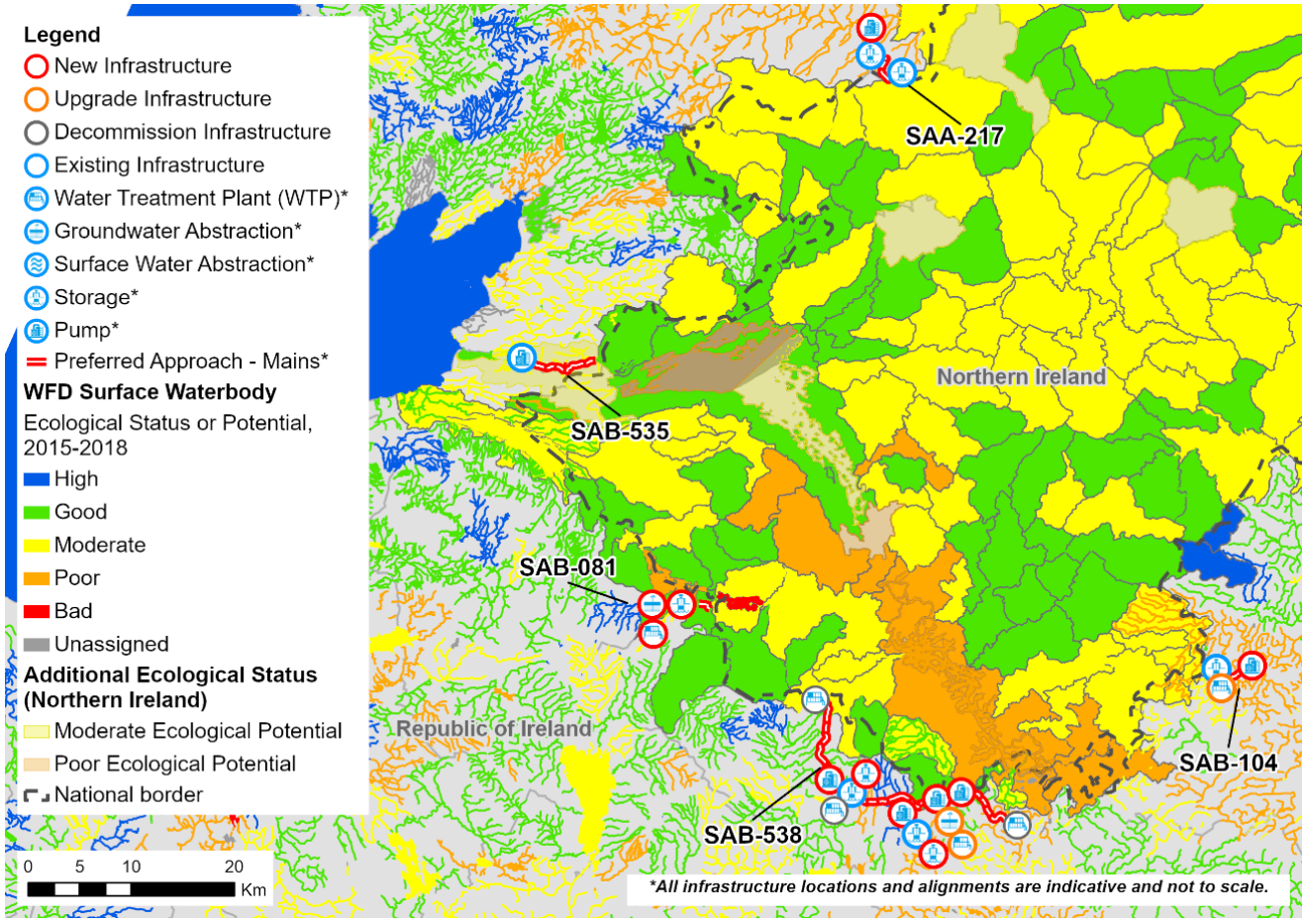


Figure 9.8 Transboundary: WFD Waterbody Status and Preferred Approach Infrastructure

9.3 Cumulative Effects with Other Plans and Programmes

There are a range of plans and programmes that apply to the North West spatial area. The ones that set a framework for future development projects or affect regional road networks such as the N5 and N56 could potentially have cumulative effects with this Plan. However, this is only likely to occur if they are developed at the same time (e.g. construction impacts) or affect the same local area and have similar effects on environmental receptors. For example, the development of a new reservoir or WTP could theoretically be in a similar location to a new housing development, and both could lead to habitat fragmentation through their respective construction footprints. However, the precise locations of the North West Region's options have not been determined yet,therefore it is not yet possible to determine cumulative construction-related effects with other plans and programmes.

Generally, in terms of carbon emissions, increase in carbon emissions can be considered a significant effect, as these add cumulatively across all developments and contribute to the national target for carbon. However, consideration also needs to be given to the additional water supply provided from the options. Mitigation to address cumulative effects on carbon emissions will include application of energy efficient design, use of renewable sources of energy and investigation of low carbon initiatives.

The strategic plans and programmes assessed for significant cumulative effects (positive and negative) are shown in Table 9.2.

Table 9.2 Cumulative Effects with Other Plans and Programmes

Plan/Project	Population, economy, tourism and recreation and human health	Water environment (quality and resources)	Water environment (flood risk)	Biodiversity	Material assets and waste	Landscape and visual amenity	Climate change (mitigation)	Climate change (adaptation)	Cultural heritage	Geology and soils
Ireland 2040: Our Plan, National Planning Framework (Government of Ireland, 2018)	+	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-
Regional Spatial and Economic Strategies	+	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-
River Basin Management Plan (RBMP) (2018-2021) and draft RBMP 2022-2027		+		+			+/-	+/-		
Climate Action Plan 2021		+		+			+	+/-		
Forestry Programme 2014-2020: IRELAND (as extended for 2021)		+		+			+	+/-		

Plan/Project	Population, economy, tourism and recreation and human health	Water environment (quality and resources)	Water environment (flood risk)	Biodiversity	Material assets and waste	Landscape and visual amenity	Climate change (mitigation)	Climate change (adaptation)	Cultural heritage	Geology and soils
National Marine Planning Framework (NMPF) Consultation	No direct interaction with the Regional Preferred Approach - potential for RWRP to support in the future with catchment management measures to improve water quality									
County and City Development Plans	+	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-
Local Area Plans	+	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-
Food Wise 2025	+	+/-		+/-			+/-			+/-
Draft Agri-Food Strategy 2030	+	+/-		+/-			+/-			+/-
EU Biodiversity Strategy for 2030	+	+		+						
National Biodiversity Action Plan	+	+		+		+	+	+		+
All Ireland Pollinator Plan 2021 – 2025	+	+		+		+	+			+
National Waste Action Plan for a Circular Economy 2020-2025					+	+				
Catchment Flood Risk Management (CFRAM) Programme (2011 onwards)	+		+							
Flood Risk Management Plans (2016)	+		+							
Offshore Renewable Energy Development Plan							+			
National Adaptation Framework (NAF)							+	+		
Tourism Development and Innovation 2016-2022	+	+/-		+/-		+			+	
Water Services Strategic Plan (WSSP)	+	+/-								
National Wastewater Sludge Management Plan (NWSMP) 2016-2021		+			+					+/-
Lead in Drinking Water Mitigation Plan (LDWMP)	+									
Northern Ireland Water (NI Water) Water Resource and Supply Resilience Plan and all other NI plans and	Continuation of the existing import associated with SAE-050 is unlikely to result in changes in the interaction between the Regional Preferred Approach and the NI WRSRP									

Plan/Project	Population, economy, tourism and recreation and human health	Water environment (quality and resources)	Water environment (flood risk)	Biodiversity	Material assets and waste	Landscape and visual amenity	Climate change (mitigation)	Climate change (adaptation)	Cultural heritage	Geology and soils
strategies included in the PPP review list										
Northern Ireland Marine Plan	The only option with potential for impact on the marine environment is the SAD-055 which is a small scale island desalination option. This is distant to NI waters and is not considered likely to conflict with the plan objectives.									
draft National Policy Statement on Geothermal Energy for a Circular Economy		+/-		+/-	+		+	+/-		+/-
National Implementation Plan for the Sustainable Development Goals 2022-2024	+	+		+			+			
National Development Plan 2021-2030	+	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-
Healthy Ireland Framework 2019-2025	+									
Ireland's CAP Strategic Plan 2023-2027		+		+			+	+/-		
The National Outdoor Recreation Strategy 2023-2027	+									
People, Place and Policy – Growing Tourism to 2025	+					+			+	
Creating Green Infrastructure for Ireland: Enhancing Natural Capital for Human Wellbeing	+			+		+	+	+		
National Landscape Strategy (NLS) for Ireland 2015-2025				+		+			+	
Our Rural Future Rural Development Policy 2021-2025	+					+			+	
National Energy and Climate Plan 2021-2030						+/-	+	+/-		

There are no additional mitigation measures identified from the assessment of interactions with other plans. The requirement to review and take account of relevant plans and policies in the implementation

and future iterations of the RWRP-NW, is built into the monitoring and feedback step and embedded in the Environmental Action Plan provided in section 10.2 of this report.

9.4 SEA Summary for the Regional Preferred Approach

An overall assessment summary of the Preferred Approach compared to the do minimum against SEA objectives is provided in Table 9.3 below.

Table 9.3 Regional Preferred Approach and Do Minimum Comparison

Population, economy, tourism and recreation and human health	Water environment (quality and resources)	Water environment (flood risk)	Biodiversity	Material assets	Landscape and visual amenity	Climate change (mitigation)	Climate change (adaptation)	Cultural heritage	Geology and soils
-	-	0	-	-	0/-	0/-	-	0/-	0

Do Minimum Approach

- The 'Do Minimum' approach is the 'without plan' approach, meaning that this is the approach that would occur without the RWRP-NW. As a result, the 'Do Minimum' approach would only include reactive, unplanned interim measures to address likely failures in infrastructure.
- Ongoing reliability issues with the supplies and the situation is expected to further deteriorate due to climate change driven reductions in water resources and increased demand growth within the area.
- While there would not be major construction works there would likely be increased pressure on existing abstractions. Including abstractions likely to be currently above sustainable levels and increasing issues with unreliable or inefficient network infrastructure.
- Currently 72 surface water bodies are identified by Uisce Éireann as not meeting sustainability guidelines during dry weather flows. These are likely to be subject to continued or increased abstraction pressure and other existing sources may also be subject to increased abstraction pressure in the future.

Population, economy, tourism and recreation and human health	Water environment (quality and resources)	Water environment (flood risk)	Biodiversity	Material assets	Landscape and visual amenity	Climate change (mitigation)	Climate change (adaptation)	Cultural heritage	Geology and soils
+	+/-	0/+	+/-	0/-	+/-	-	+	0/-	0/-

Regional Preferred Approach

- Focus on three pillars of using less, losing less, and supplying smarter and a planned rather than a reactive approach and a resilient system with more reliable sources.
- Implementation of the Regional Preferred Approach, which is the combination of Study Area Preferred Approaches for SAA-SAG, with the mitigation identified in the SEA Environmental Report Appendix D Environmental Action Plan, the Monitoring Plan and the Study Area Environmental Reviews SAs A-G.
- Construction impacts from pipelines and associated infrastructure, but will be mitigated by reinstatement of land uses and mitigation and enhancement to minimise long term landscape, land use and biodiversity effects.
- Network improvements adding flexibility and resilience.
- Decommissioning of inefficient infrastructure and abstractions including from 42 groundwater and surface water abstractions, including twenty-eight surface water sources identified by Uisce Éireann as not meeting sustainability guidelines during dry weather flows. Reduced pressure on 44 maintained surface water abstractions identified by Uisce Éireann as not meeting sustainability guidelines during dry weather flows. Uisce Éireann has applied sustainability guidelines to all new surface water sources; however, further investigations will be undertaken to confirm sustainable yields for new and increased groundwater sources and these will be subject to assessments under the new abstraction legislation. Overall these will provide potential benefits for water dependent biodiversity including aquatic ecology and support for meeting WFD objectives through more sustainable abstractions.
- Recognition that existing abstractions that will be upgraded and have been identified by Uisce Éireann as currently not meeting sustainability guidelines during dry weather flows will be supported by compensation flow releases.
- Carbon emissions associated with construction and moving and treating water.
- Improving Uisce Éireann's understanding of future risks, including climate change and efficient water use.
- Increasing routine monitoring and operational planning allowing Uisce Éireann to proactively manage and forecast resourcing and operational trends.
- Process put in place for monitoring implementation of the plan and reviewing and feeding back on a regular basis within the plan development cycle.

