Autumn 2022

Regional Water Resources Plan–Eastern and Midlands

Strategic Environmental Assessment

Appendix H: Study Area 4 – Environmental Review

Tionscadal Éireann
Project Ireland
2040

Data disclaimer: This document uses best available data at time of writing. Some sources may have been updated in the interim period. 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 documentation.

Baseline data included in the RWRP-EM 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 Irish Water data sets. Data sources will be detailed in the relevant sections of the RWRP-EM. 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

This Study Area Environmental Review forms part of the SEA environmental Report for the Regional Water Resources Plan (RWRP) for the Eastern and Midlands Region (referred to as the Regional Plan). The Regional Plan includes nine individual Study Area reviews (SA1-9) as appendices.

This Study Area 4 Environmental Review includes:

- Context for the Study Area Environmental Review;
- 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; and
- Recommendations for implementation, including mitigation and monitoring.

This Environmental Review summarises the environmental assessment undertaken for Study Area 4 within the Eastern and Midlands Region for the options and approaches considered and as outlined in the Study Area 4 Technical Report (RWRP-EM Appendix 4). This Environmental Review applies the Strategic Environmental Assessment (SEA) objectives and environmental assessment methodology set out in the NWRP Framework Plan (Framework Plan).

Environmental Reviews have been undertaken for each study area and form Appendices to the SEA Environmental Report for the Regional Plan which form Phase 2 of the National Water Resources Plan (NWRP). Phase 1 in the development of the NWRP was the preparation of the Framework Plan, which was adopted in Spring 2021 following SEA, Appropriate Assessment (AA) and extensive public consultation. The Framework Plan and supporting documentation are available at https://www.water.ie/projects/strategic-plans/national-water-resources.

1.1 Options Assessment Methodology

The Options Assessment Methodology implemented as part of the RWRP-EM provides a framework to identify potential solutions to address identified need. The key stages of the process are illustrated in Figure 1.1 and summarised below:

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 – assessing 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 and scoring assessment update;
7) Approach appraisal – comparison and assessment of combinations of options identified to meet the predicted supply demand deficit to determine the Preferred Approach; and
8) Monitoring and Feedback – a process for monitoring the implementation of the plan and responding to changes to policy and guidelines and to information changes which will feed into

the 5 year plan cycle and includes an annual review to identify actions required within the plan cycle.

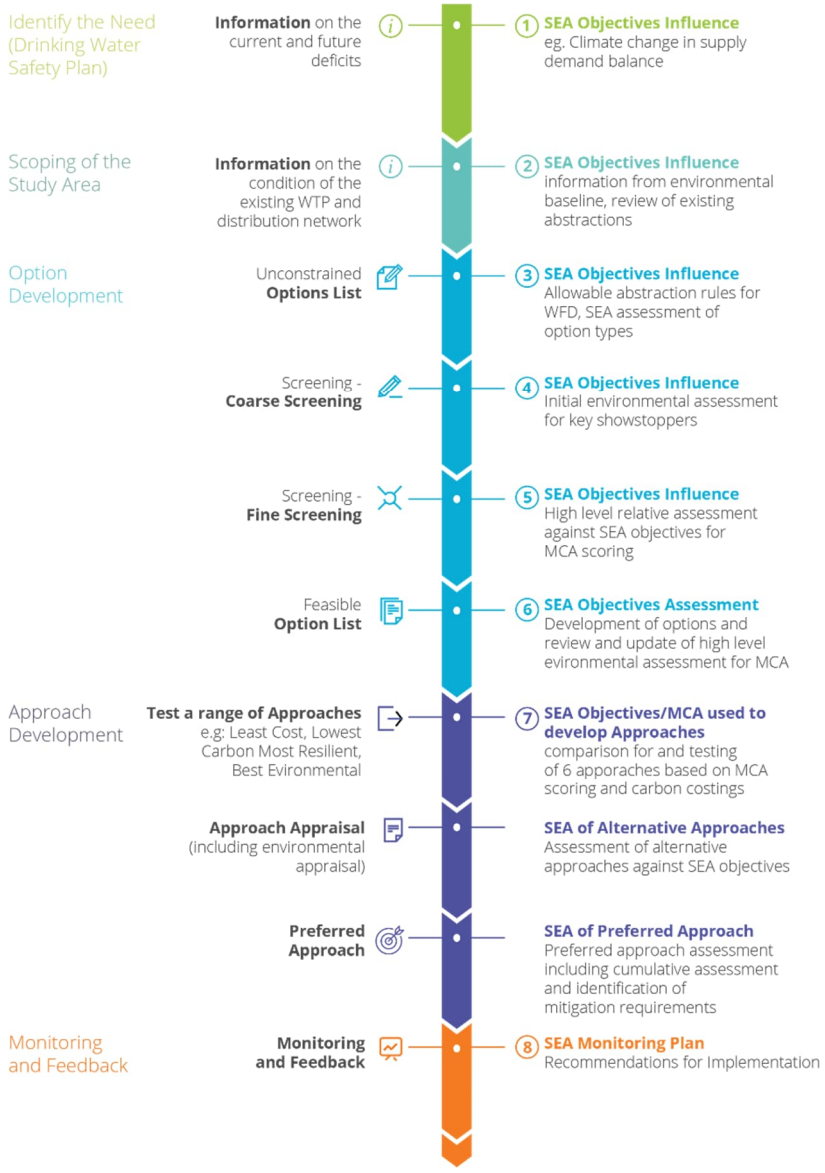

Figure 1.1 Option and Approach Development Process

1.2 Regional Plan Strategic Environmental Assessment

The four RWRPs, implementing Phase 2 of the NWRP, are each subject to a separate SEA process. The study area assessments will follow the outline methodology established by the Framework Plan. The SEA Environmental Report was published for consultation alongside the draft Regional Plans for each of the four regions.

Each of the Study Area Environmental Reviews are presented as appendices to the SEA Environmental Reports and include:

- Introduction for SEA, Water Framework Directive (2000/60/EC) (WFD) and AA applied at the study area 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 study area and with other proposed developments in the study area; and
- Recommendations for implementation, including mitigation and monitoring.

1.3 Study Area: Strategic Environmental Assessment

The set of SEA objectives developed at the Phase 1 scoping stage have been refined and finalised following consultation (see Table 1.1). These objectives 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 the Regional Plan SEA scoping report.

Table 1.1 SEA Objectives

SEA Topic	SEA Objective
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 in providing water services.
Water environment	Water quality and resources Prevent deterioration of the WFD status of waterbodies with regard to both water quality and quantity due to Irish Water's activities. Contribute towards the "no deterioration" WFD condition and, where possible, to the improvement of waterbody status for rivers, lakes, transitional and coastal waters, and groundwater to at least 'Good' status.
	Flood risk Protect and, where possible, reduce risk from ground water and surface water flooding as a result of Irish Water's activities.
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 water abstractions.
Landscape and visual amenity	Protect and, where possible, enhance designated landscapes in providing water services.
Climate change	Climate change mitigation Minimise contributions to climate change emissions to air (including greenhouse gas emissions) as a result of Irish Water's activities.

SEA Topic	SEA Objective
	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 in providing water services.
Geology and soils	Protect soils and geological heritage sites and, where possible, contribute towards the appropriate management of soil quality and quantity.

The SEA informs the development of the approaches and is undertaken on the various alternative approaches considered and the Preferred Approaches identified, along with cumulative impact assessment and identification of 'in-combination' effects.

The Regional Plan SEA Environmental Report was completed only after all study area reports for the Eastern-Midlands region were available. At that point, Irish Water conducted an exercise as part of the development of the overall relevant Regional Plan to assess the cumulative and in-combination impacts of the Preferred Approaches identified for each study area within the Eastern and Midlands region. The conclusions of that cumulative assessment are presented in the SEA Environmental Report for the Eastern Midlands region.

If appropriate, the Preferred Approach identified for SA4 will have been modified prior to finalisation of the Regional Plan Technical Report and Environmental Review to take into account the conclusions of that cumulative assessment and identification of in-combination effects. The SEA for each of the Regional Plans in turn includes a cumulative assessment of the Preferred Approaches identified in the Regional Plan, in combination with the effects of the Preferred Approaches for each other region (to the extent that data was available and recognising that each Regional Plan is at a different stage of development).

1.4 Study Area: Water Framework Directive

Requirements under the WFD to avoid deterioration in waterbody status or objectives has been incorporated into the allowable abstraction constraints for new option abstractions. WFD requirements are also included in the SEA objectives for the assessment (see Table 1.1). Baseline data in relation to the WFD is presented in section 2.2.1 and a summary of the assessment for SA4 is provided in chapter 8 of this review.

1.5 Study Area: Appropriate Assessment

An AA was required for the Framework Plan to comply with the EU Habitats Directive (92/43/EEC) and is relevant to development of the Regional Plans, including the component study areas.

AA issues will be addressed in a separate Natura Impact Statement (NIS) for the Regional Plan, which will support the overall AA process that Irish Water is required to carry out. Habitats Directive requirements have been integrated into the options development process and conclusions from the NIS for SA4 are provided in chapter 9 of this review.

1.6 Study Area 4

The Eastern and Midlands Region is subdivided into nine study areas based on factors such as:

- Groundwater body boundaries;
- Surface water sub-catchments;
- Geographical features;
- WRZ boundaries;
- Local authority functional areas; and
- Appropriate size for an efficient reporting structure.

This Appendix reports on SA4, the location of SA4 in relation to the Eastern and Midlands Region is shown in Figure 1.2.

Study Area 4 lies within the counties of Cavan, Longford, Westmeath, Meath, Offaly and Kildare and its total area is approximately 2,637 km^2. The principal settlement (with a population of over 10,000) within SA4 is Mullingar (CSO, 2016a), as shown in Figure 1.3.

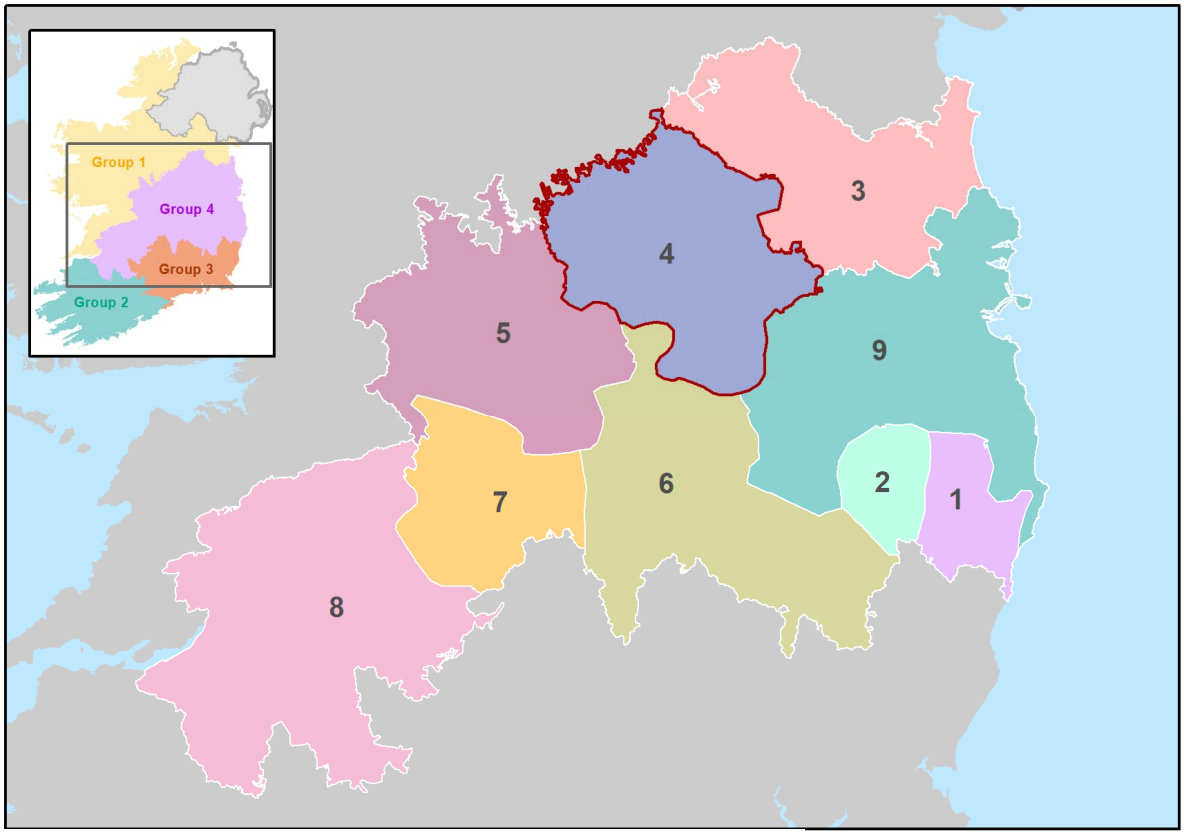

Figure 1.2 Eastern and Midlands Region Study Areas

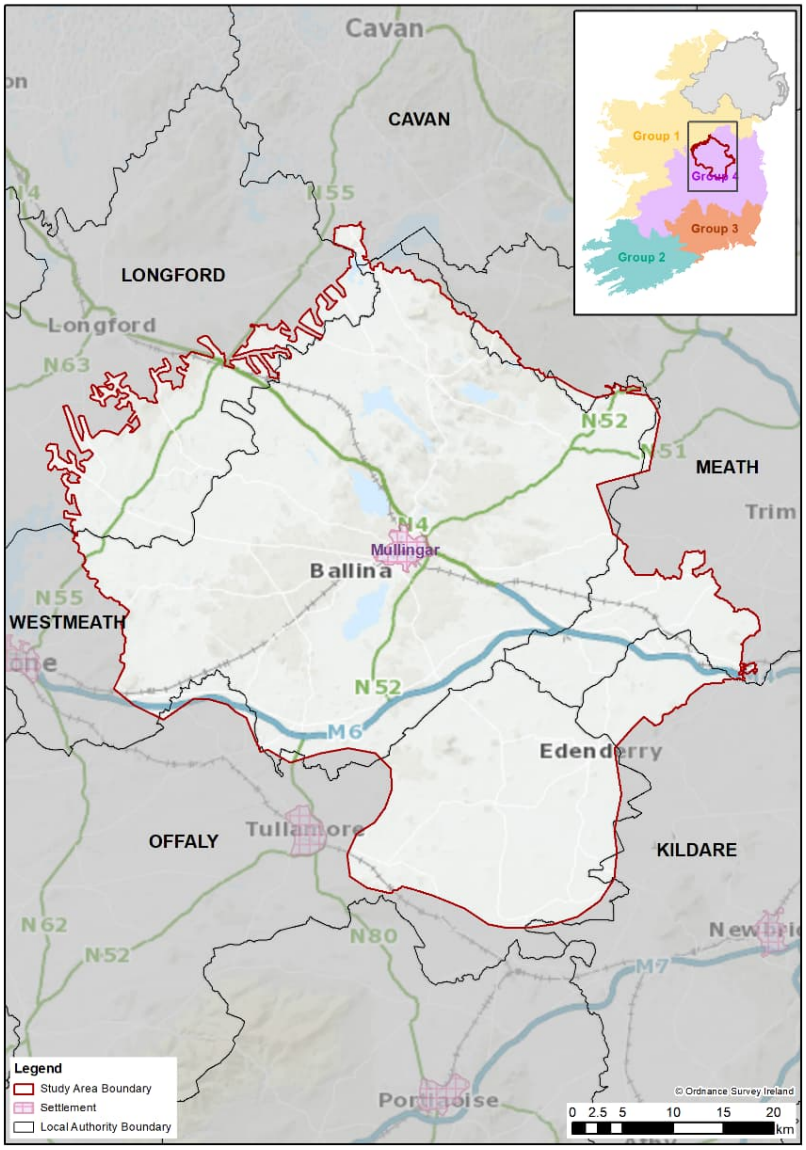

Figure 1.3 Study Area 4

2

Study Area 4 Environmental Baseline Context

2 Study Area 4 Environmental Baseline Context

This chapter provides environmental baseline information for SA4 regarding the following key environmental topics in the SEA:

- 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;
- Geology and Soils; and
- Summary of Key Issues and Trends over the Plan Period within the study area.