Basis for Assessment

The RWRP-NW Regional Preferred Approach includes a commitment to work to a 1:50 year level of service across all locations and actions are in place to achieve this target. The RWRP-NW Regional Preferred Approach will provide the basis for developing an investment programme providing greater security of supply and a more resilient supply since options will address the SDB over extreme weather planning scenarios.

The Preferred Approach identifies cross study area transfers including small cross regional transfers and a transboundary transfer (maintenance of an existing import from Northern Ireland (SAE-050)). Rationalisation and local WRZ schemes can have both positive and negative potential effects on the water environment, biodiversity, landscape and visual amenity and cultural heritage. Therefore, mitigation measures and a monitoring framework will be developed alongside recommended developments.

In the long-term, the plan will bring benefits in terms of greater security of water supply to the population, tourism industry and recreational amenities, human health and the local economy. Additionally, the newer, or upgraded, more reliable assets within the system will result in it being more adaptable to the impacts of climate change; with benefits from replacement of abstractions identified as potentially unsustainable for meeting WFD or protected area obligations and greater flexibility to respond to future sustainability reductions.

Carbon emissions are associated with the construction and operation of schemes but there is significant scope to decarbonise especially through use of renewable energy sources at a scheme and network level. Also potential for

benefits from linking carbon sequestration, biodiversity and water quality benefits from catchment management, including land use initiatives.

The SEA and AA embeds environmental considerations into the plan making process and sets a framework for identifying mitigation and monitoring so that these can be part of decision-making and can inform option design and costing as schemes are developed and studied further prior to consenting and licencing. Further consideration of alternative options and variants to options is expected to be part of the process of taking options forward.

Key			
Likely to have a positive effect	+	Likely to have a mixed positive and negative effect	+/-
Likely to have a negative effect	-	Likely to have mixed neutral and negative effect	0/-
Effects are uncertain or not applicable	? or N/A	Likely to have mixed neutral and positive effect	0/+
Likely to have a neutral effect	0		

9.5 AA Summary for the North West Region

There were -3 scores for the Preferred Approaches for SAA, SA-C, SAD and SAF. One for SAA (Cloghernagore Bog and Glenveagh National Park SAC, and Leannan River SAC), two for SA-C (Glenamoy Bog Complex SAC and Keel/Menaun Cliffs SAC), five for SAD (Lough Corrib SAC and SPA, Inishbofin SAC and SPA, Connemara Bog Complex SAC, and Twelve Bens/Garraun Complex SAC), and two for SAF (Lough Corrib SAC and Callow Bog SAC). All Likely Significant Effects (LSE) on European Sites can be addressed by mitigation measures as set out in full in the NIS. No Adverse Effects on Site Integrity (AESI) are identified at Plan level.

9.5.1 AA In-Combination Summary

In summary, potential in-combination impacts were identified at the North West Region's level for the following European sites:

- Donegal Bay SPA
- Galway Bay Complex SAC
- Inner Galway Bay SPA
- Lough Carra/Mask Complex SAC
- Lough Corrib SAC
- Lough Gill SAC
- Lough Mask SPA

However, potential in-combination effects (construction and/or operational) would only occur where options within each study area are progressed concurrently with one another or with projects, and in the absence of mitigation. With the implementation of mitigation as outlined in the NIS section 6.3 and Appendix E there will be no adverse effects on the integrity of the European sites, either alone or in-combination with other plans or projects as a result of progressing the Preferred Approach options associated with the RWRP-NW.

The conclusion of the NIS for the RWRP-NW is that, based on a plan-level assessment, and with implementation of appropriate mitigation for protecting European sites, there will be no adverse effects on the integrity of any European site(s), either alone or in-combination with other plans or projects as a result of progressing Preferred Approach options within the RWRP-NW.

9.6 WFD Summary for the North West Region

Application of estimated allowable abstraction constraints on new options means that only options that are expected to meet sustainability requirements are considered. Individual options within the Regional

Preferred Approach have been assessed and are expected to be sustainable, based on plan level desk-based assessment, in terms of avoiding deterioration of WFD status or avoiding conflict with meeting WFD objectives.

All surface water abstractions proposed within Preferred Approaches are within the expected sustainable abstraction limits of 10% or 5% of Q95 for 'good' and 'high' WFD river waterbody status sources and 10% or 5% of Q50 for 'good' and 'high' WFD lake waterbody sources respectively. Abstraction impacts on groundwater bodies have been assessed through a separate technical study which considered cumulative effects on WFD ground water quantitative status. Based on the available information this concluded that there is no indication of cumulative impact or impact on WFD quantitative status of the groundwater bodies (Irish Water, 2022).

However, cumulative effects also need to be considered, in terms of both sustainability for connected surface waterbodies and groundwater dependent habitats and protected areas. Further studies are identified in the Study Area Environmental Reviews for specific options where risks are identified.

9.7 Transboundary Effects for the Regional Preferred Approach

The types of options and their location, proximity and pathways for environmental effects have been considered through the process in relation to possible environmental effects for the Northern Ireland environment including any shared groundwater and river catchments and the marine environment. None of the options identified in proximity to the border are considered likely to have transboundary effects due to construction or operation taking into account standard good practice mitigation measures. Option identified as SAE-050 involves the maintenance of an existing water transfer from Northern Ireland which is not considered to result in a change to the current baseline.

10 Mitigation and Monitoring Plans

10 Mitigation and Monitoring Plans

The Mitigation and Monitoring Plans for the RWRP-NW are based on the plan outlined in section 8.3.8 of the Framework Plan and include three elements:

- Mitigation Measures including recommendations to incorporate into project development as options are taken forward through feasibility assessments, design, consenting and implementation (section 10.2);
- Environmental Action Plan identifying actions to be taken to integrate environmental requirements into process and related areas so that mitigation recommendations implemented (section 10.2); and
- Monitoring Plan identifying the targets and indicators to be measured or recorded to determine progress to meeting SEA objectives (section 10.3).

Commitment to implementing the Environmental Action Plan and the Monitoring Plan is provided in section 9 of the RWRP-NW which also sets out the wider context and process for monitoring and feedback to inform the implementation of the plan and future cycles of review and updating.

The approach to monitoring takes account of the EPA report '*The Tiering of Environmental Assessment – The influence of Strategic Environmental Assessment on Project-level Environmental Impact Assessment'* (EPA, 2021b).

The Monitoring Plan is therefore provided in two parts; the first to address plan level monitoring and the second to provide a framework for project level monitoring. The Environmental Action Plan also includes a task to review and update the monitoring indicators and targets to allow new conditions to be taken into account and to ensure the plan is sufficiently flexible to take account of environmental issues arising and any unforeseen adverse impacts. The plan level monitoring covers combined and cumulative effects. The indicators include both those aimed at positive as well as covering potential negative effects and sources, frequency and responsibilities are identified.

10.1 Mitigation Measures

SEA options assessment assumes the implementation of standard mitigation measures, such as operation of water sources in line with regulatory requirements and the use of good construction practice. Examples of standard measures expected to be embedded in the design and development of infrastructure options are listed in Appendix D which also identifies the mitigation measures that specifically respond to the significant environmental effects identified for each SEA topic in the RWRP-NW SEA SA Environmental Reviews A-G. Standard and specific mitigation measures include recommendations for further environmental assessment work to be undertaken at project stage to further inform mitigation development, as well as mitigation to be implemented at project stage. The implementation of mitigation measures is addressed through the Environmental Action Plan and Monitoring Plan as outlined in sections 10.2 and 10. 3 below.

10.2 Environmental Action Plan

The Environmental Action Plan (EAP) set out in Table 10.1 (green table) summarises the actions and areas of further study identified in this Environmental Report. The EAP provides a basis for tracking recommendations from the SEA during the NWRP implementation.

The EAP provided in Table 10.1 focuses on two aspects, the first being the options and approach appraisal process and the second being how environmental considerations are integrated with other supporting areas.

Table 10.1 Environmental Action Plan

Ref no.	Focus	Recommended Action for Mitigation / Further Study	Target	Monitoring (Timescale)	North West Region Progress summary: Completed: Y In progress: P Recommended: R
Identifying the Need – Quantity, Quality and Reliability					
Quantity – Supply Demand Balance					
Abstractions and Supply Side Yield Assessments					
EAP1	Options and Approach Development Process and Supporting Measures	**EAP1.1** Link investigation on supply risks to environmental resilience and avoiding damage to vulnerable habitats and protected areas; especially European designated sites, and threats to WFD water body objectives.	Environmental issues to be included in risk assessments for supply shortages or drinking water quality issues.	Study area scoping, risk assessments and prioritisation as part of the Regional Plan development and SEA 2022/2023	Y completed for the RWRP-NW
Demand Side Data Improvements: Planning for Future Developments					
EAP2	Options and Approach Development Process and Supporting Measures	**EAP2.1** Reviews of WRZ configuration can consider potential environmental benefits from rationalisation opportunities to improve operational efficiency for waste and energy use and also reduce need for developing new sources.	Optimised WRZs/study areas	Study area scoping, risk assessments and prioritisation as part of the Regional Plan development and SEA 2021-2023	Y completed for the RWRP-NW
		EAP2.2 Feed information on potential for water efficiency improvements to provide savings into future options identification			

Ref no.	Focus	Recommended Action for Mitigation / Further Study	Target	Monitoring (Timescale)	North West Region Progress summary: Completed: Y In progress: P Recommended: R
Linking SEA and Future Development of Schemes					
EAP3	Options and Approach Development Process and Supporting Measures	**EAP3.1** Understanding causes of water quality issues for drinking water can support catchment management actions and wider environmental objectives. Link clean water element (RC3) on water quality compliance and ongoing programmes on improving drinking water quality to potential for long term solutions through to long term Catchment Management and Nature Based Solutions opportunities to reduce pollution in groundwater and surface waters and water treatment issues.	Source risk assessments and drinking water safety plans linked to the NWRP process.	Regional Plan SEA Environmental Reports 2021-2023 and Source risk assessments and drinking water safety plans ongoing – consider progress in Annual reviews	Y completed for the RWRP-NW R project level assessments for water sources
		EAP3.2 Link Drinking Water Safety Plans to scoping of study areas, prioritisation and options development process including consideration of catchment management opportunities.		Study area scoping, risk assessments and prioritisation and engagement with relevant stakeholder groups	R
		EAP3.3 Link ongoing projects with the supply demand assessments, scoping area studies and prioritisation for new investment. Consider as part of investment proposals for water treatment works – wider rationalisation opportunities with opportunities to reduce abstraction pressure on	Existing programmes and projects coordinated with the NWRP	Study area scoping, risk assessments, prioritisation and application of options development methodology	Y completed for the RWRP-NW

Ref no.	Focus	Recommended Action for Mitigation / Further Study	Target	Monitoring (Timescale)	North West Region Progress summary: Completed: Y In progress: P Recommended: R
		stressed sources and potential for improvements to residuals management (see also EAP 11.1)			
		EAP3.4 Value environmental and social benefits as well as costs in options development process (using environmental economics tools such as natural capital/ecosystems services and social value assessments) which can also value nature based solutions such as catchment management benefits.	Cost Benefit Analysis and MCA supported by environmental/social valuation as well as qualitative assessment	Take forward into project development Include in next cycle of Regional Plans 2023 onwards	R
Delivering Solutions – Approach					
Climate Change					
EAP4	Options and Approach Development Process and Supporting Measures	**EAP4.1** Take account of effects of climate change effects on protected areas and WFD objectives as well as water supply.	Environmental resilience as part of the climate change risk assessment informing long-term solutions.	Regional Plan SEA Environmental Reports 2021-2023 and implementation of projects. Catchment management to be considered in source risk assessment where appropriate - ongoing. Progress to be	R
		EAP4.2 Results completed, and ongoing climate change studies should be used to inform future scoping of study areas/WRZs, and the types of solutions considered and prioritisation for investment.			R
		EAP4.3 Long term actions to improve water retention in upper catchments as well as			R

Ref no.	Focus	Recommended Action for Mitigation / Further Study	Target	Monitoring (Timescale)	North West Region Progress summary: Completed: Y In progress: P Recommended: R
		catchment wide water quality initiatives could be considered as responses. Catchment management and nature based solution benefits linking improvements to water quality reducing treatment and opportunities for improving carbon sequestration in soils and through woodland planting (also linking to biodiversity objectives)		considered in Annual review.	
		EAP4.4 Investigate opportunities to reduce carbon emissions in construction and operational phases reflecting importance of energy efficient and low carbon emission considerations in design and construction methods and considering opportunities for use of renewable energy sources. Ensure alignment with the Uisce Éireann Energy Efficiency Plan.	Identify how construction and operational carbon can be reduced across project development, construction and operation including potential for including renewable energy sources, such as solar panels, in project design	Progress to be considered in Annual review	R
Lose less: Leakage Reduction					
EAP5	Options and Approach Development Process	**EAP 5.1** Take forward studies and actions supporting meeting leakage targets and include consideration of relieving pressure on existing deficit areas and abstractions with sustainability issues and drought risks.	Develop information to support and improving leakage reduction	Progress to be considered in Annual review	R
Use Less: Water Conservation					

Ref no.	Focus	Recommended Action for Mitigation / Further Study	Target	Monitoring (Timescale)	North West Region Progress summary: Completed: Y In progress: P Recommended: R
EAP6	Options and Approach Development Process and Supporting Measures	**EAP6.1** Link to raising awareness on environmental benefits of water conservation.	Improved awareness of benefits of conserving water (day to day and during extreme events)	Awareness campaigns Progress to be considered in Annual review	R
		EAP6.2 Consider customer research on the water supply and demand management including water efficiency options development along with local community and stakeholder views.		Customer consultation Progress to be considered in Annual review	R
		EAP6.3 As data is developed to support understanding on water conservation, develop water conservation/water efficiency options to be considered as part of the Options Assessment Methodology for future plan cycles.	Monitoring and feedback stage 8 of the options assessment methodology	Progress to be considered in Annual review	R
Supply Smarter: Capital Investment and Improved Operations					
See **EAP3, 4 and 5** in relation to linking ongoing programmes and future water resource planning and **EAP10, 11 and 12** on implementing options and approach assessment methodology.					
Drought Planning					
Information for Assessing Drought Risks					
EAP7	Options and Approach	**EAP7.1** Identify the risks from potential drought actions for water sources designated for nature conservation value and supporting protected	Drought -sources at risk identified	Drought management phased for each Regional Plan area 2023 onwards	R

Ref no.	Focus	Recommended Action for Mitigation / Further Study	Target	Monitoring (Timescale)	North West Region Progress summary: Completed: Y In progress: P Recommended: R
	Development Process	species - include lessons learned from the 2018 drought.			
Environmental Mitigation of Drought Measures					
EAP8	Options and Approach Development Process	**EAP8.1** Assess potential impacts of drought restrictions on customers, especially vulnerable groups, to identify both communication requirements and exemptions on restrictions relevant for each management area.	Drought management avoiding causing temporary or long-term impacts on protected habitats and species as well as minimising restrictions to customers	Drought management - environmental reviews and communications strategy Drought management: • Social/environmental reviews • Communication strategy Environmental assessment of sources at risk phased for each Region Plan area 2023 onwards	R
		EAP8.2 Develop drought communication plans and identify approaches to avoid impacts on vulnerable water users, for example, through exemptions – plan to provide customers with information early so that voluntary measures can be effective in avoiding the need for additional measures in most cases and taking forward the approaches from the 2018 summer drought and 2020 spring drought.			R
		EAP8.3 Prepare environmental assessments (including AA) for sensitive water sources at risk from drought management actions. These should be available in advance of measures being needed. They should include consultation on the assessments with environmental authorities and			R

Ref no.	Focus	Recommended Action for Mitigation / Further Study	Target	Monitoring (Timescale)	North West Region Progress summary: Completed: Y In progress: P Recommended: R
		identify specific monitoring or mitigation measures.			
Residuals Approach					
EAP9	Options and Approach Development Process and Supporting Measures	**EAP9.1** Include consideration of residuals management in the options development process involving WTPs or rationalisation opportunities	Residuals approach linked to options development process	Regional Plan SEA Environmental Reports 2021-2023 and implementation of projects	Y
		EAP9.2 Apply the waste management hierarchy with any solid waste disposal limited to appropriate licensed sites.			R
Delivering Solutions: Options and Approach Assessment Methodology					
Integration of Environmental and Sustainability Considerations					
EAP10	Options and Approach Development Process	**EAP10.1** Study area scoping to include analysis of environmental baseline issues, risks, constraints and opportunities to inform identification of initial options as providing context for the option development process.	Context for identifying and assessment options is provided	Regional Plan SEA Environmental Reports 2021-2023 Risk assessments and prioritization	Y
		EAP10.2 Further development of the environmental and social impact valuation methodology as a tool for the approach appraisal process, based on ecosystems services assessment/natural capital assessment principles, can support cost benefit analysis and	Cost Benefit Analysis and MCA supported by environmental valuation based on natural capital/ecosystems services approaches as well as qualitative assessment	Take forward into project development Include in next cycle of Regional Plans 2023 onwards	R R

Ref no.	Focus	Recommended Action for Mitigation / Further Study	Target	Monitoring (Timescale)	North West Region Progress summary: Completed: Y In progress: P Recommended: R
		MCA methodologies and provide quantitative information supporting SEA in the future.			
		EAP10.3 Comparison of combinations of options (or approach) should include assessment of cumulative effects for each study area (groups of WRZs) and be considered in determining the best value approach. Justification for the approach selected will need to be provided.	Best environmental solutions considered in selection of preferred solutions with mitigation built into design and costing. Opportunities for enhancement to contribute to objectives to be considered.	Regional Plan SEA Environmental Reports 2021-2023 Consider in Annual Review	Y R to be taken toward to project level
Transboundary Issues					
EAP11	Options and Approach Development Process	**EAP11.1** Ensure potential for transboundary impacts are considered during options assessment and early consultation is undertaken to inform the assessment process.	Transboundary effects avoided.	Regional Plans SEA Environmental Reports 2021-2023 Consider in Annual review	Y R
Delivering Sustainable Solutions					
EAP12	Options and Approach Development Process	**EAP12.1** Link the options development information and SEA mitigation recommendations into the initial studies and designs for selected project level schemes so that assumptions and mitigation recommendations are taken forward.	Template developed and applied Preferred approach options taken to project stage subject to initial environmental review linking to information from the	Monitoring Plan/scheme development - progress to be considered in Annual review	P

Ref no.	Focus	Recommended Action for Mitigation / Further Study	Target	Monitoring (Timescale)	North West Region Progress summary: Completed: Y In progress: P Recommended: R
		Develop a monitoring information template to capture key environmental information at key project development stages recording: • Project design/implementation stage and environmental assessment process applied and link to SEA and NIS recommendations • Data review and update at each key stage including reviewing current and draft policies and plans • Report on Monitoring Plan indicators • Identify potential for cumulative effects	options development and assessment process and to good practice procedures and Monitoring Plan criteria.		
		EAP12.2 Development of procedures to integrate good practice approaches for avoiding/mitigating environmental impacts and identifying enhancement opportunities in future scheme design and development.			P
		EAP12.3 Ensure environmental mitigation and study requirements are covered in option costing and risk aspects are taken into account in scheme development.			P
		EAP12.4 Review monitoring framework and update to ensure environmental mitigation and study requirements are covered in option costing			R

Ref no.	Focus	Recommended Action for Mitigation / Further Study	Target	Monitoring (Timescale)	North West Region Progress summary: Completed: Y In progress: P Recommended: R
		and risk aspects are taken into account in scheme development.			

10.3 Monitoring Plan

The Monitoring Plan is a requirement under the SEA regulations to provide a basis of identifying significant environmental effects during the implementation of the Plan. This is required to review the predicted impacts of the Regional Plan, and the adequacy of the mitigation measures recommended so that additional mitigation can be applied if required. Performance against the monitoring plan targets will also inform the next cycle Plan and SEA process.

The Public Water Supply in Ireland is a live asset base and is subject to continuous change. Similarly, the development of Preferred Approaches, as part of the Regional Plans, is influenced by evolving scientific data, understanding, and policy change in relation to the natural environment.

Uisce Éireann must be able to continuously adapt to these changes, which may be minor or material in nature. The Framework Plan setting out the overarching approach committed to undertaking continuous monitoring and ensuring that there is a feedback mechanism within the Framework Plan and Regional Plans. Given the scale of the assessments required and work to be undertaken, the first iteration of the NWRP consists of a Framework Plan and four Regional Plans. Once completed, the NWRP will be treated as a unified plan, and the regional boundaries established for the purposes of the development of the regional plans will have no on-going application. All Preferred Approaches identified in the NWRP will be prioritised on a national basis through Uisce Éireann's regulated investment cycles. The intention is to review the NWRP every five years, and this continuous monitoring process will ensure that material amendments are assessed for significant impacts on the environment.

The Monitoring Plan is provided in two parts:

- Monitoring Plan – Part 1: North West plan level monitoring (Table 10.2 – purple table); and
- Monitoring Plan – Part 2: Framework for project monitoring (Table 10.3 – orange table).

The Monitoring Plan will take account of comments from the consultation process and has been designed to provide a basis for the identification and continuous review of the positive, negative and cumulative impacts of the draft RWRP-NW.

10.3.1 Regional Monitoring Plan

The Monitoring Plan for the RWRP-NW SEA takes forward and builds on the monitoring adopted for the Framework Plan.

The Monitoring Plan covers the integration of environmental and sustainability considerations throughout implementation of the Regional Plan and the options development methodology. It also provides a framework for future long-term monitoring. In most cases, more detailed baseline collection and project studies will be required to confirm the significance of environmental effects and ensure appropriate mitigation is included as part of the individual scheme designs.

In certain circumstances, monitoring and feedback will identify the need for a variation of the Regional Plan. Where a variation is required, Uisce Éireann will screen the change against SEA and AA requirements in accordance with its legal obligations.