The baseline environment considers key indicators characterising the current situation in the study area and how these aspects are likely to develop over the Framework Plan's planning period. This includes issues relating to pressures on the environment or the sensitivity of the environment to change. This chapter is intended to support and add to the baseline environmental information for the Regional Plans SEA Environmental Report, as context for the option appraisal and programme selection.

The baseline assessment also addresses the environmental aspects of Stages 1 and 2 of the options assessment methodology:

- Stage 1 Identifying need – based on SDB and/or Drinking Water Safety Plan Barrier Assessment; and
- Stage 2 Scoping of the study area (WRZs) – understanding WRZs within the study area and the existing conditions of assets, supply and demand issues as well as environmental constraints and opportunities.

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

2.1.1 Population

Table 2.1 provides a general overview of the WRZ's population and the projected percentage change in population between 2019 and 2044. The largest projected increases in population are expected in the WRZs Enfield (2300SC0018) and Mullingar Regional (3200SC0001). The estimated population currently living in each WRZ has been based on the 2016 Census data. The 2016 population was assigned to District Metering Areas (DMAs) by mapping the Central Statistics Office (CSO) data to DMA boundaries. Irish Water have projected the 2016 population forward to 2019 using the growth projections in the National Planning Framework, updated information from the Regional Spatial and Economic Strategies, and Local Authority Planning sections (where available).

Table 2.1 Overview of the Population within the WRZs of SA4

WRZ Reference Number and Name	Total Population Served (2019)*	% Population Change (2019-2044)*
1400SC0004 - Ardcarraig Clogherinkoe	111	+15.3%
1400SC0005 - Clonuff	36	+15.3%
2000SC0003 - Ballymahon	8,402	+15.3%
2300SC0012 - Clonard	334	+15.3%
2300SC0016 - Longwood	1,757	+15.3%
2300SC0018 - Enfield	3,748	+105.5%
2500SC0004 - Geashill PWS	721	+15.3%
2500SC0005 - Edenderry / Rhode	11,041	+15.3%
2500SC0006 - Walsh Island PWS	978	+15.3%
2500SC0007 - Clonbullogue PWS	858	+15.3%
2500SC0014 - Daingean PWS	1,505	+15.3%
3200SC0001 - Mullingar Regional	50,016	+20.0%
3200SC0003 - Ballany	8,366	+15.3%

*The estimated population has been based on the 2016 Census data. Irish Water have projected the 2016 population forward to 2019 using the growth projections in the National Planning Framework, Regional Spatial and Economic Strategies, and Local Authority Planning sections.

2.1.2 Economy and Employment

Majority of SA4 lies within the Midlands region and a small part of SA4 lies within the Mid-East region of Ireland. SA4 had a below average (Midlands) and above average (Mid-East) household disposable income per person in 2016 (CSO, 2016b), and an unemployment rate of 10.1% in the Midlands and 7.4% in the Mid-East region of the country (CSO, 2017a).

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 an aim to increase housing stock. The number of new dwellings completed in Q3 2020 was 1,303 for the Mid-East region and 214 for the Midlands region (CSO, 2020a).

2.1.3 Tourism and Recreation

Tourism in SA4 has an important role, particularly in rural areas, 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 county of Westmeath has been described as “a county… where Ireland’s Ancient East meets Ireland’s Hidden Heartlands” (Visit Westmeath, 2020) and Offaly as “Ireland’s hidden gem” (Visit Offaly, 2020), with emphasis placed on the importance of the lakes of Westmeath, and on opportunities for culture, history and outdoor recreation for both counties. For example, Lough Ennel and Owel are popular with angling and water sports and Lough Derravaragh is considered integral to Irish mythology (Visit Offaly, 2020 and Visit Westmeath, 2020).

Additionally, the study area is located within Ireland's Ancient East. This is part of a tourism development strategy that covers the South, East and part of the Midlands, placing emphasis on the importance of historic sites in the area (National Tourism Development Authority, 2016).

Ireland's natural heritage is also recognised as an important tourism asset by the Department of Transport, Tourism and Sport (2019) and is a key aspect of county Offaly's tourism strategy (Visit Offaly, 2020). For SA4, the nature reserves of note are Raheenmore Bog and Scragh Bog. Rivers, loughs and coastal areas all make an important contribution to tourism and recreational opportunities and support important fisheries.

2.1.4 Human Health

Table 2.2 provides well-being indicators for the Midlands and Mid-East regions within Ireland. Improvements in air quality, access to good quality drinking water and participation in recreational activities can all have a positive influence on human health and well-being.

Table 2.2 Well-Being Indicators for the Midlands and Mid-East Regions within Ireland

Life Expectancy (CSO, 2017b)	Participation in Sports, Fitness or Recreational Physical Activities (% of Persons Aged 15+) (CSO, 2020b)	Air Quality (EPA, 2020a)
Midlands: Male: 77.2 Female: 81.5	**Midlands:** 47%	Good
Mid-East: Male: 77.2 Female: 81.4	**Mid-East:** 49%	Good

A key issue for public health is reliable access to good quality drinking water. Regulated water service providers have to ensure appropriate standards of supply and be able to cope with drought conditions, peak events, and maintenance of assets. This requires adequate reserve capacity in Irish Water's supplies to provide a 1 in 50 Level of Service. At present, not all supplies within this study area provide the required levels of reserve capacity. Due to the limited historical monitoring of these supplies, particularly in relation to groundwater, this will need to be studied further. Table 2.3 lists the areas supplied by the Water Treatment Plants (WTPs) in SA4.

Table 2.3 Areas Supplied by the WTPs in SA4

WTP	WRZ	Local Authority Supplied
Ardcarraig WTP	1400SC0004 - Ardcarraig Clogherinkoe	Kildare
Clonuff Borehole WTP	1400SC0005 - Clonuff	Kildare
Abbeyshrule WTP	2000SC0003 - Ballymahon	Longford
Abbeyfields Estate WTP and Meadowview Estate WTP	2300SC0012 - Clonard	Meath
Longwood WTP	2300SC0016 - Longwood	Meath

WTP	WRZ	Local Authority Supplied
Enfield Borehole WTP	2300SC0018 - Enfield	Meath
Geashill WTP	2500SC0004 - Geashill PWS	Offaly
Toberdaly WTP and Edenderry (Blundelwood) WTP	2500SC0005 - Edenderry/Rhode	Offaly
Walsh Island WTP	2500SC0006 - Walsh Island PWS	Offaly
Clonbullogue WTP	2500SC0007 - Clonbullogue PWS	Offaly
Daingean WTP	2500SC0014 - Daingean PWS	Offaly
Portloman WTP	3200SC0001 - Mullingar Regional	Westmeath
Ballany WTP	3200SC0003 - Ballany	Westmeath

Currently for day-to-day operations, eight out of thirteen of the WRZs in the area have a current SDB deficit and nine have a projected SDB deficit (based on a 'Do Minimum' approach – see section 4.5 for further clarification). However, under normal weather and demand conditions, the current deficit does not manifest as an interruption to supply for all WRZs.

Poor water quality can be linked to risks to health. The Barrier Assessment identified thirteen of the fifteen WTPs within the study area as being at high risk of failing to achieve Irish Water's conservative Barrier Assessment standards in relation to maintaining chlorine residual in the network (Barrier 2.1) and the effectiveness of Irish Water's Protozoa removal processes (Barrier 3) (see table 2.1 in the SA4 Technical Report). The "quality need" identified through the Barrier Assessment is not an indicator of compliance with the Drinking Water Regulations. It is an internal Irish Water assessment of the need to invest in areas of the Irish Water asset base through resource planning, to ensure that potential risks or emerging risks to supplies are addressed. At present, there are no WTPs in SA4 on the EPA Remedial Action List (RAL). However, Longwood is subject to an EPA Direction for inadequate disinfection, which is a precursor to the RAL, and works are planned to address this in 2021.

Irish Water is currently progressing immediate corrective action in relation to a number of supplies. Details of these are included in the SA4 Technical Report.

2.2 Water Environment

This topic covers geomorphology, WFD, flood risk, surface water quality and groundwater receptors. Figure 2.1 shows the water environment, including the WRZs, the WFD water catchment boundaries, the WTPs and the waterbodies in SA4.

Table 2.4 provides a summary of the WFD catchments within SA4.

Table 2.4 Catchments within SA4 (EPA, 2020b)

WFD Catchments	Total Area (km^2)	Catchment Area within SA4 (km^2)
Boyne	2,690	884
Barrow	3,016	301
Lower Shannon (Brosna)	1,248	485
Upper Shannon (Upper)	1,500	19

WFD Catchments	Total Area (km²)	Catchment Area within SA4 (km²)
Upper Shannon (Lough Ree)	582	17
Upper Shannon (Inny)	1,229	927
Upper Shannon (Mid Shannon)	383	5

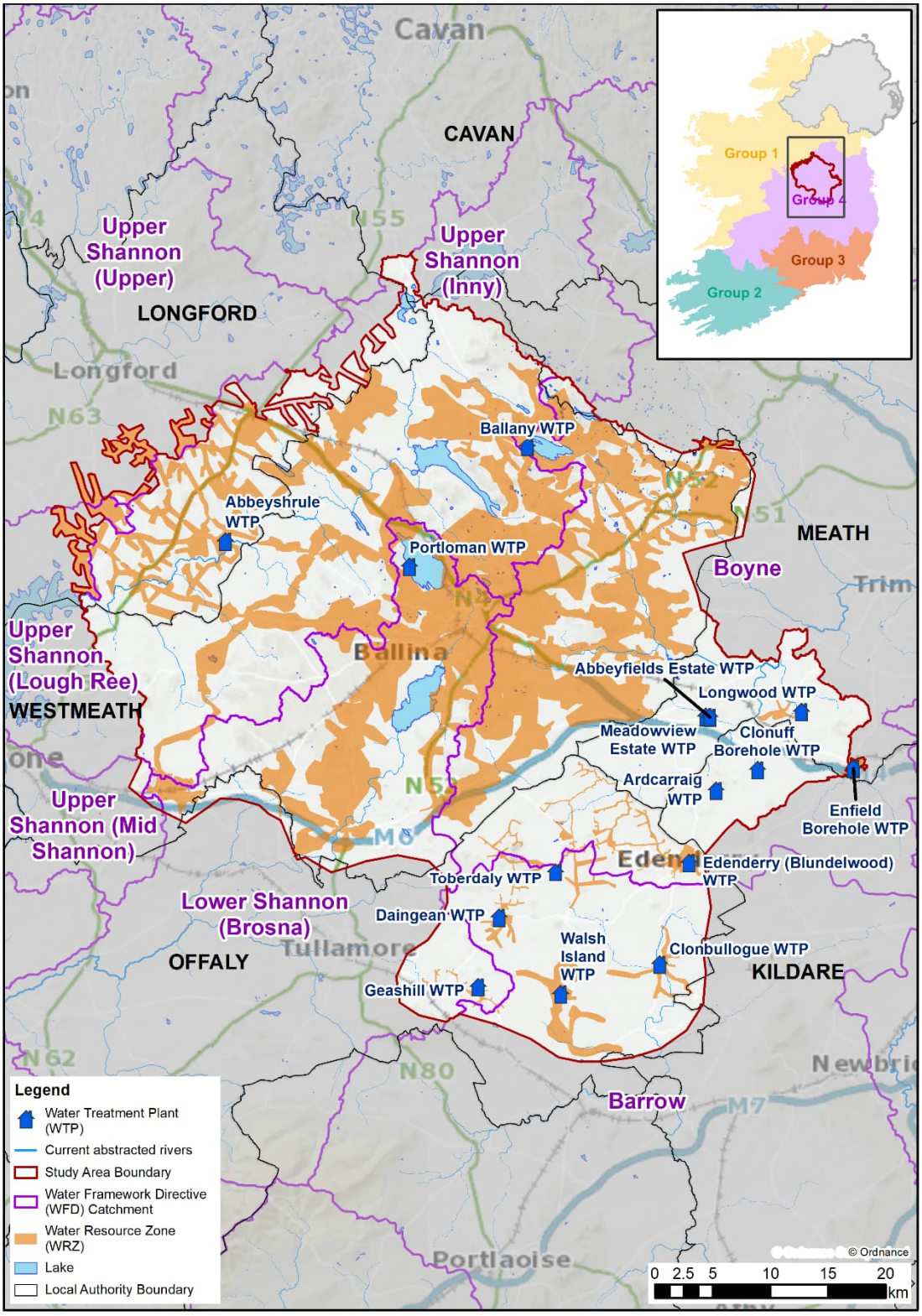

Figure 2.1 Water Environment of SA4

2.2.1 Water Framework Directive

Under the WFD, 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 or any of the WFD water quality parameters.

The General Scheme of the Water Environment (Abstractions) Bill 2018 (The Bill), to introduce abstraction licensing aligned to the WFD, was published in summer 2018. This legislation will set the amount Irish Water can take from the water supplies that it abstracts water from.

As there are very few long duration flow records for Irish Water's abstractions and for waterbodies within Ireland, Irish Water lacks comprehensive data to fully understand the impact of the new legislation on these sources. Information is not currently stored centrally as it was historically collected and collated by Local Authorities. Irish Water is building a telemetry system which will aid bringing all this data together, but this will take time. Therefore, improved monitoring and gathering better data is a priority.

On an interim basis, Irish Water has developed an initial desktop assessment based on available information (see SA4 Technical Report). Over the coming years, Irish Water will work with the environmental regulator, the EPA and the Geological Survey of Ireland, to develop desktop and site investigation systems to better understand the sustainability of its groundwater sources.

To understand the potential impact of the Abstraction Legislation on the SA4 supplies, Irish Water has assessed its surface water abstractions and summarised the potential impact on the Lough Owel (Portloman), Lough Lene (Ballany) and River Inny (Abbeyshrule). Based on this initial assessment, the volumes of water abstracted from Lough Owel and Lough Lene may not meet sustainability guidelines during dry weather flows.

Irish Water has taken a conservative approach in identifying sustainable abstractions for new options (described in section 3.2) and has applied a sensitivity assessment that considers proposals against potential for future sustainability related reductions in volume (section 5.4).

The Department of Housing, Planning and Local Government's (2019a) public consultation document, regarding the significant water management issues, has been considered by Irish Water. Therefore, the pressures, and the relevant priority 'Areas for Action' are provided below and in Table 2.7.

There are seven WFD catchments in SA4 and the total number of surface and groundwater waterbodies within SA4 are provided in Table 2.5 below.

Table 2.5 WFD Waterbodies within SA4 (EPA, 2019b, 2019c, 2019d, 2019e and 2019f)

Waterbody Type	Water Catchments	Number of Waterbodies	Number of Waterbodies Rated Below Moderate
Rivers	Barrow	14	4
	Boyne	46	4
	Lower Shannon (Brosna)	27	6
	Upper Shannon (Upper, Lough Ree, Inny and Mid Shannon)	34	5
Lakes	Barrow	0	0
	Boyne	6	0

Waterbody Type	Water Catchments	Number of Waterbodies	Number of Waterbodies Rated Below Moderate
	Lower Shannon (Brosna)	2	0
	Upper Shannon (Upper, Lough Ree, Inny and Mid Shannon)	7	0
Transitional and Coastal	N/A	0	0
Groundwater	N/A	35	1

The predominant pressures, and the percentage of 'at risk' waterbodies impacted by them, in the latest catchment summaries (catchments.ie, 2021a, 2021b, 2021c, 2021d, 2021e, 2021f and 2021g) are:

- Barrow: Agriculture (75%) and Hydromorphology (31%);
- Boyne: Agriculture (68%) and Hydromorphology (41%);
- Lower Shannon (Brosna): Agriculture (56%) and Hydromorphology (38%);
- Upper Shannon (Upper): Agriculture (79%), Hydromorphology (37%) and Other (including invasive species, anthropogenic unknown, historically polluted sites, illegal dumping and anthropogenic tourism) (29%);
- Upper Shannon (Lough Ree): Hydromorphology (70%), Agriculture (60%) and Urban Runoff (40%);
- Upper Shannon (Inny): Agriculture (81%); and
- Upper Shannon (Mid Shannon): Hydromorphology (75%), Peat Drainage and Extraction (50%) and Agriculture (38%).