As part of the screening, Uisce Éireann will consult with the EPA and relevant Government Departments as required by Article 9(5) of the EC (Assessment of Certain Plans and Programmes) Regulations 2004 (SI 435/2004) (as amended). If, following screening, Uisce Éireann determines that the change is likely to have significant effects on the environment, it will carry out a SEA before adopting the change. Uisce Éireann will also carry out an AA if it determines, following screening, that the change is not directly connected with or necessary to the management of any European site and Uisce Éireann cannot, on the

basis of objective scientific information, exclude that the change, individually or in combination with other plans and projects, will have a significant effect on European sites, as required by Article 42(6) of the EC (Birds and Natural Habitats Regulations) 2011 (SI 477/2011)(as amended).

In recognition of the importance of multi-stakeholder engagement and collaboration in managing shared natural resources, Uisce Éireann are members of an expert group chaired by the Department of Housing Local Government and Heritage (DHLGH) to make recommendations to the Minister regarding a new approach to drinking water source protection as part of the transposition of the recast Drinking Water Directive. Other members of the group include the County and City Management Association (CCMA), the Local Authority Waters Programme (LAWPRO), the National Federation of Group Water Schemes (NFGWS), the Environmental Protection Agency (EPA), Geological Survey of Ireland (GSI), the Health Service Executive, the Department of Agriculture, Food and the Marine (DAFM), the Irish National Accreditation Board (INAB), the National Standards Authority of Ireland (NSAI) and the Commission for Regulation of Utilities (CRU). Implementation of source protection measures will require further collaboration with several stakeholders including, riparian owners, industry groups, the agricultural and environmental sector forestry and Teagasc. These measures will complement existing ongoing works for example the works carried out by Teagasc under the Agricultural Sustainability and Advisory Programme (ASSAP) which looks to improve water quality through working with farmers.

Table 10.2 Regional Monitoring Plan: Indicators and Targets - North West Regional Plan Level Monitoring

SEA topics	SEA indicators	SEA targets	Source data	Responsibility
For monitoring Regional Plan. Monitoring results are to be fed back into the reporting for the Regional Plan and SEAs				
Reporting timescale: included in Regional Plan and SEA (developed during 2022-23)				
All topics and objectives	**Regional All Topics 1** Application of the options and approach assessment process, as set out in the Framework Plan, to integrate environmental, social and sustainability SEA objectives alongside other criteria in the preparation in the Regional Plans **Regional All Topics 2** Application of methodology for SEA and AA in the comparison and selection of Preferred Approaches for the preparation in the Regional Plans **Regional All Topics 3** Environmental and social valuation methodology developed further as a tool using natural capital /ecosystems services assessment **Regional All Topics 4** Transparent documentation of the appraisal and selection process	• Target 1 Options and plan approach to find sustainable solutions that contribute to environmental objectives	Uisce Éireann	Uisce Éireann
All topics and objectives	**Regional All Topics 5** Iterative approach to the identification of appropriate options meeting objectives, and mitigation measures incorporated into project costs or risks, as part of the development of options for the Regional Plans and as a basis for future project costing.	• Target 2 Process implemented for iterative options assessment through identification, option design development stages and identification of mitigation measures and input to project costing	Uisce Éireann	Uisce Éireann

SEA topics	SEA indicators	SEA targets	Source data	Responsibility
For monitoring Regional Plan. Monitoring results are to be fed back into the reporting for the Regional Plan and SEAs				
	Regional All Topics 6 Identification of process for undertaking the relevant options studies and feeding back where potential significant environmental effects are identified including engagement with relevant stakeholders.	• Target 3 Option development for Preferred Approach options built on the SEA and AA work and incorporating feedback to the next Framework Plan and adequate comparison with alternatives at key points		
Reporting timescale: to be phased for RWRP-NW implementation 2023 onwards				
All topics and objectives	**Regional All Topics 7** Environmental assessment, including AA, for designated international and national sites potentially affected by drought measures **Regional All Topics 8** Communication plan for drought/freeze-thaw period actions	• Target 4 Source-specific environmental assessment and mitigation and monitoring measures agreed, avoiding long-term damage on designated sites and associated species from drought measures	Uisce Éireann	Uisce Éireann
Reporting timescale: annual reporting for RWRP-NW from 2023 onwards				
All topics and objectives	**Regional All Topics 9** 1. Monitoring plan data collection implemented (see below for each topic) set up to support baseline information for the next Regional Plan, project level feedback, identification of cumulative effects, and providing the basis for monitoring future implementation 2. Review of the monitoring plan and update where needed to capture issues or unforeseen effects.	• Target 5 Monitoring plan data compiled for feeding into future Framework Plans and the Stage 8 Monitoring and Feedback process.	Uisce Éireann	Uisce Éireann

SEA topics	SEA indicators	SEA targets	Source data	Responsibility
For monitoring Regional Plan. Monitoring results are to be fed back into the reporting for the Regional Plan and SEAs				
Population, economy, tourism and recreation, and human health	**Regional Population and Health** 1. Level of Service achieved 2. Frequency and duration of droughts needing management actions 3. Number of days/hours when water supply to people is disrupted due to drought, freeze-thaw or other service/infrastructure issues 4. Awareness raising programmes on water conservation 5. Reduced water supply restrictions due to water quality risks	• Target 6 Maintained or improved access to reliable and safe drinking water meeting forecast demand • Target 7 Reduced number of drought actions affecting supply • Target 8 Raised public awareness of actions to take for water conservation with reduced household /non domestic per customer demand	Uisce Éireann	Uisce Éireann
	Regional Recreation and Tourism 6. Level of service accommodating seasonal tourism demand	See Target 6	Uisce Éireann	Uisce Éireann
Water environment	**Regional Water Environment** 7. Number of investigations and area covered by catchment management schemes and number of nature based solutions put in place 8. Additional water quality and biological monitoring/data collection in addition to WFD monitoring data where needed 9. Number of demand management initiatives supporting water savings 10. Compliance with WSSP Strategy Objective to manage water supplies in an efficient and economic manner (WS3). Key indicator – Leakage expressed as a percentage of treated water put into the distribution system	• Target 9 Improved environmental resilience and water quality within water resource use catchments • Target 10 Contribution to restoration to “good” status of waters currently at “moderate”, “poor” or “bad” status (WFD objective) • Target 11 Achieve leakage targets identified for the South East	Uisce Éireann and EPA	Uisce Éireann

SEA topics	SEA indicators	SEA targets	Source data	Responsibility
For monitoring Regional Plan. Monitoring results are to be fed back into the reporting for the Regional Plan and SEAs				
	11. Number of waterbody sources where WFD good status is not reached due to abstraction pressure 12. Number of waterbody sources benefiting from reduced abstraction or cessation in abstraction			
	Regional Flooding 13. Number of outages due to flood events or power or outages	• Target 12 No loss of supply due to flood events	Uisce Éireann and EPA	Uisce Éireann
Biodiversity, flora and fauna	**Regional Biodiversity** 14. Identification of existing abstractions or drinking water treatment residuals with risks to international or national designations 15. Aquatic ecology - number of existing abstractions identified by Uisce Éireann as potentially unsustainable in dry weather conditions where abstractions are reduced or abandoned 16. Number of waterbodies with improvements benefiting raw water quality/aquatic ecology due reduced or cessation of abstractions, catchment management, nature based solutions, river enhancement, migration barrier removal 17. Number of waterbodies sources where WFD good status is not reached due to abstraction pressure 18. Regional information on net loss/gain of habitats collated from proposed and undertaken projects	• Target 13 No adverse effects on integrity of European, national or regional level designations and, where feasible, seek to contribute to achieving favourable conservation status • Target 14 Improvement to aquatic biodiversity of existing waterbody sources • Target 15 region wide no net loss of high value habitats and improved habitat connectivity (OSI National Land Cover data can be used as a basis for determining no net loss)	NPWS, OSI, EPA and Uisce Éireann	Uisce Éireann

SEA topics	SEA indicators	SEA targets	Source data	Responsibility
For monitoring Regional Plan. Monitoring results are to be fed back into the reporting for the Regional Plan and SEAs				
Material assets	**Regional Material Assets** 19. Tonnes of residuals reused or recycled across region per year 20. Tonnes of waste disposed of to landfill for the region per year	• Target 16 No drinking water treatment residuals sent to landfill and no reduced abstraction to other users due to new schemes	Uisce Éireann, EPA and Local Authorities	Uisce Éireann
Landscape and visual amenity	**Regional Landscape and Visual** 21. Total working area of pipelines through protected landscapes, outside protected areas, and urban areas 22. Development of protected landscape strategies to guide work in important and valued landscapes	• Target 17 Improvement or no net change in landscape quality	Uisce Éireann	Uisce Éireann
Climate change	**Regional Climate Change Mitigation** 1. Percentage of energy supply from renewable sources and energy efficient improvement for the region. 2. Carbon footprint (total tonnes) per year, predicted over plan period, lifetime of schemes of water resource options (tonnesCO_2equiv) 3. Operational Carbon Intensity kgsCO_2equic/ML overall achieved for the region each year 4. Total carbon value from any carbon offsetting schemes linked to the Plan	Decarbonisation through the following: • Target 18 Increased contribution of renewable/low carbon energy sources for existing and new schemes including project-based sources. • Target 19 Minimised the annual carbon emissions from operation and reduced carbon intensity of water supply • Target 20 Supported carbon offsetting schemes, including upper catchment schemes linked to biodiversity and water and	Uisce Éireann	Uisce Éireann

SEA topics	SEA indicators	SEA targets	Source data	Responsibility
For monitoring Regional Plan. Monitoring results are to be fed back into the reporting for the Regional Plan and SEAs				
		population wellbeing (recreational) objectives		
	Regional Climate Change Adaptation 1. Frequency of drought (including freeze thaw) orders requiring change to normal abstractions/compensation releases 2. Number of outages due to weather events and power loss	• Target 21 Improved resilience of environment to climate change	Uisce Éireann	Uisce Éireann
Cultural heritage	See project level monitoring	N/A	N/A	N/A
Geology and soils	See project level monitoring	N/A	N/A	N/A

10.3.2 Project Level Monitoring Framework

The Monitoring Plan - Part 2 Framework for the project monitoring is set out below in Table 10.3. This is intended to provide a framework for project level monitoring which can be considered as part of the plan feedback and review process as the individual projects are developed and implemented.

Table 10.3 Project Level Monitoring : Indicators and Targets - Project Level Framework

SEA topics	SEA Project level indicators	SEA Project targets	Source data	Responsibility
For monitoring individual projects. Monitoring results on individual projects also to be fed back to reporting for the Regional Plan and SEAs. Note that not all indicators will be relevant for all types of projects				
Reporting timescale: across each project develop over plan implementation period				
All topics and objectives	**Project All Topics 1** Environmental screening applied for all projects to check appropriate level of study and assessment to address risks of environmental impacts but also opportunities for enhancements or reduction of and carbon emissions in construction and operation and application of waste hierarchy, including taking account of recommendations from the SEA and NIS. Include engagement with stakeholders. Assessments will take account of relevant and available data sources including those recommended by the EPA, NPWS and DECC[17] .Include consultation with DAERA and other relevant Northern Ireland organisations where there is potential for transboundary effects.	• Project Target 1 Project development to find sustainable solutions that contribute to environmental objectives	Uisce Éireann	Uisce Éireann
All topics and objectives	**Project All Topics 2** Application of project level monitoring and feedback to identify potential significant environmental effects are identified at each stage of project development and implementation process and post project evaluation or audit.	• Project Target 2 Process implemented for project level development feeding back information for project and regional level review	Uisce Éireann	Uisce Éireann

[17] DECC recommended, in responses to the draft RWRP-SW consultation, additional sources which would need to be considered at project level including: Geotechnical Database Resources, Geo Hazards, Marine and Coastal Unit and Coastal Vulnerability Index GSIs Groundwater Protection Scheme mapping,'GW Climate' maps and data, County Geological Sites (available on GSI's Map Viewer), National Geodatabase, National Landslide database and Landslide Susceptibility map, Historic Site project datasets, GSI's Coastal Vulnerability Index study.

SEA topics	SEA Project level indicators	SEA Project targets	Source data	Responsibility
Population, economy, tourism and recreation, and human health	**Project Population and Health** a) Number of complaints received relating to construction works b) Duration of works with traffic control/disruption c) Noise levels at receptors within recommended limits during construction and operation and mitigation provided where assessment indicated levels are exceeded d) Dust management plan applied for construction	• Project Target 3 Minimise extent and period of disruption to traffic related to construction • Project Target 4 Minimise access restrictions and noise disturbance to people from construction and operation of schemes	Uisce Éireann (project level information)	Uisce Éireann
	Project Recreation a) Number of footpath/access closures/diversions b) Length of public access paths created compared to loss c) Area of any amenity improvement provided, or amenity area lost (ha)	• Project Target 5 No net loss of important recreational amenity, improved access and support for new recreational amenity	Uisce Éireann (project level information)	Uisce Éireann
Water environment	**Project Water Environment** a) Additional water quality and biological monitoring/data collection in to supplement WFD monitoring data where needed b) Sustainability of abstraction for surface or ground water c) Inclusion of supporting measures to safeguard or improve raw water quality where appropriate d) Design measures to contribute to remove or contribute to removing barriers to fish migration where appropriate and within Uisce Éireann responsibility. e) Improvement to river morphology/aquatic ecology/water quality f) Consult INFOMAR and other GSI Marine and Coastal Unit datasets to identify constraints. g) Consult Waterways Ireland as the navigation authority regarding canals and waterways to identify constraints.	• Project Target 6 Avoids “No deterioration” in status of waters (WFD objective) • Project Target 7 Contributes to restoration to “good” status of waters currently at “moderate”, “poor” or “bad” status and WFD objectives	Uisce Éireann and EPA (project level information)	Uisce Éireann

SEA topics	SEA Project level indicators	SEA Project targets	Source data	Responsibility
	Project Flooding a) Area of flood plain/flood storage loss and compensation provided b) Flood risk vulnerability to water supply change due to project c) Any significant increase in flood risk to property or assets due to project d) Consult the GW Climate project (follow on from GW Flood project) data in relation to Flood Risk Assessment e) Consult the Geological Survey Ireland's Groundwater Protection Schemes to identify constraints f) Consult GSI's Coastal Vulnerability Index study to identify constraints related to the adverse impacts of sea-level rise on the Irish coast	• Project Target 8 No net flood plain area lost as a result of the plan, and where possible increase functioning flood plain • Project Target 9 Reduced flood risk or vulnerability to supply	Uisce Éireann (project level information) and EPA	Uisce Éireann
Biodiversity, flora and fauna	**Project Biodiversity** a) For designated nature conservation sites potentially affected by water resource options: b) Area of each designated site/type affected and the likely impact c) Area of site with a predicted or recorded change in condition (positive or negative) d) Plan for/measurement of enhancement - area/length of habitat loss or affected vs restored - (for example use of biodiversity metrics to compare before and after habitats area and condition) e) Improvement in habitat connectivity or loss of connectivity f) Improvement to aquatic habitats and fish migration where relevant g) Removal of residuals discharge to waterbodies h) Invasive species risk assessment i) Identification of potential for applying nature-based solutions or catchment management including opportunities for biodiversity	• Project Target 10 No adverse effects on integrity of European, national or regional level designations and, where feasible, seek to contribute to achieving favourable conservation status • Project Target 11 No net loss of valued habitats or habitat connectivity as a result of the works and, where possible, demonstrate habitat enhancement/creation • Project Target 12 reduced invasive species risk	NPWS, EPA and Uisce Éireann (including project level information)	Uisce Éireann

SEA topics	SEA Project level indicators	SEA Project targets	Source data	Responsibility
	enhancement	• Project Target 13 Implementation of nature-based solutions or enhancement linked to catchment management		
Material assets	**Project Material Assets** a) Area of permanent loss of greenfield land, including agricultural, forestry or other land uses or area returned to greenfield, habitat or community use. b) Materials and waste management plans used on all new schemes and including decommissioning of infrastructure c) Sustainability assessment including consideration of non Uisce Éireann abstractions d) Residuals management for water treatment plant upgrades and new plant designed in accordance with Uisce Éireann's Residuals Management Strategy	• Project Target 14 Minimise permanent loss of greenfield land, including agricultural, forestry or other land uses • Project Target 15 Minimise material consumption and waste during construction and operation of schemes • Project Target 16 Increase investment in existing and new water treatment and wastewater management infrastructure • Project Target 17 No drinking water treatment residuals sent to landfill and no reduced abstraction to other users due to new schemes	Uisce Éireann, EPA and Local Authorities (including project level information)	Uisce Éireann
Landscape and visual amenity	**Project Landscape and Visual** a) Total working area of pipelines through protected landscapes, outside protected areas, and urban areas b) Development of protected landscape strategies to guide work in important and valued landscapes c) Land use/landscape features re-established for projects over an	• Project Target 18 Improvement or no net change in landscape quality through landscape design and mitigation and enhancement	Uisce Éireann (including project level information)	Uisce Éireann

SEA topics	SEA Project level indicators	SEA Project targets	Source data	Responsibility
	appropriate period – areas/km successfully restored to meet requirements			
Climate change	**Project Climate Change Mitigation** a) Carbon footprint (total tonnes) of construction and lifetime carbon tonnes including operational carbon calculated for the project b) Carbon intensity calculated of the project (kgsCO_2equic/ML) based on lifetime carbon c) Inclusion of renewable energy sources as part of the project d) Decarbonisation plan to inform design, construction and operation e) Carbon offsetting opportunities through carbon sequestration such as woodland planting or peat bog restoration.	Decarbonisation through the following: • Project Target 19 Benchmarked reduced carbon emissions from construction • Project Target 20 Increased contribution of renewable/low carbon energy sources • Project Target 21 Minimise the annual carbon emissions from operation and Improve energy efficiency of water services • Project Target 22 Scheme related carbon offsetting- such as upper catchment management initiative/collaboration linked to biodiversity and water and population wellbeing (recreational) objectives	Uisce Éireann (including project level information)	Uisce Éireann
	Project Climate Change Adaptation a) Flood, freeze thaw and drought risk vulnerability assessment including power outages to inform scheme design.	• Project Target 23 Improved project resilience to climate change effects	Uisce Éireann	Uisce Éireann
Cultural heritage	**Project Cultural Heritage** a) Number of designated sites or other important archaeological or	• Project Target 24 No unauthorised physical damage	Uisce Éireann (including	Uisce Éireann

SEA topics	SEA Project level indicators	SEA Project targets	Source data	Responsibility
	architectural heritage sites and/or their settings adversely affected by water resource options including through hydrological change from abstraction b) Provision of access to/ or recording of assets and communication/interpretation of interest features where appropriate	or alteration of the context of cultural heritage features due to Uisce Éireann activities • Project Target 25 All schemes developed applying best practice approaches for consultation, desk study and investigation and mitigation for cultural heritage and archaeological interest	project level information) Archaeological Survey of Ireland Sites and Monuments Record	
Geology and soils	**Project Geology and Soils** a) rea of geological site affected by water resource options b) Total area of soil removed or reused on schemes c) Area of contaminated land restored, or soils removed d) Area within catchment management initiative where soil is to be improved for example by reducing soil loss/erosion, reducing artificial fertiliser use, increasing soil carbon and increasing native woodland planting e) Consult the National Geodatabase, the Geological Survey Ireland's (GSI) Groundwater and Geothermal Unit, the National Landslide Database and Landslide Susceptibility Map, and the Historic Mine Site project datasets to identify constraints	• Project Target 26 No loss of statutory and non-statutory geological sites of interest • Project Target 27 Minimal disturbance or loss of high-quality land as a result of the Framework Work and minimal net loss of soil resources • Project Target 28 Catchment areas where raw water quality issues have been improved though soil and land management changes	Uisce Éireann (including project level information)	Uisce Éireann

Glossary and Acronyms

Term	Definition
Abstraction	The process of taking water from any source, including rivers and aquifers
Appropriate Assessment (AA)	An assessment required under the Habitats Directive when a plan or project has the potential to affect a European site
Aquifer	A water-bearing rock that groundwater can be extracted from
Baseline condition	The state of the environment in the absence of the NWRP Framework
Catchment	The total area of land that drains into a watercourse
CFRAM	Catchment Flood Risk Assessment and Management
CRU	Commission for Regulation of Utilities
CSO	Central Statistics Office
Cumulative effect	The combined effects from several plans, programmes or policies
Deficit	The amount of water shortage between supply and demand
Desalination	The process of removing salt from seawater
DHPLG	Department for Housing, Planning, and Local Government
EBSD	Economics of Balancing Supply and Demand
EC	European Commission
Effluent	Liquid waste or sewage discharged into a river or the sea
Environmental Report (SEA Environmental Report)	The SEA report that documents the effects of measures outlined in a plan
EPA	Environmental Protection Agency
GIS	Geographical Information System
Gross Domestic Product (GDP)	Gross Domestic Product is a monetary measure of the market value of all goods and services produced in a period (in this case annually)
GSI	Geological Survey Ireland
IGH	Irish Geological Heritage
Invasive species	Non-native species that out-compete native species to the detriment of an ecosystem
LSEs	Likely Significant Effects
MCA	Multi-Criteria Analysis
Mitigation	The implementation of measures designed to reduce the predicted effects of a plan or project on the environment
Ml/d	Mega litres per day
NAF	National Adaptation Framework

Term	Definition
National Climate Change Adaptation Framework	National Climate Change Adaptation Framework
National Water Resources Plan (NWRP)	A plan developed by water companies to deliver a long-term provision of water to accommodate the impacts of population growth, drought, their environmental obligations and climate change uncertainty in order to balance supply and demand for water. These are produced cyclically, at least every five years, with a minimum 25-year planning horizon.
NHA	National Heritage Area
Natura Impact Statement (NIS)	The statement prepared following AA of European sites as required under the Habitats Directive, which presents information on the assessment and the process of collating data on a project and its potential significant impacts on European sites.
NIAH	National Inventory of Architectural Heritage
NPV	Net Present Value
NPWS	National Parks and Wildlife Service
OPW	Office of Public Works
PCC	Per Capita Consumption
pNHA	Proposed National Heritage Area
Ramsar site	An international designation for an important wetland site under the Ramsar Convention
RSES	Regional Spatial and Economic Strategies
River Basin District	The area of land and sea, made up of one or more neighbouring river basins together with their associated groundwater and coastal waters, which is identified under Article 3(1) as the main unit for management of river basins
River Basin Management Plan (RBMP)	A key element to the WFD, taking an integrated approach to the protection, improvement and sustainable use of the water environment; including all surface water and groundwater bodies
RMP	Record of Monuments and Places
RPS	Record of Protected Structures
Special Area of Conservation (SAC)	An international designation for habitats and/or species under the Habitats Directive
Special Protection Area (SPA)	A site of international importance for birds, designated as required by the Birds Directive
Strategic Environmental Assessment (SEA) Objectives	Methodological measures against which the effects of the NWRP can be tested
Supply Demand Balance (SDB)	The SDB is the deficit or surplus between the supply and demand both now and over the 25-year horizon