The Boyne catchment summary (catchments.ie, 2021b) also notes that Bane Noggin Hill Lake (Kells/Oldcastle Public Water Supply) is under significant pressure due to abstraction for water supply.

Table 2.6 includes a summary of the 'at risk' waterbodies within SA4.

Table 2.6 Summary of 'At Risk' Waterbodies in SA4 (EPA, 2019b, 2019c, 2019d, 2019e and 2019f)

Waterbody Type	Water Catchments	Number of Waterbodies Identified as 'At Risk'	Surface Waterbodies Status 'At Risk' Due to Abstraction Pressure*
Rivers	Barrow	6	0
	Boyne	28	
	Lower Shannon (Brosna)	14	
	Upper Shannon (Upper, Lough Ree, Inny and Mid Shannon)	15	
Lakes	Barrow	0	2
	Boyne	0	
	Lower Shannon (Brosna)	0	

Waterbody Type	Water Catchments	Number of Waterbodies Identified as 'At Risk'	Surface Waterbodies Status 'At Risk' Due to Abstraction Pressure*
	Upper Shannon (Upper, Lough Ree, Inny and Mid Shannon)	2	
Transitional and Coastal	N/A	0	0
Groundwater	N/A	4	0
Total		**69**	**2**

To meet WFD objectives, it has been recognised that there is a need to prioritise and focus efforts to address issues through identifying 'Areas for Action'. The reasons for selection of the 'Areas for Action' within the sub-catchments of SA4 are listed in Table 2.7. Note that the 'Areas for Action' included in Table 2.7 are from the WFD cycle 2 River Basin Management Plan (RBMP), as the WFD cycle 3 RBMP was undergoing consultation at the time of writing.

Table 2.7 'Areas for Action' within SA4 (catchments.ie, 2021h)

Areas for Action	Key Reasons for Selection
Lough Lene	• Headwaters to Lough Lene which has heritage values and is a popular designated bathing location • Deteriorated waterbody • Lough Lene failed to meet protected area objective for drinking water
Athboy	• Headwater tributaries to the Boyne main channel • Long term challenge - five of the six waterbodies are At Risk • Building on work completed by Meath County Council to reduce nutrient concentrations in the river waterbody • One deteriorated waterbody
Blackwater (Longwood)	• Building on work completed by Kildare County Council • Opportunity to address spikes in ammonia from peat • Headwaters of Blackwater (Longwood) • Opportunity to work with Bord naMona and Office of Public Works
Upper Boyne	• Drinking water protected area for the largest number of consumers (Water abstraction at Trim & Kishawanny boreholes which are the raw water for Edenderry Public supply) • Multiple pressures in multiple areas • Edenderry Area Drainage Plan due in 2021 so preparatory work could feed into it e.g. upgrades required for some pumping stations • Cross County project • Building on existing knowledge from works completed by Offaly County Council • Premier angling River

Areas for Action	Key Reasons for Selection
Lough Ennel	• Important fishery - wild brown trout • Building on restoration works completed by Inland Fisheries Ireland (IFI) • Potential pilot hydromorphology project • Important for angling tourism • Feeder streams to Lough Ennell • Socioeconomic benefit for town.
Gageborough	• Joint county project • Potential 'quick wins' • Headwaters to river Gageborough • One deteriorated waterbody
Sheelin (with Inny)	• Sub catchment project • Headwaters of the River Inny • One potential 'quick win' • Building on improvements completed at Oldcastle WwTP • Building on improvement works completed by Meath County Council - nutrient concentrations have declined in the last few years. • Building on IFI Lough Sheelin project. The lake is one of 13 wild brown trout fisheries in Europe and IFI • The River Inny and Lough Sheelin are important for tourism & heritage • Two deteriorated waterbodies
Derravaragh	• Three potential quick wins • Building on existing work completed by Westmeath County Council in Multyfarnham • Headwaters to Derravaragh lake • Important fishery - one of 13 wild brown trout fisheries in Europe • Potential to build on work completed by IFI • The underlying groundwater body is At Risk - potential to build on previous karst research • Important for tourism and heritage • Two deteriorated waterbodies

2.2.2 Flood Risk

Flood risk is considered as part of the options appraisal; however, many options are at a conceptual stage and there is insufficient information to differentiate between options on the basis of flood risk when design details, siting and routing are still to be determined. Both surface water and ground water flood risk will need to be considered further as part of the development of option design and for assessment at project level.

The OPW has been implementing the European Communities (Assessment and Management of Flood Risks) Regulations 2010 mainly through the Catchment Flood Risk Assessment and Management

(CFRAM) Programme, through which 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. CRFAMS mapping for all Areas for Further Assessment is available to view on the CFRAMS website (OPW, 2018). Figure 5.4 in the SEA Environmental Report (Appendix A) provides a summary of surface water and groundwater flood risk from the OPW CFRAMS data for the region including SA4.

For existing water infrastructure assets such as WTPs, flood risk vulnerability is considered in decisions on need to rationalise and decommission assets.

Any options which are progressed and require planning permission will require a Flood Risk Assessment to be completed in accordance with The Planning System and Flood Risk Management Guidelines for Planning Authorities (2009).

2.3 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).

In June 2019, the government agreed to support the adoption of a net zero target by 2050 at EU level, and to pursue a trajectory of emissions reduction nationally which is in line with reaching net zero in Ireland by 2050.

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 IW, to take account of, 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) published November 2021, 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 to 2030. CAP 2021 updates existing targets with renewable energy to provide 80% of electricity by 2030 and sets targets for sectors including for agriculture and forestry such as woodland planting and improving land management to support carbon sequestration (Department of the Environment, Climate and Communications, 2021).

In addition, Ireland has a sectoral climate adaptation plan for the 'Water Quality and Water Services Infrastructure' sector. A summary of the report's findings is included in Table 2.8.

Table 2.8 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

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

- Mainstream Adaptation: That climate change adaptation is a core consideration and is mainstreamed in all functions and activities across the local authority. In addition, ensure that local authority is well placed to benefit from economic development opportunities that may emerge due to a commitment to proactive climate change adaptation and community resilience;
- Informed decision making: That effective and informed decision making is based on a 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;

- 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
- 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 in Table 2.9.

Table 2.9 Climate Change Risks Identified by Local Authorities in SA4

County	Key Risk Areas
Cavan (Cavan County Council, 2019)	• Strong wind • Extreme rainfall • Heavy snowfall/low temperatures • Low rainfall/drought • High temperatures
Kildare (Kildare Country Council, 2019)	• Extreme rainfall events • Windstorms • Extreme heat/drought events • Freezing/snow events
Longford (Longford County Council, 2019)	• Strong wind • Extreme rainfall • Heavy snowfall/low temperatures • Low rainfall/drought • High temperatures
Meath (Meath County Council, 2019)	• Strong wind • Extreme rainfall • Heavy snowfall/low temperatures • Low rainfall/drought • High temperatures
Offaly (Offaly County Council, 2019)	• Strong wind • Extreme rainfall • Heavy snowfall/low temperatures • Low rainfall/drought • High temperatures
Westmeath (Westmeath County Council, 2019)	• Strong wind • Extreme rainfall • Heavy snowfall/low temperatures • Low rainfall/drought

County	Key Risk Areas
	• High temperatures

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 and water quality. For SA4, not all supplies within the study area meet the required levels of reserve capacity. As evidenced in the 2018 drought, there is the potential for this deficit to affect access to water in the future. This situation will further deteriorate over time due to climate change driven reductions in water resources.

A key aspect of Irish Water's strategy is to 'Supply Smarter', by improving the quality, resilience and security of their supply through infrastructural improvements. One of the high-level goals taken from the national level is building resilience, with water services being a key factor.

Supporting environmental resilience to climate change will also be an important consideration for the future with additional benefits for supply resilience.

2.4 Biodiversity, Flora and Fauna

2.4.1 Designated Sites

Within SA4 there are a number of European, national and locally designated sites, including Special Protected Areas (SPAs), Special Areas of Conservation (SACs), nature reserves, Ramsar sites, Natural Heritage Areas, and proposed Natural Heritage Areas (see Table 2.10 and Figure 2.2). The European sites (SPAs and SACs), and the potential impacts on them, are discussed in more detail in the NIS.

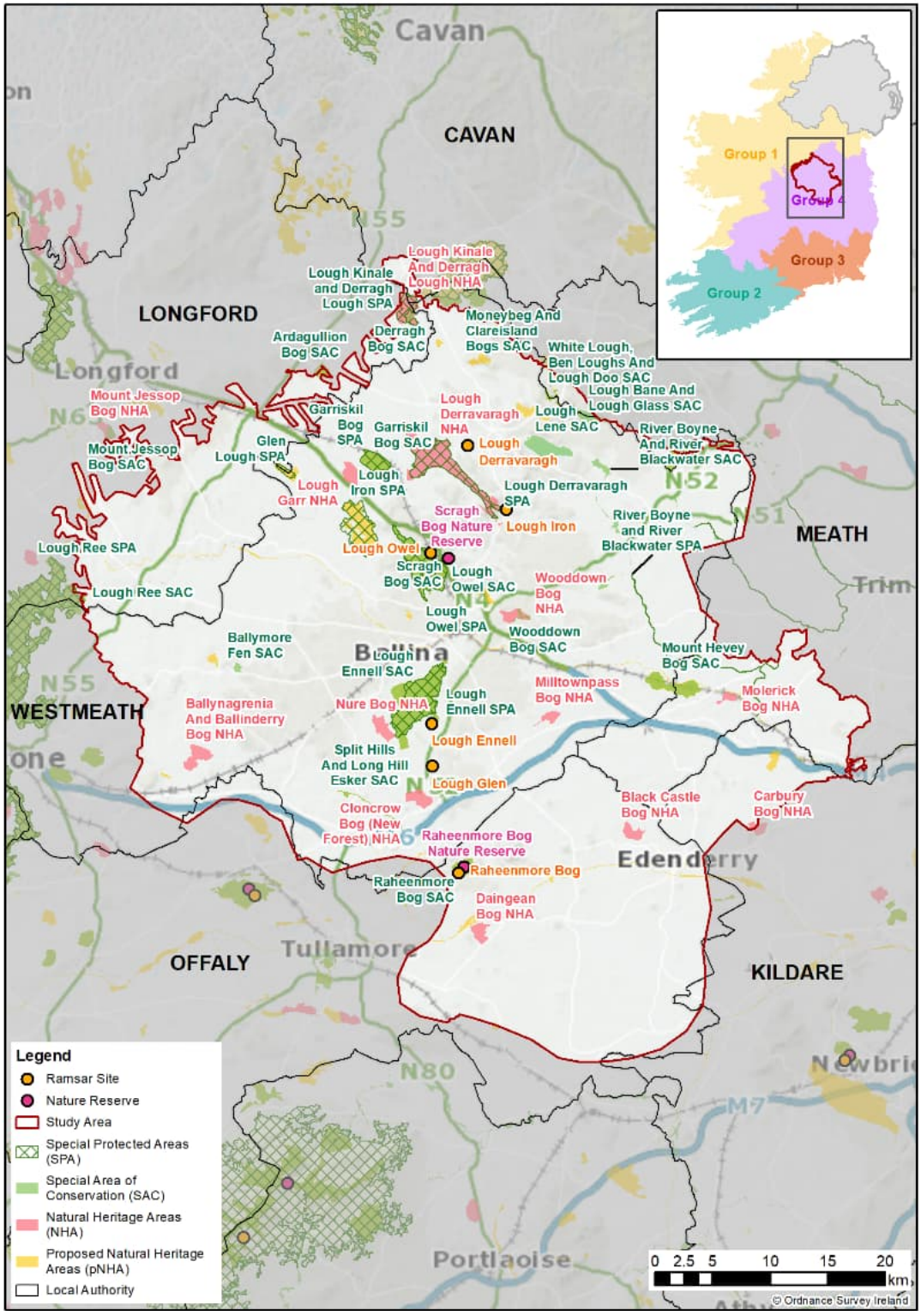

Figure 2.2 Designated Sites in SA4

Table 2.10 Designated Sites within SA4 (NPWS, 2019a)

Receptor	Name	Total Number
Special Protected Area (SPA)	Lough Derravaragh SPA	9
	Lough Ennell SPA	
	Glen Lough SPA	
	Lough Iron SPA	
	Lough Owel SPA	
	Lough Kinale and Derragh Lough SPA	
	Lough Ree SPA	
	Garriskil Bog SPA	
	River Boyne and River Blackwater SPA	
Special Area of Conservation (SAC)	Lough Ree SAC	18
	Lough Ennell SAC	
	White Lough, Ben Loughs And Lough Doo SAC	
	Split Hills And Long Hill Esker SAC	
	Lough Bane And Lough Glass SAC	
	River Boyne And River Blackwater SAC	
	Moneybeg And Clareisland Bogs SAC	
	Lough Lene SAC	
	Ballymore Fen SAC	
	Ardagullion Bog SAC	
	Garriskil Bog SAC	
	Derragh Bog SAC	
	Mount Jessop Bog SAC	
	Wooddown Bog SAC	
	Mount Hevey Bog SAC	
	Lough Owel SAC	
	Scragh Bog SAC	
	Raheenmore Bog SAC	
Ramsar sites	Lough Derravaragh	6
	Lough Ennell	
	Lough Glen	
	Lough Iron	

Receptor	Name	Total Number
	Lough Owel	
	Raheenmore Bog	
Nature reserves	Raheenmore Bog	2
	Scragh Bog	
National Parks	N/A	0
Natural Heritage Areas (NHAs)	Black Castle Bog NHA	13
	Ballynagrenia And Ballinderry Bog NHA	
	Cloncrow Bog (New Forest) NHA	
	Lough Derravaragh NHA	
	Wooddown Bog NHA	
	Lough Kinale And Derragh Lough NHA	
	Carbury Bog NHA	
	Mount Jessop Bog NHA	
	Molerick Bog NHA	
	Nure Bog NHA	
	Lough Garr NHA	
	Daingean Bog NHA	
	Milltownpass Bog NHA	
Proposed Natural Heritage Areas (pNHAs)	See Figure 2.2	32

2.4.2 Habitats

Table 2.11 lists the percentage of the study area, and the number of hectares, covered by each habitat within SA4; as reported in the Corine land use dataset[1].

Table 2.11 Habitat Areas for SA4 (EPA, 2018)

Habitat	Ha	% of Study Area
Agricultural Land		
Pastures	193,179	73.26%
Non-irrigated arable land	8,654	3.28%
Land principally occupied by agriculture, with significant areas of natural vegetation	7,422	2.81%
Complex cultivation patterns	1,274	0.48%

[1] The EPA land use dataset will be used available

Habitat	Ha	% of Study Area
Natural habitats		
Peat bogs	2,2534	8.55%
Water bodies	3,922	1.49%
Inland marshes	1,127	0.43%
Natural grasslands	78	0.03%
Intertidal flats	30	0.01%
Forest		
Transitional woodland-shrub	6,697	2.54%
Mixed forest	6,267	2.38%
Coniferous forest	5,926	2.25%
Broad-leaved forest	2,199	0.83%

Particularly relevant habitats that depend on the water quality and/or quantity in SA4 are:

- Turlough ecosystems;
- Oligotrophic, hard oligo-mesotrophic and natural eutrophic lakes;
- Bog habitats – Active raised bogs, degraded raised bogs still capable of natural regeneration, *Rhynchosporion* depressions, transition mires and quaking bogs;
- Alkaline fens; and
- Groundwater dependant terrestrial habitats, such as petrifying springs with tufa formation and calcareous fens.

2.4.3 Species

The key species and habitats (Nelson et al, 2019) of concern within SA4 include:

- Otter;
- Bat species - Daubenton's bat along the waterways. The most common species in the study area are Common and Soprano pipistrelles and Leisler's bat;
- Fish species (Lamprey and European eel);
- Waterbirds of 'qualifying interest' e.g. whooper swan and winter migratory waders;
- Other 'qualifying interest' bird species e.g. kingfisher;
- Protected whorl snails e.g. *Vertigo moulinsiana*);
- Freshwater white-clawed crayfish; and
- Slender green feather-moss (*Hamatocaulis vernicosus*)

The key invasive species to consider (European Communities (Birds and Natural Habitats) Regulations, 2011) for developing options within SA4 include:

- Japanese knotweed;
- Himalayan balsam;
- Giant hogweed; and
- *Elodea spp*.;
- Himalayan knotweed (*Persicaria wallichii*); and

- Zebra mussel (*Dreissena polymorpha*).

2.5 Material Assets

Material assets are considered to be the natural and built assets (non-cultural assets) required to enable a society to function as a place to live and work, in giving them material value.

Some of the natural assets within SA4 are listed in Table 2.12, such as agricultural land and natural habitats.

Built assets include transport and communications infrastructure, and other developed areas, including existing water supply infrastructure (see Figure 2.1 and Figure 2.3). These assets all need to be taken into account in new water resource developments.

In addition, water resources and water quality are influenced by urban, agricultural and forestry activity within river and groundwater catchments. This can affect the availability and quality of water for supply.

Irish Water has thirteen WTPs in SA4, meeting the demand of 39.0 Ml/d in 2019.

Ireland's canals once played a significant role as a transport network; however, their primary use is now for recreational and heritage purposes. The key canal within SA4 is the Royal Canal.

There are no ports or airports of national or regional significance within SA4. Although, there are two airports of local significance, namely Abbeyshrule Airfield and Clonbullogue Airfield.

Other significant transport infrastructure includes the main road (particularly the M4, M6, N4, N52 and N55) and rail network (Dublin Connolly - Sligo, and Dublin - Maynooth, Longford and M3 Parkway).

Any new infrastructure considered for SA4 will need to take, existing as well as planned land zoning and local development into consideration.

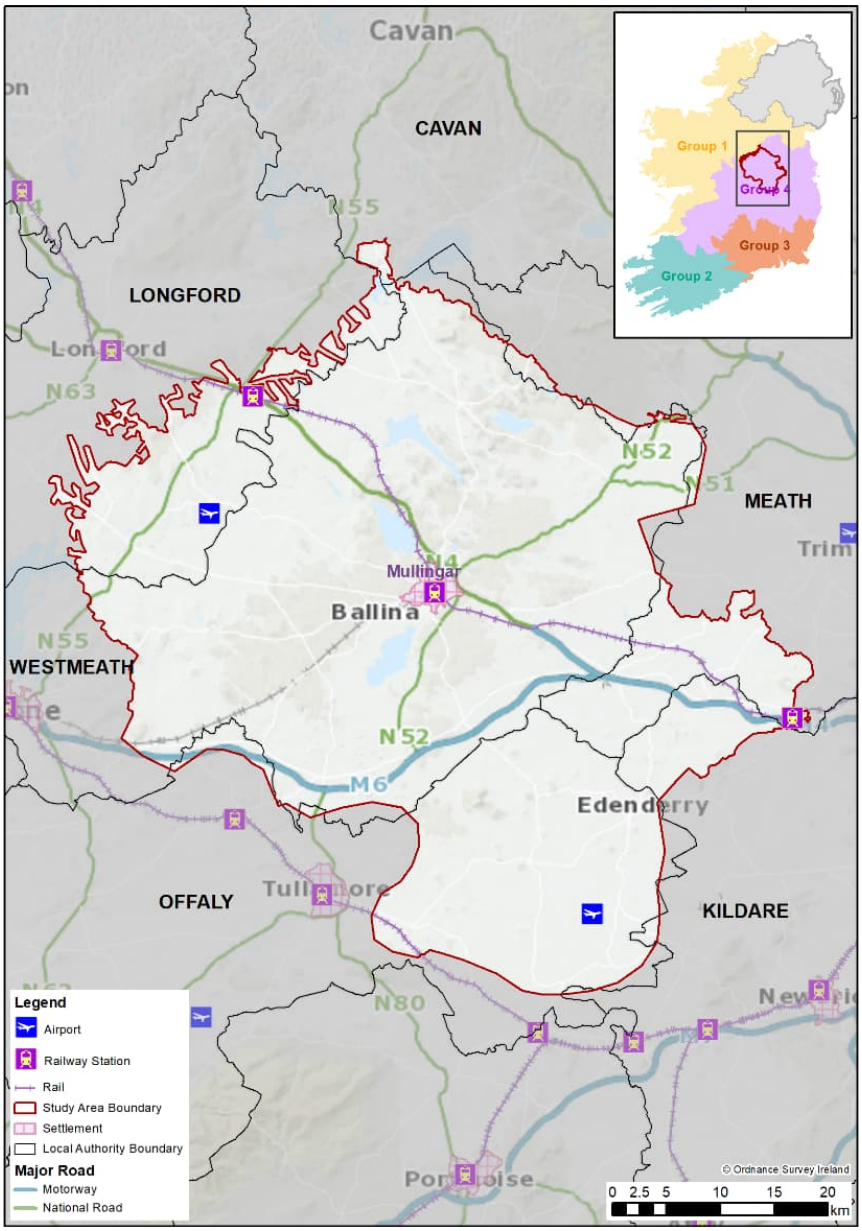

Figure 2.3 Transport Infrastructure in SA4

Table 2.12 Land Use within SA4 (EPA, 2018)[2]

Land use	Ha	% of Study Area	Comparison to Overall Eastern and Midlands Region %
Agriculture	210,529	79.84%	75.52%
Urban	3,366	1.28%	3.69%
Forest	21,090	8.00%	9.42%
Natural habitats	27,690	10.50%	10.61%
Industry	1,011	0.38%	0.70%
Other	N/A	N/A	0.06%

[2] The EPA land use dataset will be used once it has been made available

Proposals for other strategic developments within SA4 are considered for the assessment. These are primarily identified from the National Planning Framework and from myProjectIreland, where any relevant projects for the study area are included (other local developments may also be included that are not listed in myProjectIreland if they are considered to be of an appropriate scale). Small scale housing and business development are not considered for this plan level assessment.

Table 2.13 gives an overview of the project developments in SA4 which are available from myProjectIreland (2021)[3]. The myProjectIreland map focuses mainly on major projects with costs over €20 million. The map also includes all projects supported to date under the Government's Urban and Rural Regeneration Funds and reflects the full portfolio of projects in the pipeline at present.

Table 2.13 Proposed New Developments

Development		
Ardmore Road, Mullingar	Blackhall, Mullingar	Canal Avenue & Environs Regeneration Project
Castlepollard Regeneration	Community Facilities Enfield	Edenderry Masterplan
Edenderry Regeneration - Phase 1	Historic Granard Motte Project	Kinnegad Regeneration
Libraries Capital Programme - Edenderry Library	Mullingar Radiation Department	Mullingar Theatres
Mullingar Courthouse - PPP: Ongoing Unitary Charge Payments	Railway Terrace, Mullingar	The Yard, Abbeyshrule - Community and Economic Hub

2.6 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. This will be taken into account when identifying landscape character areas and protected areas at the project level in the future. Table 2.14 shows the value and sensitivity of the Landscape Character Areas (LCAs) within each of the counties listed within the study area. No data is available for the values of the LCAs within the counties of Kildare, Longford or Offaly. No data is available for the values and sensitivities of the LCAs within the counties of Cavan or Westmeath[4].

The value of the landscape in SA4 is reflected in baseline data sections 2.1.3 (Tourism and Recreation), 2.4 (Biodiversity, Flora and Fauna) and 2.8 (Cultural Heritage).

Water supply infrastructure will need to take account of sensitive landscapes and views. This will need to include culturally important areas, townscapes, natural areas and areas and views of importance for tourism and recreation.

[3] Note that the myProjectIreland dataset was taken at a fixed point in time to allow for assessment of cumulative effects. The date for SA4 being the 01//10/21.
[4] As with all the baseline information, the LCA information will be updated as part of regular reviews

Table 2.14 Value and Sensitivity of Landscape Character Areas in the Counties of SA4 (Ordnance Survey Ireland. n.d.)

Landscape Character Area	Value	Sensitivity
County: (Cavan County Council, 2014)		
No values or sensitivity information available		
County: Longford (Longford County Council, 2015)		
Northern Drumlin Lakeland	-	Low to Medium with some High areas
Northern Upland	-	Medium to High
Shannon Basin/Lough Ree	-	Medium to High
Central Corridor	-	Low with potential areas of Medium to High
Inny Basin	-	Low with potential areas of Medium to High
Peatlands	-	Low with the vicinity of the Royal Canal High.
Open Agricultural	-	Low
County: Westmeath (Westmeath County Council, 2021)		
No values or sensitivity information available		
County: Meath (Meath County Council, 2016)		
Teervurcher Uplands	High	Medium
North Meath Lakelands	Moderate	Low
North Navan Lowlands	Moderate	Medium
Rathkenny Hills	Very High	High
Boyne Valley	Exceptional	High
Central Lowlands	High	Medium
Coastal Plain	Moderate	High
Nanny Valley	Very High	High
Bellewstown Hills	Very High	Medium
The Ward Lowlands	Low	High
South East Lowlands	Very High	Medium
Tara Skryne Hills	Exceptional	High
Rathmoylan Lowlands	High	High
Royal Canal	High	Medium

Landscape Character Area	Value	Sensitivity
South West Lowlands	High	Medium
West Navan Lowlands	Moderate	Medium
South West Kells Lowlands	Moderate	Medium
Lough Sheelin Uplands	High	High
Loughcrew and Slieve na Calliagh Hills	Exceptional	High
Blackwater Valley	Very High	High
County: Offaly (Offaly County Council, 2014)		
Rural and Agricultural Areas	-	Low
Cutaway Bog	-	Moderate
The River Shannon and Callows	-	High
The Grand Canal Corridor	-	High
Wetlands	-	High
Slieve Bloom Upland Area	-	High
Croghan Hill and its Environs	-	High
Bogland Areas	-	High
The Esker Landscape	-	High
Archaeological and Historical Landscapes	-	High
County: Kildare (Kildare County Council, 2017)		
North-western Lowlands	-	Low
Northern Lowlands	-	Low
Central Undulating Lands	-	Low
Southern Lowlands	-	Low
Eastern Transition Lands	-	Medium
South-eastern Uplands	-	Medium
Western Boglands	-	High
Eastern Uplands	-	High
Chair of Kildare	-	Special
Northern Hills	-	Special
River Liffey	-	Special
River Barrow	-	Special

Landscape Character Area	Value	Sensitivity
The Curragh	-	Unique
Pollardstown Fen	-	Unique

2.7 Air Quality and Noise

2.7.1 Air Quality

Air quality is monitored and managed using Air Quality Zones and air monitoring sites, the air quality index rating of the area within SA4 is rated as 'good'.

In general, the water industry is not a major contributor to air quality issues, although there is potential for local pollution through Irish Water 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. Air quality will be a consideration at the project level, for example, through scheme construction management and scheme design and operation.

2.7.2 Noise

The main areas that experience noise pollution are likely to be areas along the main roads, particularly around the M4, M6, N4 and N55.

Water infrastructure development is not expected to add significantly to noise pollution. Construction noise will be considered through scheme construction management and design for local receptors and for sensitive receptors in close proximity. Noise pollution will also be managed through the planning process with conditions included in planning permissions.

2.8 Cultural Heritage

Within SA4, there are numerous designated and non-designated cultural heritage assets inventoried in the Record of Monuments and Places, the Sites and Monuments Record, the Record of Protected Structures, and the National Inventory of Architectural Heritage (NIAH) (see Table 2.15).

Figure 2.4 shows the location of the individual cultural heritage records from the National Monuments Service and the NIAH. Given the number of small sites, these can be better viewed on the Department of Culture, Heritage and the Gaeltacht's (2020) 'Historic Environment Viewer' website.

There are also potentially unknown, undesignated archaeological and architectural remains throughout Ireland. Water supply can affect cultural heritage through, direct loss or construction of infrastructure involving disturbance of soils, above ground structures close to existing heritage sites affecting setting or changes due abstraction changing drainage and affecting interests within wetland sites.

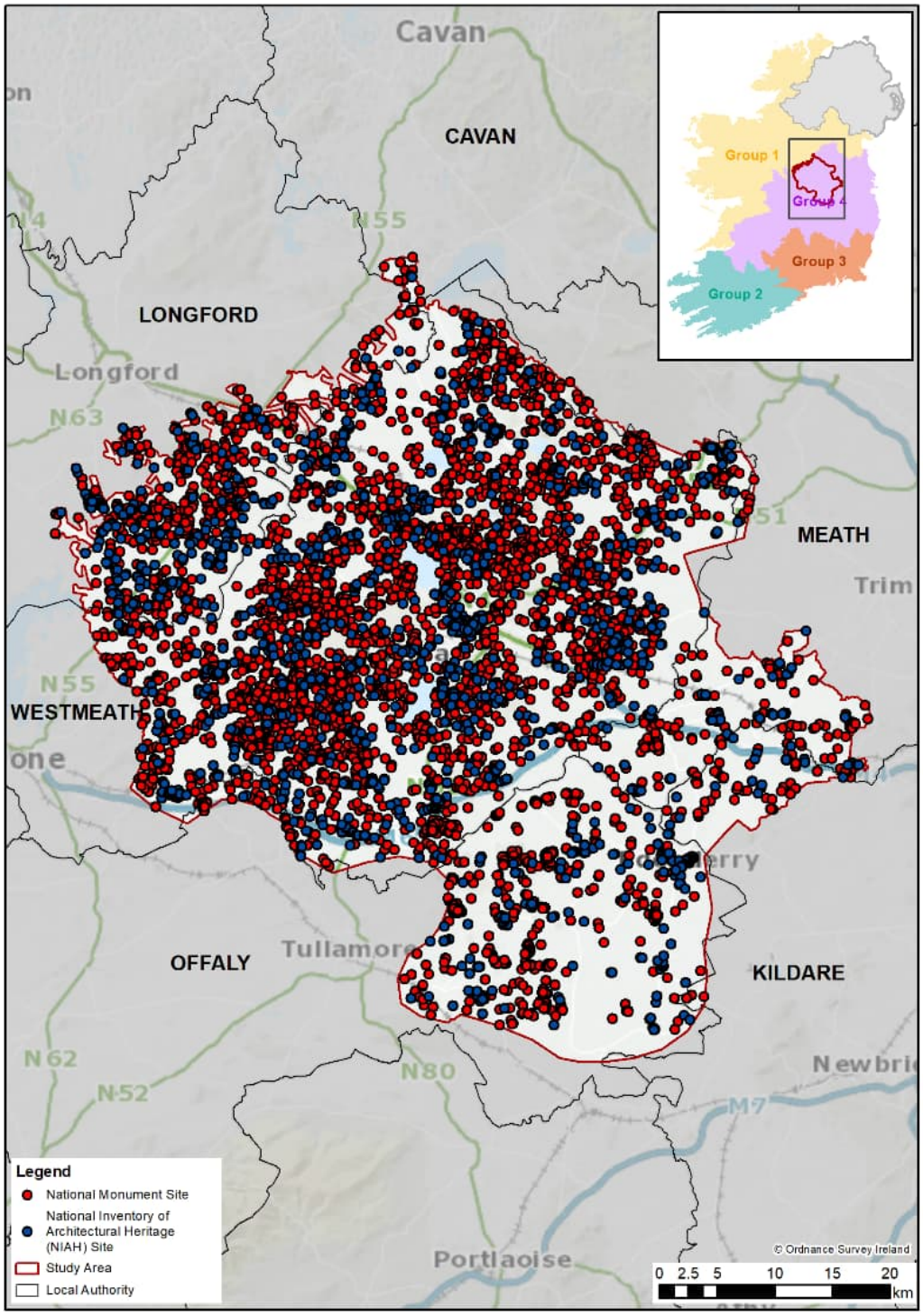

Figure 2.4 SA4 Cultural Heritage Assets

Table 2.15 Cultural Heritage Assets within SA4

Assets	Total Number
National Monuments Service sites	5,871
National Inventory of Architectural Heritage sites	2,171
Sites and Monuments Record Zones	3,110

2.9 Geology and Soils

Table 2.12 lists the land uses within SA4. SA4 predominantly has a fine loamy soil type with areas of peat to the south-east of the study area (EPA, 2019a).