Term	Definition
UKWIR	UK Water Industry Research
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organisation
WFD	Water Framework Directive
Water resource management	The management of water sources and demands to minimise any deficit between the two
Water Resource Management Plan	A plan designed to identify water deficits and outline measures that can reduce the deficit
Water Resource Zone (WRZ)	The largest possible zone in which all resources, including external transfers, can be shared and all customers experience a similar risk of supply failure from a resource shortfall
WSSP	Water Supply Strategic Plan
Water Supply Zone	The area supplied by an individual water supply scheme. This typically includes one or more abstractions (from a river, lake or groundwater), a treatment plant, storage in reservoirs and the distribution pipe network to deliver the water to each household or business.
WTP	Water Treatment Plant
WwTP(s)	Wastewater Treatment Plant

References

Central Statistics Office (CSO). 2020b. *New Dwelling Completions: Quarter 3 2020*. [Online]. Accessed: 15/10/21. Available at: https://www.cso.ie/en/releasesandpublications/er/ndc/newdwellingcompletionsq32020/

Central Statistics Office (CSO). 2021b. *Labour Force Survey (LFS) Quarter 4 2020*. [Online]. Accessed: 14/10/2022. Available at: https://www.cso.ie/en/releasesandpublications/er/lfs/labourforcesurveylfsquarter42019/

Ask about Ireland. 2017. *Land Use in Ireland.* Accessed: 05/09/2017. Available at: http://www.askaboutireland.ie/reading-room/life-society/farming/farming-in-ireland-overvi/land-use-in-ireland/

Cavan County Council. 2019. *Cavan County Council Climate Change Adaptation Strategy 2019-2024*. [Online]. Accessed: 14/10/2022. Available at: https://www.cavancoco.ie/output/file-library/environment/climate-change/climate-change-adaptation-strategy-pdf.pdf

Cavan County Council. 2022. *This is Cavan!* [Online]. Accessed: 17/10/2022. Available at: https://thisiscavan.ie/

Central Statistics Office (CSO). 2016. *E2014: Population Density and Area Size 2016 by Towns by Size, Census Year and Statistic*. [Online]. Accessed: 06/01/20. Available at: https://www.cso.ie/en/releasesandpublications/ep/p-cp2tc/cp2pdm/pd/

Central Statistics Office (CSO). 2020a. *Irish Life Tables 2015-2017*. [Online]. Accessed: 18/01/22. Available at: https://www.cso.ie/en/releasesandpublications/er/ilt/irishlifetablesno172015-2017/

Central Statistics Office (CSO). 2020b. *Physical activity of persons aged 15 years and over*. [Online]. Accessed: 05/10/21. Available at: https://data.cso.ie/table/IH292

Central Statistics Office (CSO). 2022. County Incomes and Regional GDP 2019. [Online]. [Accessed: 06/05/22]. Available from: https://www.cso.ie/en/releasesandpublications/er/cirgdp/countyincomesandregionalgdp2019/

Central Statistics Office (CSO). 2023a. Labour Force Survey Quarter 1 2023. [Online]. [Accessed: 01/07/23]. Available from: https://www.cso.ie/en/releasesandpublications/ep/p-lfs/labourforcesurveyquarter12023/labourforce/

Central Statistics Office (CSO). 2023b. *New Dwelling Completions: Quarter 1 2023*. [Online]. [Accessed: 01/07/23]. Available from: https://www.cso.ie/en/releasesandpublications/ep/p-ndc/newdwellingcompletionsq12023/

Clare County Council. 2019. *Clare County Council Climate Change Adaptation Strategy 2019-2024*. [Online]. Accessed: 14/10/2022. Available at: https://www.clarecoco.ie/services/environment/publications/clare-climate-change-adaptation-strategy-2019-2024-33843.pdf

Clare County Council. 2022. *Visit Clare*. [Online]. Accessed: 17/10/2022. Available at: https://www.clare.ie/disclaimer/

Department of Agriculture, Food and the Marine, 2015. *Food Wise 2025*. Accessed: 17/07/2018. Available at: https://www.agriculture.gov.ie/media/migration/foodindustrydevelopmenttrademarkets/agri-foodandtheeconomy/foodwise2025/report/FoodWise2025.pdf

Department of Agriculture, Food and the Marine, 2015. *Forestry Programme 2014-2020: Ireland*. Accessed: 17/07/2018. Available at: https://www.agriculture.gov.ie/media/migration/forestry/forestryprogramme2014-2020/IRELANDForestryProgramme20142020230215.pdf

Department of Agriculture, Food and the Marine. 2010. *Food Harvest 2020*. Accessed: 17/07/2018. Available at: https://www.agriculture.gov.ie/media/migration/foodindustrydevelopmenttrademarkets/agri-foodandtheeconomy/foodharvest2020/2020FoodHarvestEng240810.pdf

Department of Agriculture. 2016. *Fact Sheet on Irish Agriculture – February 2016*. Accessed: 05/09/2017. Available at: https://www.agriculture.gov.ie/media/migration/publications/2016/February2016Factsheet170216.pdf

Department of Arts, Heritage and the Gaeltacht (now known as Department of Culture, Heritage and the Gaeltacht), 2015. *National Landscape Strategy for Ireland 2015-2025*. Accessed: 17/07/2018. Available at: https://www.chg.gov.ie/heritage/built-heritage/national-landscape-strategy/

Department of Arts, Heritage and the Gaeltacht, 2011. *Actions for Biodiversity 2011-2016, Ireland's National Biodiversity Plan*. Accessed: 17/07/2018. Available at: https://www.npws.ie/sites/default/files/general/national-biodiversity-plan-english.pdf

Department of Arts, Heritage and the Gaeltacht, 2015. *Interim Review of the Implementation of Actions for Biodiversity 2011-2016*. Accessed: 17/07/2018. Available at: https://www.npws.ie/sites/default/files/publications/pdf/Biodiversity_Plan_Interim_Review_2011-2016.pdf

Department of Arts, Heritage and the Gaeltacht. 2020. *Historic Environment Viewer*. [Online]. Accessed: 06/01/20. Available at: http://webgis.archaeology.ie/historicenvironment/

Department of Business, Enterprise and Innovation. 2017. *Action Plan for Jobs 2017*. Accessed: 11/07/2018. Available at: https://dbei.gov.ie/en/Publications/Action-Plan-for-Jobs-2017.html#

Department of Communications, Climate Action and Environment. 2018. *Local Authority Adaptation Strategy Development Guidelines*. [Online]. Accessed: 06/01/2020. Available at: https://www.dccae.gov.ie/documents/LA%20Adaptation%20Guidelines.pdf

Department of Communications, Climate Action and Environment. 2012. *Our Sustainable Future*. Accessed: 11/07/2018. Available at: https://www.dccae.gov.ie/en-ie/environment/topics/sustainable-development/our-sustainable-future/Pages/default.aspx

Department of Communications, Climate Action and Environment. 2013. *National Policy Position on Climate Action and Low Carbon Development*. Accessed: 20/07/2018. Available at: https://www.dccae.gov.ie/en-ie/climate-action/publications/Pages/National-Policy-Position.aspx

Department of Communications, Climate Action and Environment. 2017. *National Mitigation Plan*. Accessed: 12/02/2018. Available at: https://www.dccae.gov.ie/documents/National%20Mitigation%20Plan%202017.pdf

Department of Communications, Climate Action and Environment. 2018. *National Adaptation Framework: Planning for a Climate Resilient Ireland*. Accessed: 20/07/2018. Available at: https://www.dccae.gov.ie/documents/National%20Adaptation%20Framework.pdf

Department of Communications, Marine and Natural Resources. 2007. *Government White Paper: Delivering a Sustainable Energy Future for Ireland – The Energy Policy Framework 2007-2020*.

Accessed: 11/07/2018. Available at: https://www.teagasc.ie/media/website/crops/crops/EnergyWhitePaper12March2007.pdf

Department of Culture, Heritage and the Gaeltacht. 2017. *National Biodiversity Action Plan 2017-2021*. Accessed: 17/07/2018. Available at: https://www.npws.ie/sites/default/files/publications/pdf/National%20Biodiversity%20Action%20Plan%20English.pdf

Department of Environment, Community and Local Government. 2012. *National Climate Change Adaptation Framework: Building Resilience to Climate Change*. Accessed: 20/07/2018. Available at: https://www.dccae.gov.ie/en-ie/climate-action/publications/Documents/4/National%20Climate%20Change%20Adaptation%20Framework.pdf

Department of Environment, Heritage and Local Government. 2010. *Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities*. Accessed: 20/07/2018. Available at: https://www.npws.ie/sites/default/files/publications/pdf/NPWS_2009_AA_Guidance.pdf

Department of Health. 2013. *Healthy Ireland: A Framework for Improved Health and Wellbeing 2013 – 2025*. Accessed: 17/10/2022. Available at: http://health.gov.ie/wp-content/uploads/2014/03/HealthyIrelandBrochureWA2.pdf

Department of Housing, Planning and Local Government (DPHLG). 2018. River Basin Management Plan for Ireland 2018-2021. [Online]. Accessed: 22/03/2021. Available at: https://www.gov.ie/en/publication/429a79-river-basin-management-plan-2018-2021/?referrer=http://www.housing.gov.ie/water/water-quality/river-basin-management-plans/river-basin-management-plan-2018-2021

Department of Housing, Planning and Local Government. 2017. *Nitrates Action Programme, 3rd Review*. Accessed: 02/08/2018. Available at: https://www.housing.gov.ie/search/archived/current?query=nitrate%20action%20programme

Department of Housing, Planning and Local Government. 2019b. Water Quality and Water Services Infrastructure: Climate Change Sectoral Adaptation Plan. [Online]. Accessed: 06/01/2020. Available at: https://www.dccae.gov.ie/documents/Water_Quality_and_Water_Services_Infrastructure_Climate_Adaptation_Plan.pdf

Department of Housing, Planning and Local Governments. 2019a. *Public Consultation on the Significant Water Management Issues for the third cycle River Basin Management Plan for Ireland 2022-2027*. [Online]. Accessed: 06/01/2020. Available at: https://www.housing.gov.ie/water/water-quality/water-framework-directive/public-consultation-significant-water-management

Department of Housing, Planning, Community and Local Government. 2017. *Public Consultation on the River Basin Management Plan for Ireland (2018-2021)*. Accessed: 12/09/2017. Available at: http://www.housing.gov.ie/sites/default/files/public-consultation/files/draft_river_basin_management_plan_1.pdf

Department of Housing, Planning, Community and Local Government. 2017. *River Basin Management Plan for Ireland (2018-2021)*. Accessed: 19/06/2018. Available at: http://www.housing.gov.ie/sites/default/files/publications/files/rbmp_full_reportweb.pdf

Department of Public Expenditure and Reform. 2017. *Capital Investment Plan 2016 – 2021*.