The geology and soils in the environment are fundamental for the quality and quantity of water in the area through differences in drainage, chemical composition, filtration and soil type, topography and resultant land use. Land use has significant impact on water quantity and quality. Groundwater supply depends on the type of aquifers in the area, as they determine the system's ability to store and transmit groundwater. The regionally and locally important aquifers with resource potential for SA4 are shown in Figure 2.5.

Two aquifer types form the basis for groundwater development in the study area, namely the Calp consisting of dark shaley limestone which is widespread in the region. Secondly, the regionally important karst aquifers around Kilbeggan, and immediately north of Mullingar and in the area surrounding Castlepollard supply groundwater to the urban hinterlands and also into the Lough Len and Lough Owel.

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, 45 of which have the potential to constrain water resource options in SA4.

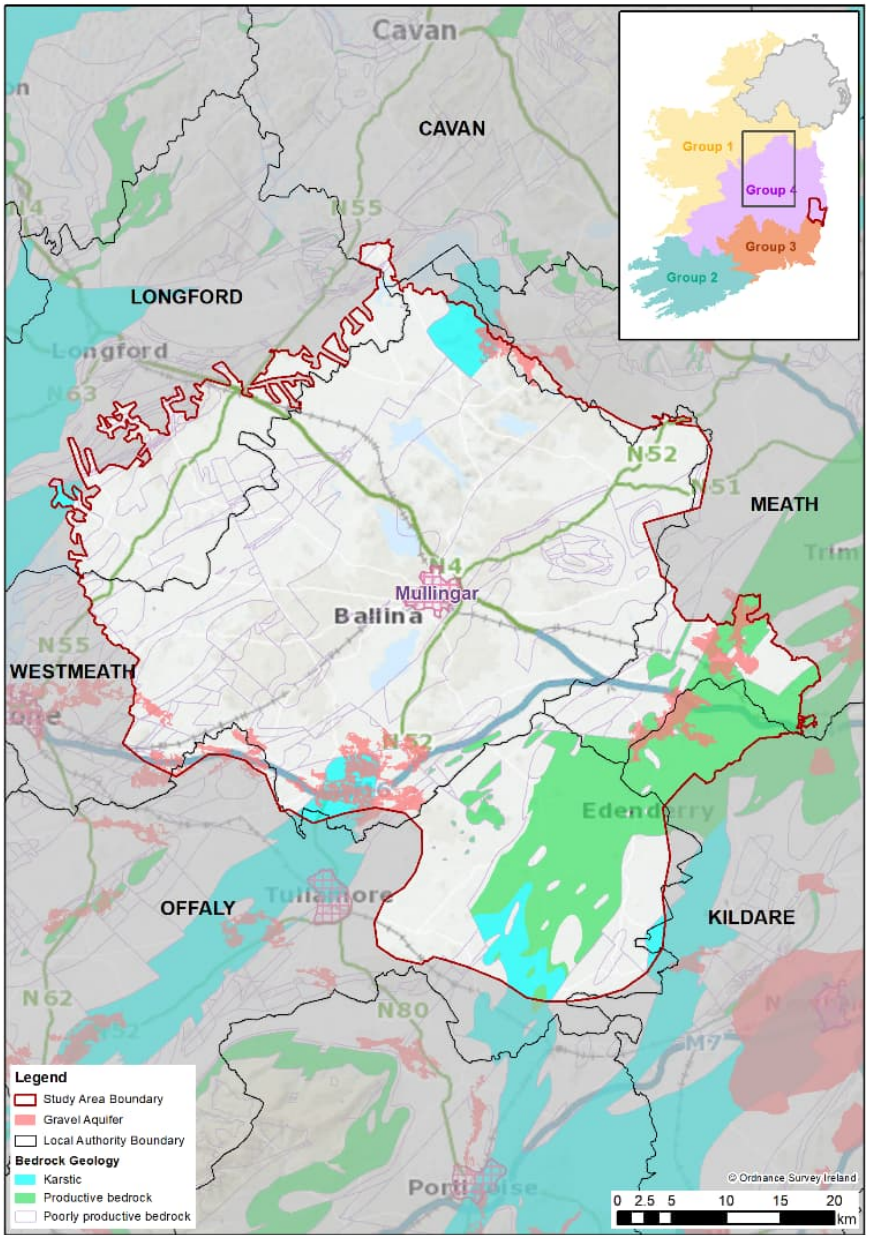

Figure 2.5 SA4 Hydrogeology

2.10 Summary of Key Issues and Trends over the Plan Period

All aspects of the environment will need to be considered as individual schemes are taken forward for further design and implementation. However, the key issues relevant for strategic water planning identified within SA4 are listed in Table 2.16.

Table 2.16 Summary of Key Issues and Trends Over the Plan Period

SEA Topic	Issues and Opportunities	Interrelated Topics
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 well-being. **Opportunities:** Irish Water will put in place plans to assess water quality and put in place measures to address risks as part of the NWRP.	Climate Change, Water environment, Biodiversity, Material Assets and Landscape and visual amenity

SEA Topic	Issues and Opportunities	Interrelated Topics
	Irish Water has ongoing activities to improve the Supply Demand Balance in SA4, 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. Valuing 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 being imposed at associated sites. For SA4, some of the existing abstractions may not meet sustainability guidelines in the medium term; specifically, during drought periods. On an interim basis, Irish Water has developed an initial conservative assessment based on available information (see SA4 Technical Report). This has been used to inform options identification and appraisal. Irish Water will update its sustainability analysis and impact on their baseline SDB calculations when regulatory assessment for the new legislation is undertaken. **Opportunities**: to take account of identified pressure on the water environment in the selection of solutions for SA4.	Biodiversity and climate change
Biodiversity, Flora and Fauna	**Issues:** for SA4, the Mullingar and Ballany WRZs are supplied from Lough Owel and Lough Lene, respectively. The two sources are designated as Special Areas of Conservation, meaning that consideration must be given to the conservation objectives which are under threat from abstraction. It is also considered especially important to avoid the loss of irreplaceable or rare habitats and increasing pressure on vulnerable species; potentially through direct land take or indirect such as through increased abstraction pressure	Water resources, water quality and climate change
Material Assets	**Issues:** WTP assets and network infrastructure requiring improvement or replacement **Opportunities:** improvements to support reliability of access to good quality water.	Health and Wellbeing
Landscape and Visual Amenity	**Issues:** potential for climate change to affect land use and habitats and influencing landscape quality and amenity.	Biodiversity and geology and soils, climate change, health and well being

SEA Topic	Issues and Opportunities	Interrelated Topics
Air Quality and Noise	No specific issues identified for the baseline for SA4.	Health and well being
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.	Biodiversity and water environment
Cultural Heritage	**Issues:** known cultural heritage and archaeological assets and potential unknown archaeological assets.	Health and wellbeing
Geology and Soils	No specific issues although general need for good soil conservation and retention of nutrients and carbon in soil resources.	Biodiversity and Landscape and climate change
Additional interrelated aspects	**Issues:** poor water quality requiring additional water treatment and affecting biodiversity **Opportunities:** potential for catchment management initiatives leading to, habitat, water retention, water quality enhancement and soil quality - have the potential to provide wider benefits for environmental resilience and water supply although not specifically studied in this study area.	

3 Environmental Assessment – Options Appraisal

3 Environmental Assessment – Options Appraisal

This chapter provides a summary of the environmental assessment of options considered in the study area, including the option identification and screening process, and assessment of options used in approach development.

3.1 Overview

Irish Water applied its Options Assessment Methodology from the Framework Plan to identify potential solutions to meet the needs identified in the SA4 WRZs.

The general methodology, and how environmental assessment is included, is outlined in the SEA Environmental Report prepared in relation to the Framework Plan. That report identifies SEA objectives and assessment criteria and provides a framework for integrating the environmental assessment of options and combinations of options into a phased appraisal process which also takes account of other criteria such as feasibility, deliverability, resilience and cost.

The Framework Plan Options Assessment Methodology covers eight stages. Stages 1 and 2 are covered through the needs and baseline assessments addressed in chapter 2 of this review. The key stages considered in this chapter for SA4 are Stage 3-6:

- Stage 3 Unconstrained options – to identify all the potential options to be considered to resolve water quality or quantity requirements;
- Stage 4 Coarse screening – to assess the unconstrained options and eliminate any that will not be viable and collect information to inform the next stage;
- Stage 5 Fine screening – options assessment and scoring against the key criteria to verify option feasibility and understand key risks and constraints; and
- Stage 6 Feasible option list – further option development encompassing costing and SEA assessment of options.

3.2 Stage 3: Unconstrained Options

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 an internal 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 for the purposes of this plan 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 5 or 10% of Q50 in line with this guidance (the NIS prepared in relation to the Framework Plan, sets out the approach in relation to Appropriate Assessment).

As mentioned previously, these are estimates applied for the purpose of strategic planning and are based on a conservative approach to what new legislative regime might require. The EPA will be the authority adjudicating the sustainability or otherwise of abstractions, once the legislation is enacted and will have the benefit of more detailed site specific information.

For groundwater sources, the assessment includes a high level assessment taking account of a range of information available for existing site and in many cases limited information for new abstraction options This desktop assessment undertaken aimed to identify potential yield and the impact of the yield, including the steps described below.

3.2.1 Existing Groundwater Abstractions

Site specific data is taken into account where possible in assessing potential sustainable yield for increasing abstraction at existing sources. In some cases, however location, abstraction rate(s) and site configuration are often the minimum information available. The operational data provides useful information on the yield, and assumptions can be made around the average production from each site. It can be assumed the average abstraction value is an initial estimate of the yield. Most local authorities in the case of development of groundwater sources, would likely have drilled and sought the maximum yield possible through 72 hours pumping tests. This provides an initial yield. Additional information on performance in prolonged dry weather periods provides supporting information on yields. Data collected on site is used to improve the yield and impact estimates.

3.2.2 New Groundwater Abstractions

The Zone of Contribution (ZOC), the land area that contributes water to the well or spring, is defined and used to calculate a preliminary water balance for the source using the average abstraction rate and the annual average recharge rate as estimated from the Geological Survey Ireland (GSI) recharge maps. The water balance estimates the area needed to supply the yield and is then compared to the delineated ZOC. A WFD >30% recharge is applied as a guide for assessment in the fine screening assessment but is recognised to apply more to catchment scale abstraction impact assessments so at a very local abstraction scale it can overestimate the impacts for some sources.

Additional assessment is undertaken on potential preferred groundwater options to inform the SEA taking into account site specific information and consideration of likely impacts on WFD and cumulative effects with existing groundwater abstractions.

Further work will need to be undertaken for groundwater options taken forward as part of abstraction licensing and the development of Drinking Water Safety Plans. This will include establishing detailed geoscientifically robust zones of contribution in line with GSI's Groundwater Protection Schemes (Department of Environment, Community and Local Government, GSI and EPA, 1999) and the EPA Advice Note Number 7, Source Protection and Catchment Management (EPA, 2013). This work will provide in-depth hydrogeological information on the source that will establish reliable and sustainable yields.

3.2.3 Sustainable Abstraction in Options Assessment

The Government is currently developing new legislation dealing with water abstractions. As this legislation is still being developed, Irish Water does not have full visibility of the future regulatory regime. As the objective of the plan is to achieve safe, secure, reliable and sustainable supplies, any new abstractions proposed to be developed by Irish Water as part of this plan will be based on conservative assessments of sustainable abstraction. This will ensure that water supplies continually improve in terms of environmental sustainability.

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

3.3 Stage 4: Coarse Screening

A total of 113 unconstrained options were identified for SA4 and subjected to coarse screening. The coarse screening process assessed the options against the criteria outlined in Table 3.1. This process is summarised in chapter 9 of the SEA Environmental Report for the Framework Plan. The process allows the assessment of the unconstrained options to eliminate any that will not be viable. The focus at this stage is on options that would be difficult to mitigate, those with likely significant effects on European or nationally important sites, or options likely to lead to deterioration of waterbody WFD status.

Table 3.1 Coarse Screening 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?

Of the 113 unconstrained options, 32 were rejected after being analysed against the coarse screening criteria of resilience, deliverability and environment.

Sustainability reasons for rejecting options were identified for four options. Table 3.2 provides the options that were rejected on an environmental basis and not considered suitable to address the deficit for the WRZs located in SA4. The full rejection register for both the coarse and fine screening (where applicable) is provided in Appendix C of the SA4 Technical Report.

Table 3.2 Coarse Screening Rejection Register

Option Reference	Option Description	Rejection Reasoning
SA4-002	Increase abstraction from Lough Lene (groundwater fed lake) for Ballany	This option relates to a complex groundwater supplied lake. The assessments undertaken in the plan indicate that it is already under pressure and therefore was rejected on the grounds of Resilience, Deliverability & Flexibility and Sustainability.
SA4-035	New abstraction from Lough Killinure and upgrade WTP to supply Athlone and Mullingar WRZs	This option involves a new abstraction from Lough Killinure. A planning application for a new abstraction from this source was withdrawn in 2020 for environmental reasons,

Option Reference	Option Description	Rejection Reasoning
		therefore, this option was not taken forward to the fine screening stage.
SA4-042	Part supply with Lough Lene from Ballany WRZ to Mullingar	The desktop assessments undertaken indicate that the sustainable allowable abstraction from Lough Lene is less than the existing abstraction. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving good WFD status. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.
SA4-086	New SW source to supply deficit in Edenderry & Rhode WRZ. Nearby River Boyne.	The River Boyne at this location is a tributary of the main channel designated as the River Boyne and River Blackwater SAC. The River Boyne is a Moderate status waterbody under WFD. It was determined that the sustainable allowable abstraction from the River Boyne at this location is 0.75 Ml/d, however, additional supply of over 5 Ml/d is required. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving good WFD status. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.

3.4 Stage 5: Fine Screening

A total of 81 options passed the coarse screening stage; these options were subjected to further consideration as part of a multi-criteria assessment (MCA) at the fine screening stage.

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. The MCA process allows a combination of issues to be considered together. This process can help indicate if one option will be overall more cost effective, environmentally sustainable, progressible, resilient or feasible when compared with other options. This process requires a desk-based analysis of the options and their potential benefits and impacts against the key criteria.

The environmental criteria are based on the SEA objectives in the form of screening questions. These questions have been developed to allow the performance of each option to be assessed against the SEA objectives. The list of questions developed to assess the environmental and social effects of the options and guidance on the MCA scoring for the fine screening is provided in the SEA Environmental Report Appendix B.

Summaries of the environmental assessment for options that passed the fine screening stage are grouped by option type and are included in Appendix A. These summaries combine the assessments against individual criteria to give an overall environmental topic score; this overall score is based on the worst score across each of the topic's criteria.

This is a high-level risk based assessment intended to support a comparison of options. Likely beneficial effects are represented by positive scores and likely adverse effects are represented by negative scores based on a seven-point scale.

At fine screening a further 7 options were rejected. Table 3.3 provides the options that were rejected from the fine screening and not considered suitable to meet the needs identified for the WRZ located in SA4.

Table 3.3 Fine Screening Rejection Register

Option Reference	Option Description	Rejection Reasoning
SA4-001	New GW abstraction at Ballany	The desktop assessments undertaken indicate that an abstraction at Ballany would lead to a direct pathway to River Blackwater SAC, Lough Bane & Lough Glass SAC and White Lough & Lough Doo SAC; all of which include fen type habitat. Given the potential for impacts, this option was rejected and not taken through to fine screening stage.
SA4-043	Part supply from developed GW wellfield north of Ballany	
SA4-003	New SW abstraction from Lough Derravaragh	The desktop assessments undertaken indicate that a surface water abstraction from Lough Derravaragh may impact Lough Derravaragh SPA. There is also the potential to have a direct impact on the qualifying interests (QI) through the lowering of lake level and impacting shallow areas of the lake used as breeding habitat of its QIs. In addition, this is a groundwater fed lake and, with the lack of data available, there is too much uncertainty in relation to the potential impact. As a result, this option was rejected on the basis of Deliverability & Flexibility and Sustainability.
SA4-014	Supply deficit from Lough Forbes to Ballymahon and interconnect WRZs for increased resilience	This option is too costly to progress for the purposes of resilience only. It was therefore rejected on this basis but was considered as part of a new supply option (SA4-015).
SA4-025	New SW abstraction from River Inny located approximately 18km off the existing Portloman WTP to supplement supply to	This is a duplicate of SA4-037.

Option Reference	Option Description	Rejection Reasoning
	Mullingar WRZ. New WTP at abstraction.	
SA4-027	Maintain and reduce abstraction from Lough Owel - close connection to canal and pump treated effluent from WwTP to canal to maintain satisfactory levels in the canal	In accordance with Irish Water's current abstraction authorisation, Irish Water must discontinue abstraction at Lough Owel before the end of the decade. Therefore, continued abstraction from Lough Owel is considered unlikely. On that basis, further investment is not preferable and suitable alternative options are considered
SA4-038	Proposed connection point from potential desalination plant at a site in North Dublin. Pipeline to supply full Mullingar WRZ demand	The proposed desalination plant in North Dublin will require large energy costs to operate. It will also require blending with freshwater to ensure the pipes and infrastructure are protected. Desalination plant will require large energy costs and would require over 70km of pumped watermain.

3.5 Stage 6: Feasible Options List

A total of 74 options were included as feasible options and were taken forward for Approach Development. The next step was to use the information collected for the fine screening assessment to inform the development of approaches to resolve the SDB deficit within each WRZ and across the study area.

Details of the feasible options identified for this study area, and the Preferred Approach selected, are provided in the SA4 Technical Report.

4

Environmental Assessment – Approach Development

4 Environmental Assessment – Approach Development

This chapter describes how the SEA was integrated into the development of potential approaches/combinations for meeting the SDB deficit at the WRZ level, then at the Study Area level, and how alternative approaches were considered and assessed.

4.1 Introduction to Approach Development

After the feasible options for the study area were identified the next step was to assess a range of possible SA combinations to resolve the supply deficit within each WRZ and across the study area as a whole. This chapter addresses Stage 7 in the assessment methodology.

An SA combination is a way of configuring an option, or options, to meet either an SDB deficit or water quality requirements. As set out in the Framework Plan, Irish Water considers six SA approaches, which are the combinations rated as the best within the six categories summarised in Table 4.1. This process contributes to assessment of alternatives to meet plan objectives. Consideration of reasonable alternatives is an important part of meeting SEA regulatory requirements.

Table 4.1 The Six SA Approaches

SA 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
Best Environmental (BE)	This is the option or combination of options with the highest total score across the 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	National Adaptation Plan

SA Approaches Tested	Description	Policy Driver
	to SEA Objective for climate change adaptation for environment)	
Lowest Carbon (LC)	This is the option or combination of options with the lowest embodied and operational carbon cost	Climate Change Strategy

These six SA approaches focus on different plan or environmental objectives. Three of the six SA approaches address environmental objectives;

- Best AA;
- Best Environmental; and
- Lowest Carbon approaches.

These are all focused on environmental criteria and are based on the environmental information and scoring undertaken for the MCA.

4.2 Stage 7: Approach Development Process

There are three stages in the Approach Development Process, these are summarised below and provided in more detail in section 7 of the RWRP-EM:

The **First Stage** is the Approach Appraisal at WRZ level. This stage assesses the feasible options for each WRZ and identifies the best performing option within each of the six Approach Types for the relevant WRZ. For example, the option or combination of options that would be classified as the Lowest Carbon Approach, would be that with the lowest carbon cost, based on comparative outline design. The best performing options within each Approach Category are then compared against one another using the 7-step process outlined in Figure 4.1. This process develops an initial Preferred Approach at WRZ level, for all of the individual WRZs in the study area (the "WRZ Level Preferred Approach").

For the Best AA Approach, the scoring on the European Sites (Biodiversity) sub-criteria question refers to the possibility for Likely Significant Effects (LSEs). A Score of 0 equates to no LSEs. If an option is identified that meets the “Objectives of the Plan” and is assessed as having no potential impact on a European Site (zero or neutral score based on desktop assessment), it is automatically adopted as the Preferred Approach at WRZ level. Furthermore, because it is possible that all of the potential impacts identified at Plan level can be entirely ruled out through project level investigation and analysis or avoided through project level mitigation, options with potential for LSEs (score of -1 to -3 for biodiversity) may be progressed as the Preferred Approach. If potential impacts cannot be ruled out or avoided, then mitigation in the form of avoidance is provided for within the NWRP to protect European site(s). Should potential adverse effects on European sites be identified at the project level from a given option/Preferred Approach the NWRP will have identified other options[5] that could be progressed at the project level if required. Therefore, no project arising from the NWRP, with Adverse Effects on Site Integrity (AESI) identified at the project stage would be implemented. Scores of -1 to -3 equates to LSEs being identified. Scores of -1 to -2 are LSEs that will not result in AESI with standard best practice

[5] These options may not have progressed as the Preferred Approach initially as they may have scored significantly worse against other environmental, resilience or feasibility criteria (e.g. the best AA approach may identify an option that results in four times more carbon being produced or is twice as expensive).

project specific mitigation applied as these can be addressed with general/standard mitigation measures. Scores of -3 equates to LSEs that may be difficult to mitigate or where uncertainty remains.

The NIS provides more detail in the LSE and the AESI Tables: Appendices C-D. Any option with a score of -1 to -3 is taken forward to AA (Stage 2 of the AA process) and assessed within the NIS for the Regional Plan.

The **Second Stage** assesses whether there are any larger options (SA options also referred to as 'group options') that might resolve deficits across multiple WRZs within a study area. Combinations are then developed using these SA options and WRZ Preferred options to create "SA Combinations".

The **Third Stage** compiles the SA Combinations that rank highest for each of the Six Approach Types to generate SA Approaches. The WRZ Level Approach and SA Approaches are then compared against each other using the 7-Step process in Figure 4.1 to generate the SA Preferred Approach.

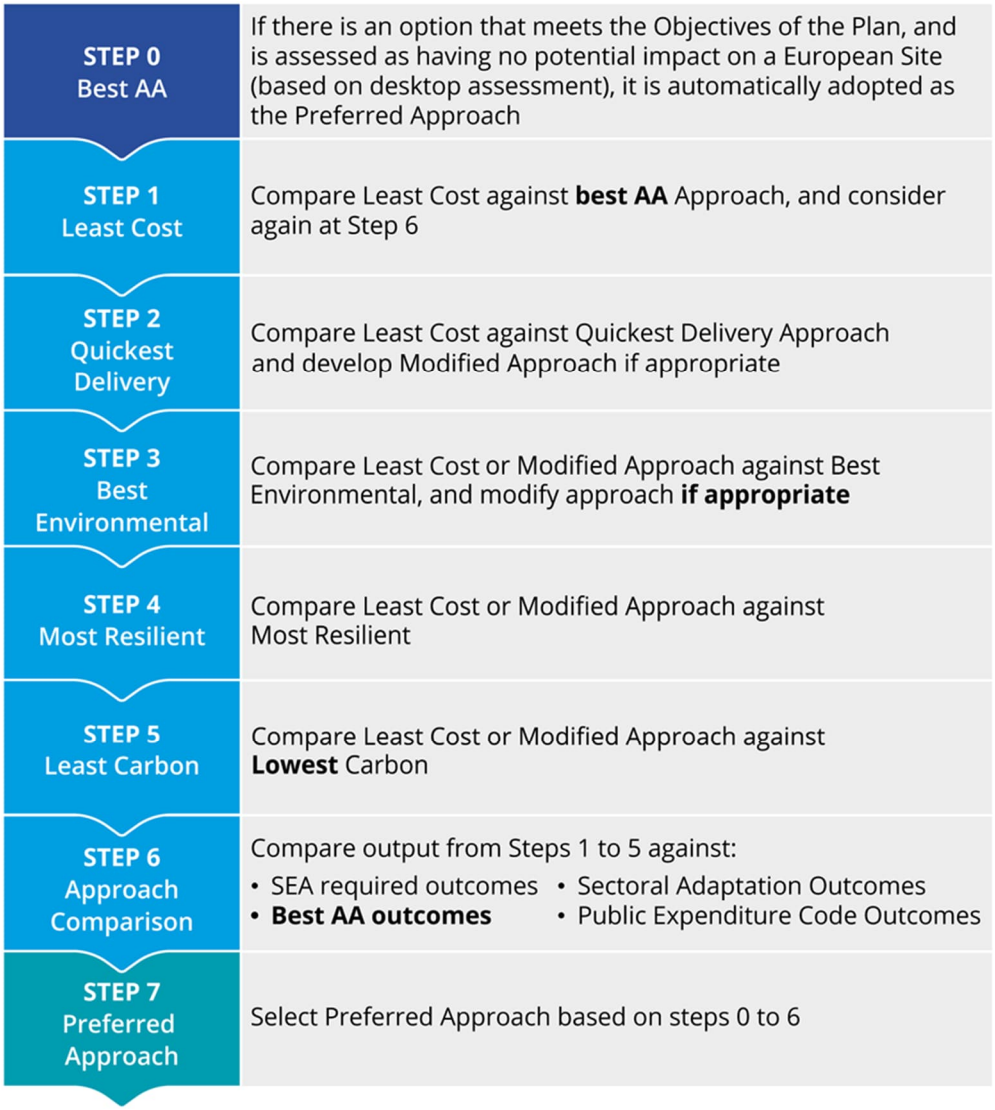

Figure 4.1 The 7 Step Process

4.2.1 Environmental Assessment in the Approach Development process

Combinations of feasible options are identified to balance the water demand and predicted baseline supply and address the remaining deficit over the plan period. The Approach Development process allows Irish Water to compare and optimise the options against different elements to create a range of approaches capable of meeting the deficit.

There are two strands of environmental information and assessment used in the Approach Development process. These are:

Environmental and social costs: these were based on a natural capital/ecosystems services framework and scoped to be relevant and achievable with the information available and to add to, rather than duplicate, the qualitative environmental assessment of the options. This included:

i. Climate regulation – woodland;
ii. Traffic impacts – opportunity cost of time due to road congestion from roadworks;
iii. Food – crops and livestock; and
iv. Carbon equivalent emissions tonnes (note total greenhouse gas emissions are expressed in terms of carbon equivalent emissions) including embodied and operational carbon were also calculated and costed.

The approach for calculating the elements i, ii, iii and iv are explained in the SEA Environmental Report Appendix E.

Carbon emissions (tCO_2e) and carbon costs are calculated alongside construction and operational costs. As part of the environmental assessment carbon efficiency has also been calculated to identify carbon emissions per ML of water supply.

Environmental assessment: this is qualitative assessment against the SEA objective for each option as part of the MCA scoring for the fine screening. These scores are based on assessing options in terms of potential adverse or beneficial effects and a seven-point scale is used from Major, Moderate or Minor Adverse, Neutral, to Minor, Moderate or Major Beneficial. These are reflected in numeric scores -3 to 0 to +3 and are used to assess option performance against the MCA scores. The scoring applied at fine screening is reviewed and updated based on the developed option descriptions and additional environmental analysis.

Carbon emissions (tCO_2e) were initially assessed through qualitative assessment for fine screening as this preceded option costing, however in the approach development process the carbon emissions as total Net Present Value (NPV) costs have been used to inform the Approach Development Process. Total life- time carbon emissions and carbon efficiency per ML have been used to inform the SEA assessment.

The general process is illustrated in Figure 4.2 below.

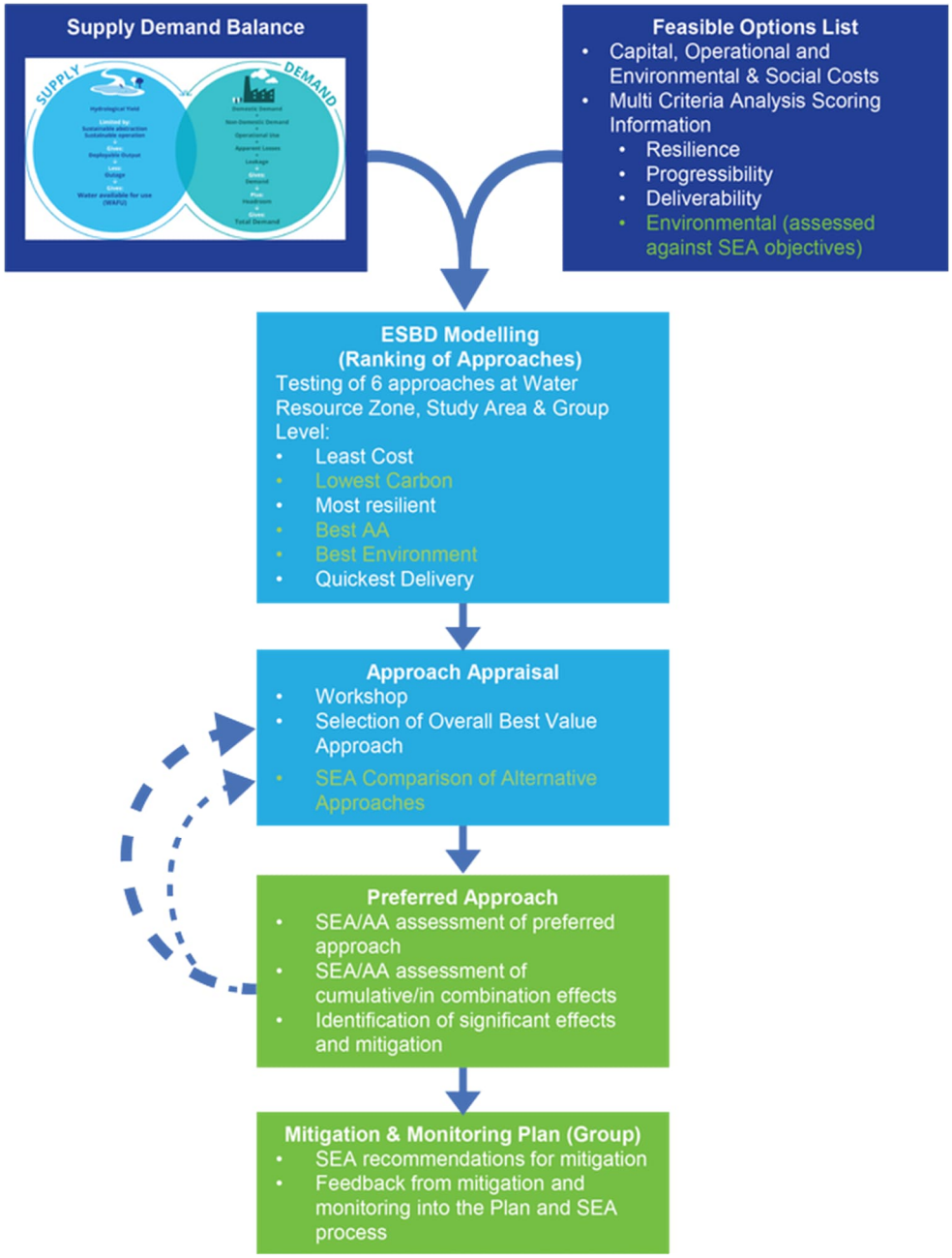

Figure 4.2 Approach Development Process

4.3 SA4 Approach Development Process

The approach appraisal process was undertaken through structured workshops and reviews involving relevant environmental expertise (including ecologists, hydrogeologists, hydrologists and environmental scientists) and included Local Authority involvement and feedback. This process was supported by information on the feasible options, including the environmental assessment against SEA criteria in the MCA and the option costings.

The options were then taken through the sequential testing (the 7 step process detailed in section 4.2, Figure 4.1 above) against the six SA categories (lowest carbon, best environmental, best AA, least cost, quickest delivery and most resilient) to identify the best overall options and combinations at WRZ and study area levels applying the three stages:

Stage 1 - comparing WRZ options and identify the preferred WRZ level approach. For SA4 there are 42 WRZ options and these are listed in Table 5.2 in the SA4 Technical Report, providing option reference

numbers and the relevant WRZ. These options were taken through the 7 step process to identify the preferred WRZ approach.