Department of Public Expenditure and Reform. 2019. *Public Spending Code: A Guide to Evaluating, Planning and Managing Current Expenditure*. Accessed: 14/05/2020. Available at: https://www.gov.ie/en/publication/public-spending-code/

Department of the Environment and Local Government, 2002. *National Spatial Strategy for Ireland, 2002-2020; People, Places and Potentia*l. Accessed: 17/10/2022. Available at: http://nss.ie/pdfs/Completea.pdf

Department of Transport, Tourism and Sport. 2015. *Tourism Policy Statement; People, Place and Policy – Growing Tourism to 2025*. Accessed: 20/07/2018. Available at: http://www.dttas.ie/sites/default/files/publications/tourism/english/people-place-and-policy-growing-tourism-2025/people-place-and-policy-growing-tourism-2025.pdf

Department of Transport, Tourism and Sport. 2016. *Tourism Action Plan 2016 -2018*. Accessed: 11/07/2018. Available at: http://www.dttas.ie/sites/default/files/tourism/Tourism%20Action%20Plan%20-%20Final.pdf

Department of Transport, Tourism and Sport. 2016. *Tourism*. Accessed: 11/07/2018. Available at: http://www.dttas.ie/tourism

Department of Transport, Tourism and Sport. 2019. *People, Place and Policy - Growing Tourism to 2025*. [Online]. Accessed: 06/01/2020. Available at: https://assets.gov.ie/15792/8b462712683748e7bcec6c7d5c7ecd2a.pdf

Donegal County Council. 2019. *Donegal Council Climate Change Adaptation Strategy 2019-2024*. [Online]. Accessed: 14/10/2022. Available at: https://www.donegalcoco.ie/media/donegalcountyc/environment/FINAL_Climate%20Change%20Adaptation%20Strategy%202019%20-2024.pdf

Donegal County Council. 2022. *Visit Donegal*. [Online]. Accessed: 17/10/2022. Available at: https://visitdonegal.net/

EC Environment Directorate-General. 2000. *Managing Natura 2000 Sites: The Provisions of Article 6 of the Habitats Directive 92/43/EEC*. Accessed: 20/07/2018. Available at: http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/provision_of_art6_en.pdf

EFTEC. 2012. *Benefits Assessment Guidance: User Guide*. Accessed: 20/07/2018. Available at: http://webarchive.nationalarchives.gov.uk/20140328154217/http://cdn.environment-agency.gov.uk/geho0312bwdz-e-e.pdf

Environmental Protection Agency (EPA). 2021a. Air Quality in Ireland Report 2021. [Online]. [Accessed: 31/10/22]. Available from: https://indd.adobe.com/view/67188a5f-37ff-44bd-b335-5d168fdcf113

Environmental Protection Agency (EPA). 2021b. *Tiering of Environmental Assessment – The Influence of Strategic Environmental Assessment on Project-level Environmental Impact Assessment*. [Online]. Accessed: 31/06/2022. Available at: https://www.epa.ie/publications/research/epa-research-2030-reports/research-391-tiering-of-environmental-assessment--the-influence-of-strategic-environmental-assessment-on-project-level-environmental-impact-assessment.php

Environmental Protection Agency (EPA). 2023a. *WFD Status Tables (excel) (All Waterbodies) 2016-2021.* (Online). (Accessed: 31/05/23). Available at: https://gis.epa.ie/GetData/Download

Environmental Protection Agency (EPA). 2023b. *WFD Risk Data Excel.* (Online). (Accessed: 05/02/23). Available at: https://gis.epa.ie/GetData/Download

Environmental Protection Agency (EPA). 2023. Water Quality in 2022: An Indicators Report (Online) Accessed 19/07/2023. Available at Water-Quality-2022-Indicator-Report-Web.pdf (epa.ie)

Environmental Protection Agency (EPA). 2022. Good Practice Guidance: Strategic Environmental Assessment in the Water Sector. Available at SEA_Screening_GoodPractice_Water-2022.pdf (epa.ie)

Environmental Protection Agency (EPA). n.d. *Environmental Sensitivity Mapping*. [Online]. Accessed: 23/03/2021. Available at: http://gis.epa.ie/GetData/Download

Environmental Protection Agency Research. 2015. *Report No. 159, Ensemble of regional climate model projections for Ireland.* Accessed: 21/07/2017. Available at: http://www.epa.ie/pubs/reports/research/climate/EPA%20159_Ensemble%20of%20regional%20climate%20model%20projections%20for%20Ireland.pdf

Environmental Protection Agency. 2020. *SEA Pack.* Accessed: 07/05/2020. Available at: http://www.epa.ie/pubs/advice/ea/seapack.html

Environmental Protection Agency. 2010. *The Provision and Quality of Drinking Water in Ireland: A Report for the Year 2010*. Accessed: 07/05/2020. Available at: http://www.meath.ie/media/Media,50445,en.pdf

Environmental Protection Agency. 2012. *CORINE Landcover Final Report*. Accessed: 07/05/2020. Available at: http://www.epa.ie/pubs/data/corinedata/CLC2012_IE_Final_Report.pdf

Environmental Protection Agency. 2013. *EPA Integrated Biodiversity Impact Assessment*. Accessed: 20/07/2018. Available at: http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/natura_2000_assess_en.pdf

Environmental Protection Agency. 2013. *Ireland's Greenhouse Gas Emission Projections: 2012 – 2030*. Accessed: 20/07/2018. Available at: https://www.epa.ie/pubs/reports/air/airemissions/EPA_GHG_Emission_Proj_pub_2013_FINAL.pdf

Environmental Protection Agency. 2015. *Developing and Assessing Alternatives in Strategic Environmental Assessment (SEA)*. Accessed: 20/07/2018. Available at: http://www.epa.ie/pubs/advice/ea/developingandassessingalternativesinsea.html

Environmental Protection Agency (EPA). 2020. State of the Environment report. Ireland's Environment – An Integrated Assessment 2020. [Online]. [Accessed: 21/12/20]. Available from: https://www.epa.ie/our-services/monitoring--assessment/assessment/irelands-environment/state-of-environment-report-/

Environmental Protection Agency (EPA). 2021a. *Air Quality in Ireland Report 2021*. (Online). (Accessed: 31/10/22). Available at: https://indd.adobe.com/view/67188a5f-37ff-44bd-b335-5d168fdcf113

Environmental Protection Agency. 2016b. *Air Quality in Ireland 2016: Indicators of Air Quality*. Accessed: 24/07/2018. Available at: https://www.epa.ie/pubs/reports/air/quality/Air%20Quality%20In%20Ireland%202016.pdf

Environmental Protection Agency. 2017. *Ireland's Greenhouse Gas Emission Projections 2016-2035*. Accessed: 14/10/2022. Available at: http://www.epa.ie/pubs/reports/air/airemissions/ghgprojections2016-2035/EPA_2017_GHG_Emission_Projections_Summary_Report.pdf

Environmental Protection Agency. 2022. *Guidelines on the information to be contained in Environmental Impact Assessment Reports*. Accessed: 14/10/2022. Available at: https://www.epa.ie/publications/monitoring--assessment/assessment/EIAR_Guidelines_2022_Web.pdf

European Commission. 1992. *Habitats Directive (92/43/EEC) on the Conservation of Natural Habitats and of Wild Flora and Fauna.*

European Commission. 2000. *WFD Directive (2000/60/EC) on establishing a framework for community action in the field of water policy*.

European Commission. 2001. *SEA Directive (2001/42/EC) on assessment of the effects of certain plans and programmes on the environment*.

European Commission. 2021. *Commission notice Assessment of plans and projects in relation to Natura 2000 sites – Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC 2021/C 437/01*. Accessed: 01/11/2022. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021XC1028%2802%29

European Commission. 2002. *Directive (2002/49/EC) relating to the assessment and management of environmental noise*.

European Commission. 2008. *Directive (2008/98/EC) on Waste (Waste Framework Directive).*

European Commission. 2008. *Directive 2008/50/EC on ambient air quality and cleaner air for Europe*.

European Commission. 2011. *The EU Biodiversity Strategy to 2020*. Accessed 17/07/2018. Available at: http://ec.europa.eu/environment/nature/info/pubs/docs/brochures/2020%20Biod%20brochure%20final%20lowres.pdf

European Commission. 2013. *Green Infrastructure Strategy: Enhancing Europe's Natural Capital*.

European Communities (Birds and Natural Habitats) Regulations 2011 [SI. 477]

European Communities (Environmental Assessment of Certain Plans and Programmes) Regulations 2004 (S.I. No. 435 of 2004) as amended by the European Communities (Environmental Assessment of Certain Plans and Programmes) (Amendment) Regulations 2011 (S.I. No. 200 of 2011).

European Communities (Good Agricultural Practices for the Protection of Waters) Regulations, 2006 as amended (S.I. No. 378 of 2006).

Fáilte Ireland. 2009. *Determination of Waters of National Tourism Significance and Associated Water Quality Status*. Accessed: 19/07/2017. Available at: http://swanireland.ie/download/resources/the_economics_of_water/Failte-Ireland-Water-Quality-Status-Report.pdf

Fáilte Ireland. 2016. *Tourism Development & Innovation: A Strategy for Investment 2016-2022*. Accessed: 02/02/2018. Available at: http://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/2_Develop_Your_Business/6_Funding/FI-Tourism-Investment-Strategy-Final-07-06-16.pdf

Fáilte Ireland. 2018. *Sligo.* [Online]. Accessed: 17/10/2022. Available at: https://sligotourism.ie/

Fáilte Ireland. 2020a. *Ireland's Hidden Heartlands.* [Online]. Accessed: 06/01/2020. Available at: https://www.failteireland.ie/IrelandsHiddenHeartlands.aspx

Fáilte Ireland. 2020b. *The Wild Atlantic Way*. [Online]. Accessed: 06/01/2020. Available at: https://www.failteireland.ie/Wild-Atlantic-Way.aspx

Galway City Council. 2020. *Galway City Council Climate Adaptation Strategy 2019-2024.* [Online]. Accessed: 14/10/2022. Available at: https://galwaycitycommunitynetwork.ie/wp-

content/uploads/2020/11/Climate-Adaptation-Strategy-Implementation-Plan-September-2020-to-September-2021-16112020.pdf

Galway County Council. 2019. *Galway County Council Draft Climate Adaptation Strategy 2019-2024*. [Online]. Accessed: 14/10/2022. Available at: https://www.galway.ie/en/services/environment/climatechange/

Geoba.se. 2017. *Ireland, Life Expectancy 1942*. Accessed: 25/07/2017. Available at: http://www.geoba.se/country.php?cc=IE&year=2042

Geological Survey of Ireland. 2017. *IGH Programme*. Accessed: 25/07/2017. Available at: http://www.gsi.ie/Programmes/Heritage+and+Planning/Heritage/The+IGH+Programme.html

Government of Ireland. 2018. *Ireland 2040 Our Plan: National Planning Framework*. Accessed: 16/03/2018. Available at: http://www.gov.ie/en/project-ireland-2040/

Government of Ireland. 2018. *Ireland 2040: Our Plan, National Development Plan 2018-2027*. Accessed: 16/03/2018. Available at: http://www.gov.ie/en/project-ireland-2040/

Government of Ireland. 2021. *myProjectIreland: Project Ireland 2040*. [Online]. Accessed: 06/02/2022. Available at: https://geohive.maps.arcgis.com/apps/MapSeries/index.html?appid=f05a07c5a0324b1a887cd9d5d7103e22

Healthy Ireland. 2016. *Healthy Ireland Survey*. Accessed: 20/07/2018. Available at: http://www.healthyireland.ie/accessibility/healthy-ireland-survey/

Hickey, D. 2016. *Ireland has great woodlands but has the lowest forest cover of all European countries, Irish Examiner*. Accessed: 20/07/2017. Available at: http://www.irishexaminer.com/lifestyle/outdoors/donal-hickey/ireland-has-great-woodland-but-has-the-lowest-forest-cover-of-all-european-countries-389700.html