Stage 2 - creating combinations of WRZ options and SA options (group options) for comparison. These are the possible SA combinations and are presented and ranked against the approach categories (see Table 4.2)

Stage 3 - selecting the Preferred Approach at study area level – this stage compares the WRZ level preferred approach and the SA combinations to determine the Preferred Approach that provides the best outcome for the study area. The best performing SA combinations under each of the six approach categories are identified and then compared using the 7 step process applied in the workshop to establish the Preferred Approach at study area level.

Performance ranking against the assessment criteria was based on the MCA scoring, including the fine screening environmental assessments, and costings. Further environmental assessment has also been undertaken to compare the alternative approaches in line with SEA requirements and this assessment is presented in Table 4.7 and Table 4.9 below.

For SA4, a total of 9 combinations were compared including the WRZ Level Approach; these are presented in Table 4.4. Note that the Preferred Approach selected at the end of the process has been outlined in red throughout this section.

Table 4.2 SA4 Summary of SA Combination of Performance against Approach Category

Category	WRZ level approach	SA combination 1 (SA option 1)	SA combination 2 (SA option 2)	SA combination 3 (SA option 4)	SA combination 4 (SA option 5)	SA combination 5 (SA option 7)	SA combination 6 (SA option 8)	SA combination 7 (SA option 9)	SA combination 8 (SA option 10)
Least Cost		Best				Worst			
Quickest Delivery		Best				Worst			
Number of -3 Biodiversity Scores	No -3 scores	No -3 scores	No -3 scores	No -3 scores	No -3 scores	No -3 scores	No -3 scores	No -3 scores	No -3 scores
Lowest Carbon		Worst				Best			
Most Resilient		Best				Worst			
Best Environmental	Worst	Best							

Through comparing all the potential SA combinations, the best SA approach for each of the six categories was identified; these aligned as two SA approaches (see Table 4.3). For SA4, the WRZ Level Approach and combination 1 were within 5% of each other in the Least Cost category. After further comparison (see section 5 of the SA4 Technical Report) combination 1 was determined to be the best in the Least Cost category.

Table 4.3 Study Area Approach Categories

Category	SA Approach 1 (SA Combination 1) (LCo, QD, BE, MR, BA)	SA Approach 2 (WRZ Approach) (LC)
Least cost (LCo)	✓	-
Quickest Delivery (QD)	✓	-
Best Environmental (BE)	✓	-
Most Resilient (MR)	✓	-
Lowest Carbon (LC)	-	✓
Best AA (BA)	✓	-

The WRZ options and SA options (group options) that make up each SA approach are listed in Table 4.4. More detailed descriptions of the options are also provided in Appendix A and a full list of options for each approach is given in Appendix B of this report.

Table 4.4 Study Area Approaches

Options included	Do Minimum	Least Cost Approach (SA Combination 1)	Best Appropriate Assessment Approach (SA Combination 1)	Quickest Delivery Approach (SA Combination 1)	Best Environmental Approach (SA Combination 1)	Most Resilient Approach (SA Combination 1)	Lowest Carbon Approach (WRZ Approach)
SA options (Group options)	No options	**SA Option 1:** 010, 020, 36a, 046, 052, 053, 060, 063, 066, 071, 077	**SA Option 1:** 010, 020, 36a, 046, 052, 053, 060, 063, 066, 071, 077	**SA Option 1:** 010, 020, 36a, 046, 052, 053, 060, 063, 066, 071, 077	**SA Option 1:** 010, 020, 36a, 046, 052, 053, 060, 063, 066, 071, 077	**SA Option 1:** 010, 020, 36a, 046, 052, 053, 060, 063, 066, 071, 077	**SA option 7:** 021, 040
WRZ options	No options	098 099	098 099	098 099	098 099	098 099	005 047 049 054 059 062 65b 098 099

Options included	Do Minimum	Least Cost Approach (SA Combination 1)	Best Appropriate Assessment Approach (SA Combination 1)	Quickest Delivery Approach (SA Combination 1)	Best Environmental Approach (SA Combination 1)	Most Resilient Approach (SA Combination 1)	Lowest Carbon Approach (WRZ Approach)
							100 101

* Note on option references - all options are part of SA4 e.g. SA4-010 is shown as 010 above

For the purposes of the Approach Development Process as set out in the SA Technical Report and for the purpose of the SEA comparison as set out in this Environmental Review, Irish Water has only considered the options that were identified as the "best" performing options for each approach category. The identification of the approaches and 7 step process are outlined in detail in section 5 of the SA4 Technical Report.

Within SA4, this resulted in two approaches being selected from the 9 SA combinations identified in Table 4.2, as they were identified as the best performing against the six approach categories - Least Cost, Best Environmental, Quickest Delivery, Most Resilient, Best AA and Lowest Carbon. This means that when comparing the two identified approaches against each other (representing the Stage 3 analysis for the selection of the Preferred Approach used in the workshop - see Table 4.5), their relative performance against categories they were not identified as “best” in in Table 4.2 may be different. This is because Table 4.2 compares all of the combinations to give a wider ranking, whereas Table 4.5 only compares the best performing combinations that have been selected as approaches. For example, an option identified as the "worst" performer against a particular approach category in Table 4.5 may not be the overall worst performing option when considered alongside all of the combinations in Table 4.2.

Table 4.5 includes a summary of the MCA scoring and cost comparison used in the approach development for the each of the SA approaches identified as performing best against at least one of the approach categories.

The three stages identified above were applied through a final workshop with all of the background MCA and option costing information available for each option and the ranking from the Economic Balance of Supply and Demand (EBSD) tool. Table 4.5 shows both approaches as the best AA because they have the same number of -3 biodiversity scores. SA approach 1 was selected as the best AA approach in Table 4.3 after further scrutiny of the other biodiversity scores.

Table 4.5 Summary of the MCA Scoring Costing for the SA Approaches

Category Criteria	SA Approach 1 (SA Combination 1) (LCo, QD, BE, MR, BA)	SA Approach 2 (WRZ Approach) (LC)
Least Cost Score	Best	Worst

Category Criteria	SA Approach 1 (SA Combination 1) (LCo, QD, BE, MR, BA)	SA Approach 2 (WRZ Approach) (LC)
Quickest Delivery Score	Best	Worst
Best AA Score	No -3 Biodiversity Scores	No -3 Biodiversity Scores
Lowest Carbon Score	Worst	Best
Most Resilient Score	Best	Worst
Best Environmental Score	Best	Worst

Key	
Ranked order (best to worst) within the 2 selected approaches	
Worst	Best

4.4 Comparison of SA4 Approaches

An overall summary of the infrastructure components and abstractions for each of the SA approaches identified for SA4 is provided below in Table 4.6 and has been used to inform the environmental assessment.

Table 4.6 Study Area Approach Components Summary

Infrastructure Summary	Do Minimum	SA Approach 1 (SA Combination 1) (LCo, QD, BE, MR, BA)	SA Approach 2 (WRZ Approach) (LC)
New pipeline network (km)	0	174	109
New WTPs	0	0	0
Upgrade WTPs	0	2	12
New/upgraded abstractions	0	0	6
WTPs decommissioned	0	13	3
Abstractions abandoned	0	13	0
Raw Water Storage	0	0	0
Treated Water Storage	0	2	8

A comparative assessment of the two SA approaches based on the environmental option scores is summarised in Table 4.7 below. This covers:

- Scores across the options summed for all the sub-criteria against each SEA objective topic heading;
- Total numbers of -3 scores representing higher risk of effect, or likely greater requirement for mitigation, against each SEA objective topic heading; and
- Indication of the extent of difference in performance across the options to help identify if the differences between the SA approaches are small or large

Table 4.7 Study Area Approach Comparison Summary

Topic	Total No. of	SA Approach 1 (SA Combination 1) (LCo, QD, BE, MR, BA)	SA Approach 2 (WRZ Approach) (LC)	Range (Difference between Lowest and Highest Score)
Population, health, economy and recreation	-3 scores	No Difference		0
	MCA score	Best	Worst	10
Water Environment: quality and resources	-3 scores	No Difference		0
	MCA score	Best	Worst	3
Biodiversity, Flora and Fauna	-3 scores	No Difference		0
	MCA score	Best	Worst	42
Material Assets	-3 scores	No Difference		0
	MCA score	Best	Worst	7
Landscape and Visual	-3 scores	No Difference		0
	MCA score	Best	Worst	3
Climate Change	-3 scores	Worst	Best	1
	MCA Score	Best	Worst	6
Culture, Heritage and Archaeology	-3 scores	No Difference		0
	MCA Score	No Difference		0

Geology and Soils	-3 scores	No Difference	0
	MCA Score	No Difference	0

Key	
MCA/No. of -3 scores against each criterion	
Worst	Best

* approaches are showing similar level of risk on climate change adaptation and therefore represented as no difference. However, carbon mitigation is covered separately based on estimated emissions and carbon cost (NPV). See lowest carbon approach.

** approaches are showing similar level of risk on culture, heritage and archaeology. Routing and siting is only indicative at this stage. Most options involving new constructions include a level of risk to buried unknown archaeology, this would need to be investigated further at the project level.

4.4.1 SA Approach 1 (SA Combination 1) (LCo, QD, BE, MR, BA)

SA approach 1, key comparison points:

- Identified as the best in the Lowest Cost, Quickest Delivery, Best Environmental, Most Resilient and Best AA categories;
- Option types included:
  - SA option: 1 New Shannon Source option;
  - WRZ options: 2 WTP upgrade options;
- No -3 biodiversity scores (higher risk options that could impact on European sites); and
- SA approach 1 requires over 65km more pipeline than SA approach 2 as it is rationalising the majority of the WRZs in SA4. Hence, SA approach 1 also decommissions ten more WTPs than SA approach 2.

4.4.2 SA Approach 2 (WRZ Approach) (LC)

SA approach 2, key comparison points:

- Identified as the best in the Lowest Carbon category;
- Option types included:
  - SA option: 1 surface water interconnection option;
  - WRZ options: 5 groundwater abstraction options, 1 surface water abstraction option, 1 New Shannon Source option and 4 WTP upgrade options;
- No -3 biodiversity scores (higher risk options that could impact on European sites); and
- SA approach 2 does not rationalise as many WRZs, therefore, it requires less pipeline and involves the upgrade of ten more WTPs and six more new/upgraded abstractions.

4.5 SA4 Approach Assessment Comparison

The ‘Do Minimum’ approach is the ‘without plan’ approach, meaning that this is the approach that would occur without the NWRP. As a result, the ‘Do Minimum’ approach would only include reactive, unplanned interim measures to address failures in infrastructure.

The SDB shows a current deficit, applying the level of service in the area with the corresponding requirements for reserves, indicating operation of supplies with an SDB ranging from -22,415 m^3/d in 2019, to a projected maximum of -38,190 m^3/d in 2044 during dry conditions under a 'Do Minimum' scenario. As a result, public water supplies in this area are vulnerable, particularly under drought conditions. In addition, there may be 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. Table 4.8Table 4.8 shows the SDB for the WRZs in SA4.

Table 4.8 Supply Demand Balance for SA4

WRZ Name	WRZ Code	Population	Maximum Deficit m^3/day*	
			2019	2044
Ardcarraig Clogherinkoe	1400SC0004	111	-57	-62
Clonuff	1400SC0005	36	No deficit	No deficit
Ballymahon	2000SC0003	8,402	-914	-1,110
Clonard	2300SC0012	334	-37	-46
Longwood	2300SC0016	1,757	No deficit	-39
Enfield	2300SC0018	3,748	-380	-1,022
Geashill PWS	2500SC0004	721	-99	-124
Edenderry/Rhode	2500SC0005	11,041	-4,204	-4,646
Walsh Island PWS	2500SC0006	978	No deficit	No deficit
Clonbullogue PWS	2500SC0007	858	No deficit	No deficit
Daingean PWS	2500SC0014	1,505	No deficit	No deficit
Mullingar Regional	3200SC0001	50,016	-11,804	-25,837
Ballany	3200SC0003	8,366	-4,919	-5,304

*Based on the Dry Year Critical Period (DYCP) weather event planning scenario

An overall assessment and comparison of the SA approaches considered along with the 'Do Minimum' approach (a continuation of the current situation) is provided in Table 4.9 below.

Table 4.9 Assessment of the SA Approaches and the 'Do Minimum' Approach

SEA Objectives	Phase (Construction (C) / Operation (O))	Do Minimum	SA Approach 1 (SA Combination 1) (LCo, QD, BE, MR, BA)	SA Approach 2 (WRZ Approach) (LC)
1. Protect public health and promote wellbeing	C	0	--	-
	O	---	++	++
	C	0	--	--

SEA Objectives	Phase (Construction (C) / Operation (O))	Do Minimum	SA Approach 1 (SA Combination 1) (LCo, QD, BE, MR, BA)	SA Approach 2 (WRZ Approach) (LC)
2. Protect and enhance biodiversity and contribute to resilient ecosystems	O	--	-	-
3. To protect landscapes, townscapes and visual amenity	C	0	--	-
	O	0	++	+
4. Protect and where appropriate enhance, built and natural assets and reduce waste	C	0	--	--
	O	-	0	0
5. Reduce greenhouse gas emissions	C	0	-	-
	O	-	-	-
6. Contribute to environmental climate change resilience	C	0	0	-
	O	--	++	+
7. Protect and improve surface water and groundwater status	C	0	0	0
	O	--	0	-
8. Avoid flood risk	C	0	0	0
	O	0	0	0
9. Protect and where appropriate, enhance cultural heritage assets	C	0	-	-
	O	0	0	0
10. Protect quality and function of soils	C	0	-	-
	O	0	0	0

Key			
Major beneficial	+++	Minor adverse	-
Moderate beneficial	++	Moderate adverse	--
Minor beneficial	+	Major adverse	---
Neutral	0		

The overall assessment of the approaches against the SEA objectives indicates that SA approach 2 is expected to have less of an adverse impact on public health and wellbeing during construction than SA approach 1 because there is less pipeline associated. SA approach 1 involves the decommissioning of more WTPs, which has a more beneficial long term effect than SA approach 2. SA approach 1 is also to be connected to a more resilient source, increasing resilience more than SA approach 2 long term.

Mitigation for the Preferred Approach is identified in chapter 5 through the individual options assessment and the chapter 6 cumulative assessment. All the approaches address the identified water supply quantity and quality requirements to secure a level of service important for public health and wellbeing compared with the 'Do Minimum'.

4.5.1 Selection of the SA Preferred Approach

SA approach 1 has been selected through the 7 step process as the best performing approach overall across the different categories.

The SA Preferred Approach does not include any -3 Biodiversity score options. Therefore, no higher risk options for effects on European Sites are included in the Preferred Approach. For options identified as having some level of risk for LSEs, mitigation measures to address these are set out in the NIS and no AESI are identified.

4.6 liWithout Regional Transfer Alternative

The approach development process at study area level identifies a number of locations where a supply from outside the study area is likely to represent a better solution than relying on local supply solutions only. The SA4 Preferred Approach includes options that are dependent on the development of the SA9 Preferred Approach. Alternatives for these options need to be considered in the event that the Preferred Approach for SA9 cannot advance, the alternative options are outlined in Table 4.10. Note that the options for the other WRZs that are not specified in Table 4.10 will remain the same as those in the current SA4 Preferred Approach.

Table 4.10 Alternative Options for WRZs Dependent on the SA9 Preferred Approach

WRZ	SA4 Preferred Approach Option	SA4 Alternative Option
Ballany	SA Option 1 New Shannon Source Connection to Mullingar Regional and 10 other WRZs.	SA4-004 Maintain existing WTPs and abstraction from Lough Lene. New WTP and associated SW abstraction from Lough Sheelin.
Mullingar Regional		SA4-039 Decommission existing WTP and SW abstraction from Lough Owel. Increased abstraction at Lough Ree and upgrade existing Athlone WTP to supply full demand to Mullingar.
Clonard/ Abbeysfields Housing Estate		SA4-047 Increase GW abstraction to supply deficit.