Hooban, B. 2021. *A Point Prevalence Survey of Antibiotic Resistance in the Irish Environment, 2018-2019*. Environment International (152). [Online]. Accessed: 13/08/2021. Available at: https://www.sciencedirect.com/science/article/pii/S016041202100091X

Iarnród Éireann. 2018. *Network Statement*. Accessed: 18/09/2017. Available at: http://www.irishrail.ie/media/ie_2018_network_statement_(final).pdf

Inland Fisheries Ireland. 2015. *National Strategy for Angling Development 2015-2020*. Accessed: 02/02/2018. Available at: https://www.fisheriesireland.ie/national-strategy-for-angling-development/607-nationalstrategyforanglingdevelopment.html

Inland Fisheries Ireland. 2016. *Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters*. Accessed: 14/05/2020. Available at: https://www.fisheriesireland.ie/documents/624-guidelines-on-protection-of-fisheries-during-construction-works-in-and-adjacent-to-waters/file.html

Ireland GDP – *Gross Domestic Product, Ireland*. Accessed: 25/07/2018. Available at: https://countryeconomy.com/gdp/ireland

Irish Water. 2014. *Capital Investment Plan 2014-2016*. Accessed: 10/06/2017. Available at: https://www.water.ie/news/proposed-capital-investme/

Irish Water. 2015. *Irish Water Business Plan; Transforming Water Services in Ireland to 2021*. Accessed: 06/05/2021. Available at: https://www.water.ie/projects-plans/our-plans/irish-water-business-plan/

Irish Water. 2017. *Capital Investment Plan 2017-2021*. Accessed: 08/11/2017. Available at: https://www.cru.ie/document_group/decision-on-irish-water-revenue-for-2017-to-2018/

Irish Water. 2021. *Biodiversity Action Plan*. [Online]. Accessed: 06/05/2021. Available at: https://www.water.ie/docs/21668_Ervia_IrishWaterBiodiversityActionPlan_v7.pdf

Irish Water. 2022. *Technical Note: Groundwater Summary Report – Potential impacts on GW Bodies due to Irish Water Groundwater Abstraction Scheme*. Accessed: 17/10/2022.

Kelly-Quinn, M. and Reynolds, J.D. 2020. *Ireland's Rivers.* Accessed: 17/10/2022.

Leitrim County Council. 2019. *Leitrim County Council Climate Change Adaptation Strategy 2019-2024*. [Online]. Accessed: 14/10/2022. Available at: https://leitrimcoco.ie/eng/services_a-z/environment/climate-change-adaptation-strategy/leitrim-ccas-2019-2024-.pdf

Leitrim Tourism. 2020. *Welcome to Leitrim.* [Online]. Accessed: 17/10/2022. Available at: https://leitrimtourism.com/

Longford County Council. 2019. *Longford County Council Climate Change Adaptation Strategy 2019-2024*. [Online]. Accessed: 14/10/2022. Available at: https://www.longfordcoco.ie/services/environment/climate-action/climate-change-adaptation-strategy.pdf

Longford County Council. 2022. *Visit Longford*. [Online]. Accessed: 17/10/2022. Available at: https://longford.ie/en/visit/

Louth County Council. 2012. *Visit Louth*. [Online]. Accessed: 17/10/2022. Available at: https://www.visitlouth.ie/

Louth County Council. 2019. *Louth County Council Climate Change Adaptation Strategy 2019-2024*. [Online]. Accessed: 14/10/2022. Available at: https://www.louthcoco.ie/en/services/environment/climate-change-adaptation/climate-change-adaption-strategy.pdf

Mayo County Council. 2019. *Mayo County Council Climate Change Adaptation Strategy 2019-2024*. [Online]. Accessed: 14/10/2022. Available at: https://www.mayo.ie/getmedia/ede67b0e-a4e4-4e7c-a40b-fb1fcbdfd00c/Mayo-Climate-Adaptation-Strategy.pdf

Mayo County Council. 2020. *Visit Mayo.* [Online]. Accessed: 17/10/2022. Available at: https://www.mayo.ie/visit

McCormack, T., Naughton, O., Bradford, R., Campanyà, J., Morrissey, P., Gill, L., Lee, M. 2020. *GWFlood Project: Monitoring, Modelling and Mapping Karst Groundwater Flooding in Ireland*, Geological Survey Ireland Report. Accessed: 20/08/2021. Available at: https://secure.dccae.gov.ie/GSI_DOWNLOAD/Groundwater/Reports/GWFlood_Report_July2020_c.pdf

Meath County Council. 2019. *Meath County Council Climate Action Strategy 2019-2024*. [Online]. Accessed: 14/10/2022. Available at: https://www.meath.ie/system/files/media/file-uploads/2019-09/Meath%20CC%20Report_v4.pdf

Meath County Council. 2020. *Discover.* [Online]. Accessed: 17/10/2022. Available at: https://www.meath.ie/discover

Met Éireann. 2019. *Climate of Ireland*. [Online]. Accessed: 06/01/2020. Available at: https://www.met.ie/climate/climate-of-ireland

Monaghan County Council. 2019. *Monaghan County Council Climate Change Adaptation Strategy 2019-2024*. [Online]. Accessed: 14/10/2022. Available at: https://monaghan.ie/environment/wp-

content/uploads/sites/11/2019/11/Monaghan-County-Council-Climate-Change-Adaptation-Strategy-2019-2024-PDF.pdf

Monaghan Tourism. 2022. *More to Monaghan*. [Online]. Accessed: 17/10/2022. Available at: https://monaghantourism.com/

Mooney, D. et al. 2021. An analysis of the spatio-temporal occurrence of anthelmintic veterinary drug residues in groundwater. Science of the Total Environment (769). [Online]. Accessed: 13/08/2021. Available at: https://www.sciencedirect.com/science/article/pii/S0048969720383376

National Biodiversity Data Centre. 2014. *Ireland's invasive and non-native species – trends in introductions*. Accessed: 24/10/2018. Available at: http://www.biodiversityireland.ie/wordpress/wp-content/uploads/Trends-Report-2013.pdf

National Biodiversity Data Centre. 2021. *National Invasive Species Database*. [Online]. Accessed 13/08/2021. Available at: https://maps.biodiversityireland.ie/Dataset/66.

National Monuments Service, (n.d) *National Monuments; How many National Monuments are in State care*. Accessed: 20/07/2018. Available at: https://www.archaeology.ie/how-many-national-monuments-are-state-care-0

National Parks and Wildlife Service. 2013. T*he Status of Protected EU Habitats and Species in Ireland. Overview Volume 1*. Accessed: 20/07/2018.

National Parks and Wildlife Service. 2015. *National Peatlands Strategy*. Accessed: 20/07/2018. Available at: https://www.npws.ie/peatlands-and-turf-cutting/peatlands-council/national-peatlands-strategy

National Parks and Wildlife Service. 2016a. *Special Areas of Conservation*. Accessed: 20/07/2018. Available at: http://www.npws.ie/protected-sites/sac

National Parks and Wildlife Service. 2016b. *Special Areas of Conservation; SAC datasheets*. Accessed: 24/10/2018. Available at: http://www.npws.ie/protected-sites/sac

National Parks and Wildlife Service (NPWS). 2023. *Protected Sites in Ireland*. [Online]. [Accessed: 16/05/23]. Available from: https://www.npws.ie/protected-sites

National Tourism Development Authority. 2016. *Tourism Development & Innovation: A strategy for investment 2016-2022*. [Online]. Accessed: 06/01/2020. Available at: https://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/Irelands%20Ancient%20East/FI-Tourism-Investment-Strategy-Final-07-06-16.pdf

Nelson, B., Cummins, S., Fay, L., Jeffrey, R., Kelly, S., Kingston, N., Lockhart, N., Marnell, F., Tierney, D. and Wyse Jackson, M. 2019. *Checklists of protected and threatened species in Ireland*. Irish Wildlife. [Online]. Accessed: 06/01/2020. Available at: https://www.npws.ie/sites/default/files/publications/pdf/iwm-116-checklists-protected-threatened-species-2019.pdf

Noone, S., Broderick, C., Duffy, C., Matthews, T., Wilby, R.L. and Murphy, C. 2017. *A 250-year drought catalogue for the island of Ireland (1765–2015)*. Accessed: 20/07/2018.

NPWS. 2016. *Special Protection Areas*. Accessed: 20/07/2018. Available at: http://www.npws.ie/protected-sites/spa

Office of Public Works. 2018. *Flood Maps*. Accessed: 17/07/2018. Available at: http://www.floodinfo.ie/map/floodmaps/

Roscommon County Council. 2019. *Roscommon County Council Climate Change Adaptation Strategy 2019-2024*. [Online]. Accessed: 14/10/2022. Available at: https://www.roscommoncoco.ie/en/about_us/business-units/assets-energy-management/climate-change-adaptation-strategy-2019-%E2%80%93-2024/final-climate-change-adaptation-strategy-2019-%E2%80%93-2024.pdf

Roscommon County Council. 2020. *Visit Roscommon*. [Online]. Accessed: 17/10/2022. Available at: https://www.visitroscommon.ie/

Scottish Environment Protection Agency. 2016. *Strategic Environmental Assessment, SEPA Guidance Note 4, Guidance on consideration of material assets in Strategic Environmental Assessment*. Accessed: 17/10/2022. Available at: https://www.sepa.org.uk/media/219432/lups-sea-gu4-consideration-of-material-assets-in-sea.pdf

Sleeman, A, MacDonnell, B. and Gatley, S. 2004. Understanding Earth processes, Rocks and the Geological History of Ireland: A Companion to the 1:1,000,000 Scale Bedrock Geological Map of Ireland [Online]. Accessed: 16/08/2021. Available at: https://www.gsi.ie/en-ie/publications/Pages/Understanding-Earth-Processes-Rocks-and-the-Geology-of-Ireland.aspx

Sligo County Council. 2019. *Sligo County Council Climate Change Adaptation Strategy 2019-2024*. [Online]. Accessed: 14/10/2022. Available at: https://www.sligococo.ie/corporateplan/ClimateAdaptationStrategy.pdf

Sustainable Development Council. 2010. *Creating Green Infrastructure for Ireland; Enhancing Capital for Human Wellbeing*. Accessed: 12/02/2018. Available at: http://edepositireland.ie/bitstream/handle/2262/71873/Comhar_27_2010.pdf?sequence=1&isAllowed=y

Teagasc. 2016. *Agriculture in Ireland*. Accessed: 08/02/2018. Available at: https://www.teagasc.ie/rural-economy/rural-economy/agri-food-business/agriculture-in-ireland/

Tourism Ireland. 2017. *2016 Facts & Figures.* Accessed: 27/09/2017. Available at: https://www.tourismireland.com/TourismIreland/media/Tourism-Ireland/Press%20Releases/Press%20Releases%202017/Facts-and-Figures-2016.pdf?ext=.pdf

UKTAG. 2013. *UK Technical Advisory Group on the Water Framework Directive Final recommendations on new and updated biological standards.* [Online]. Accessed: 06/01/2020. Available at: http://www.wfduk.org/sites/default/files/Media/UKTAG%20Final%20recommendations%20on%20biological%20stds_20131030.PDF

UKWIR. 2012. *Strategic Environmental Assessment and Habitat Regulations Assessment – Guidance for Water Resource Management Plans and Drought Plans*.

UKWIR. 2012. *Water resource planning guideline: The technical methods and instructions*. Accessed: 19/07/2018. Available at: http://webarchive.nationalarchives.gov.uk/20130304134536/http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/LIT_6932_56bc01.pdf

Visit Galway. 2020. *Welcome to Galway.* [Online]. Accessed: 17/10/2022. Available at: https://www.visitgalway.ie/