WRZ	SA4 Preferred Approach Option	SA4 Alternative Option
Longwood WS		SA4-049 Maintain existing WTP and abstraction and a new GW source.
Enfield WS		SA4-057 Maintain and increase existing WTP and provide new GW abstraction.
Ardcarraig Clogherinkoe		SA4-059 Maintain existing WTP and increase GW abstraction.
Edenderry & Rhode		SA4-65b Maintain existing WTPs and abstractions. New GW source to provide additional supply to Toberdaly WTP.
Daingean		SA4-100 Upgrade to existing WTP no increase in output required.
Walsh Island		SA4-101 Upgrade to existing WTP no increase in output required.
Ballymahon		SA4-012 Maintain and increase existing WTP and SW abstraction from River Inny.
Geashill		SA4-062 Maintain and increase existing WTP and provide new GW abstraction.

An overall infrastructure summary of the Preferred Approach options and the alternative options listed in Table 4.10 are provided in Table 4.11, covering the main components of the options.

Table 4.11 Alternative and Preferred Approach Options Infrastructure Summary

Infrastructure Summary	Preferred Approach Options	Alternative Approach Options
New pipeline network (km)	174.1	74.3
New WTPs	0	1
Upgrade WTPs	0	12
New/upgraded abstractions	0	9
WTPs decommissioned	13	2
Abstractions abandoned	13	0

Infrastructure Summary	Preferred Approach Options	Alternative Approach Options
Raw water storage	0	0
Treated water storage	2	7

Table 4.12 provides an overall comparative assessment between the SA4 Preferred Approach options and the alternative options listed in Table 4.10 against the SEA objectives.

Table 4.12 Assessment of the Preferred Approach Options and the Alternatives

SEA Objectives	Phase (Construction (C) / Operation (O))	Preferred Approach Options (PA)	Alternative Approach Options (Alt)	Summary
1. Protect public health and promote wellbeing	C	--	--	The PA option has over twice the length of pipeline, however, the Alt options require one new WTP. Both have the potential to cause disruption to urban and rural areas.
	O	++	+	The PA option decommissions failing WTPs whereas the Alt options upgrade these failing WTPs to provide benefits during operation.
2. Protect and enhance biodiversity and contribute to resilient ecosystems	C	--	--	Both the PA and Alt options have potential to impact Annex species. Both have hydrological links to multiple European and Nationally designated sites.
	O	-	--	The PA option includes a major river crossing which have direct and indirect hydrological links to European sites. The Alt options have the potential to impact multiple European sites through hydrological links associated with the abstractions.
3. To protect landscapes, townscapes and visual amenity	C	--	--	The PA option has over twice the length of pipeline, however, the Alt options require one new WTP. Both have the potential to cause visual impacts to urban and rural areas during construction.
	O	++	-	The PA option includes the decommissioning of thirteen WTPs, whereas the Alt options require one new WTP to be built. This has the potential to cause minor long term visual impacts.
4. Protect and where appropriate enhance, built and natural assets and reduce waste	C	--	--	The PA options require approximately 174km of new pipeline; however, the Alt options requires over 74km of pipeline and one WTP to make use of existing assets.

SEA Objectives	Phase (Construction (C) / Operation (O))	Preferred Approach Options (PA)	Alternative Approach Options (Alt)	Summary
	O	0	-	The PA options require approximately 170km of pipeline; however, land will be reinstated after construction and no long term impacts are predicted. The Alt options will result in the loss of agricultural land to allow for the new WTP.
5. Reduce greenhouse gas emissions	C	-	---	There is a minor level of carbon emissions associated with the PA options and major level of carbon emissions associated with the Alt options in relation to the Deployable Output created.
	O	-	---	
6. Contribute to environmental climate change resilience	C	0	0	No construction impacts are predicted.
	O	++	--	The PA option uses a large resilient supply whereas the Alt options utilise several smaller supplies that are more vulnerable to climate change impacts. The PA options would also help to reduce pressure on existing environmental sources within these WRZs through rationalising the supply.
7. Protect and improve surface water and groundwater status	C	0	0	No construction impacts are predicted.
	O	0	--	The PA options do not include any new or increased abstractions whereas the Alt options include several new and increased surface water and groundwater abstractions. The Alt option SA4-057 also has potential concerns regarding long term capacity.
8. Avoid flood risk	C	0	0	No impediment to surface water flow paths or increase to flood risk anticipated.
	O	0	0	
9. Protect and where appropriate, enhance cultural heritage assets	C	-	-	The Alt and PA options are not located where there are any records of cultural heritage assets or unknown archaeology listed under the Record of Monuments/Record of Protected Structures and/or National Inventory of Architectural Heritage records. However, due to new network required, risk of unknown archaeology is assessed as minor.
	O	0	0	No operational impacts are predicted.

SEA Objectives	Phase (Construction (C) / Operation (O))	Preferred Approach Options (PA)	Alternative Approach Options (Alt)	Summary
10. Protect quality and function of soils	C	-	--	The PA options are located where there are a number of sites listed under IGHS, NHAs, or pNHAs of geological significance present. The Alt options are associated with a considerable disruption to soils used for turf cutting when developing the new WTP.
	O	0	0	Soils will be reinstated after construction and no operation impacts are predicted.

Key			
Major beneficial	+++	Minor adverse	-
Moderate beneficial	++	Moderate adverse	--
Minor beneficial	+	Major adverse	---
Neutral	0		

The Preferred Approach options are assessed in Table 4.12 as performing better against eight of the ten SEA objectives, a summary of the key reasoning behind this is also provided.

In the event that the SA9 Preferred Approach cannot progress, the alternatives above will be required to replace those options that are reliant on it. These alternatives will be subject to their own planning and regulatory processes and it will take a number of investment cycles to progress these projects; hence, they may change in later iterations of the plan.

5

SA4 Preferred Approach: Strategic Environmental Assessment

5 SA4 Preferred Approach Strategic Environmental Assessment

5.1 SA4 Preferred Approach Options

This chapter provides an environmental assessment of the proposed SA Preferred Approach as required by the SEA Directive and implementing Irish regulations. The environmental effects are considered for each option individually. Additional measures proposed to be taken forward along with these options are also considered. Cumulative effects for both the 'within plan' SA Preferred Approach and the cumulative effects with other proposed developments outside the Framework Plan are addressed in chapter 6.

The SA Preferred Approach consists of WRZ options for two of the WRZs in the study area, namely, Clonuff and Clonbullogue. The remaining eleven WRZs are covered by SA option 1, this consists of transfers from the New Shannon Source to Mullingar Regional WRZ, a transfer to Ballany from the Kells Old-Castle WRZ, and a transfer from Enfield to the Greater Dublin Area WRZ.

Table 5.1 gives a breakdown of the options in SA4 and the associated abstractions/demand.

Table 5.1 Preferred Approach Breakdown

WRZ Name and Option Reference*	Option Description	Abstraction / Demand
SA4-010 (SA Option 1) 3200SC0003 Ballany	New connection point from WSP connecting to Ballany • New surface water abstraction to meet WRZ future demand. New Shannon source to meet this deficit • Shannon abstraction previously assessed as part of GDA study area • WFD status of proposed source: Derg highly modified waterbody 2013-2018 – Good	7,126 m^3/d
SA4-36a (SA Option 1) 3200SC0001 Mullingar Regional	New connection point from New Shannon Source connecting to Mullingar Regional • New surface water abstraction to meet WRZ future demand. New Shannon source to meet this deficit • Shannon abstraction previously assessed as part of GDA study area • WFD status of proposed source: Derg highly modified waterbody 2013-2018 – Good	25,837 m^3/d
SA4-046 (SA Option1) 2300SC0012 Clonard/ Abbeyfields	New connection point from New Shannon Source connecting to Clonard/Abbeysfields Housing Estate • Potential to rationalise Clonard to Kinnegad (Mullingar Regional WRZ) via 6 km watermain • New surface water abstraction to meet WRZ future demand. New Shannon source to meet this deficit • Shannon abstraction previously assessed as part of GDA study area	83 m^3/d

WRZ Name and Option Reference*	Option Description	Abstraction / Demand
	• WFD status of proposed source: Derg highly modified waterbody 2013-2018 – Good	
SA4-052 (SA Option 1) 2300SC0016 Longwood WS	New connection point from New Shannon Source connecting to Longwood • Potential to connect Longwood to Kinnegad (Mullingar Regional WRZ) • New surface water abstraction to meet WRZ future demand. New Shannon source to meet this deficit • Shannon abstraction previously assessed as part of GDA study area • WFD status of proposed source: Derg highly modified waterbody 2013-2018 – Good	589 m^3/d
SA4-053 (SA Option 1) 2300SC0018 Enfield WS	New connection point from New Shannon Source connecting to Enfield • Potential to connect at Kinnegad from Mullingar • New surface water abstraction to meet WRZ future demand. New Shannon source to meet this deficit • Shannon abstraction previously assessed as part of GDA study area • WFD status of proposed source: Derg highly modified waterbody 2013-2018 – Good	1,664 m^3/d
SA4-053 (SA Option 1) 1400SC0004 Ardcarraig Clogherinkoe	New connection point from New Shannon Source connecting to Ardcarraig Clogherinkoe • New surface water abstraction to meet WRZ future demand. New Shannon source to meet this deficit • Shannon abstraction previously assessed as part of GDA study area • WFD status of proposed source: Derg highly modified waterbody 2013-2018 – Good	98 m^3/d
SA4-098 2500SC0007 Clonbullogue	No deficit - water quality upgrade only • WRZ not in deficit, option to upgrade WTP for water quality issues • WFD status of groundwater body of proposed abstraction: Cushina groundwater body status – Good	N/A
SA4-020 (SA Option 1) 2000SC0003 Ballymahon	Rationalise Ballymahon To Mullingar WRZ • New surface water abstraction to meet WRZ future demand. New Shannon source to meet this deficit	5,877 m^3/d

WRZ Name and Option Reference*	Option Description	Abstraction / Demand
	• Shannon abstraction previously assessed as part of GDA study area • WFD status of proposed source: Derg highly modified waterbody 2013-2018 – Good	
SA4-099 1400SC0005 Clonuff	No deficit - water quality upgrade only • WRZ not in deficit, option to upgrade WTP for water quality • WFD status of Trim groundwater body status 2013-2018 – Good	N/A
SA4-066 (SA Option 1) 2500SC0005 Edenderry & Rhode	New connection point from New Shannon Source connecting to Edenderry & Rhode • New surface water abstraction to meet WRZ future demand. New Shannon source to meet this deficit • Shannon abstraction previously assessed as part of GDA study area • WFD status of proposed source: Derg highly modified waterbody 2013-2018 – Good	6,391 m^3/d
SA4-071 (SA Option 1) 2500SC0014 Daingean	New connection point from New Shannon Source connecting to Daingean • New surface water abstraction to meet WRZ future demand. New Shannon source to meet this deficit • Shannon abstraction previously assessed as part of GDA study area • WFD status of proposed source: Derg highly modified waterbody 2013-2018 – Good	839 m^3/d
SA4-077 (SA Option 1) 2500SC0006 Walsh Island PWS	New connection point from New Shannon Source connecting to Walsh Island • New surface water abstraction to meet WRZ future demand. New Shannon source to meet this deficit • Shannon abstraction previously assessed as part of GDA study area • WFD status of proposed source: Derg highly modified waterbody 2013-2018 – Good	861 m^3/d
SA4-063 (SA Option 1) 2500SC0004 Geashill	New connection point from New Shannon Source connecting to Geashill • New surface water abstraction to meet WRZ future demand. New Shannon source to meet this deficit • Shannon abstraction previously assessed as part of GDA study area	536 m^3/d

WRZ Name and Option Reference*	Option Description	Abstraction / Demand
	• WFD status of proposed source: Derg highly modified waterbody 2013-2018 – Good	

* Note: SA Options are the same as Group Options

The SA Preferred Approach options are shown in Figure 5.1, in relation to key environmental designations. Note that SA option 1 is labelled as SA4-501.

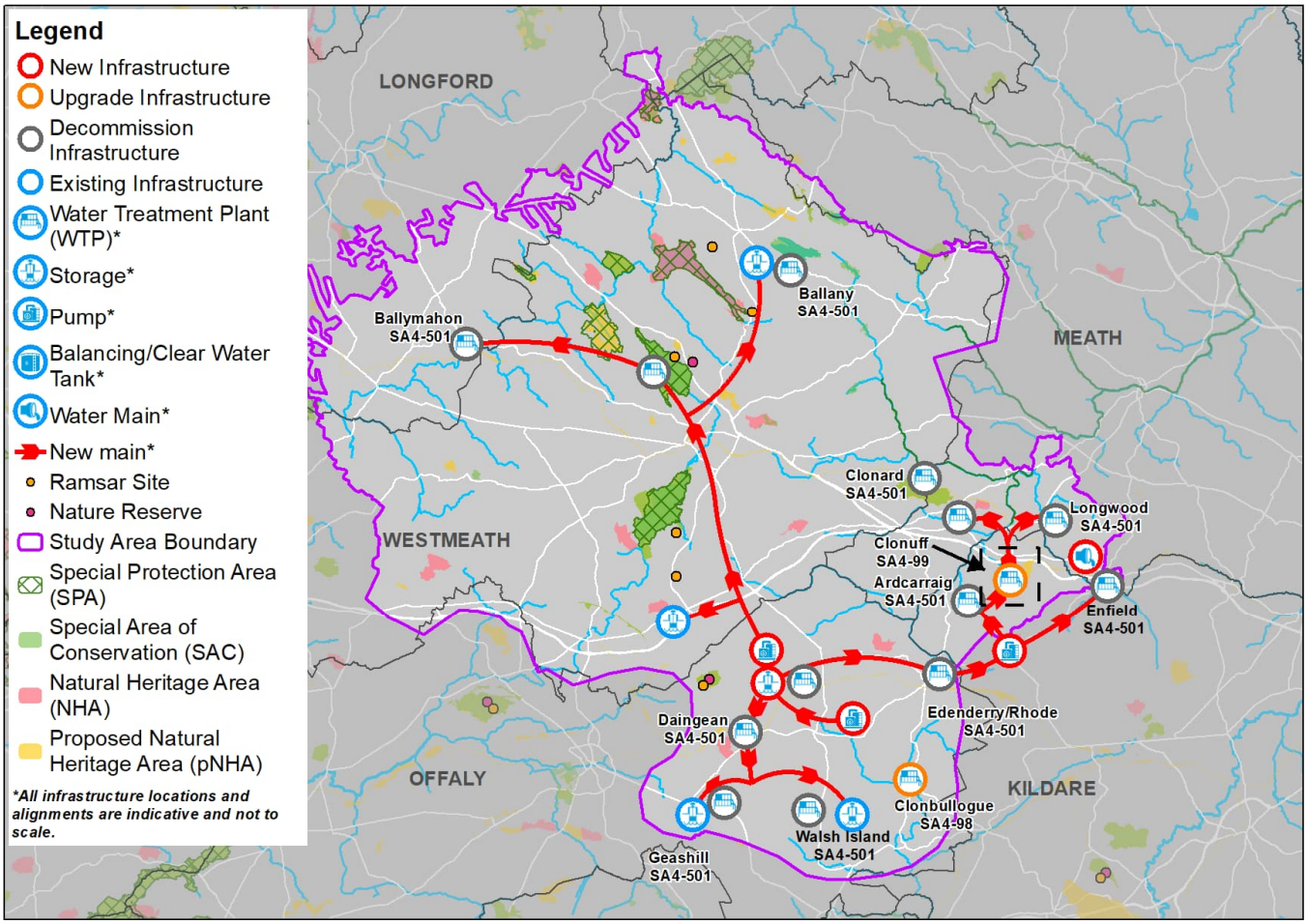

Figure 5.1 SA Preferred Approach and Key Environmental Designations

The SA Preferred Approach options have each been assessed against the SEA objectives, taking account of construction and operational phases, long term and short term, permanent and temporary, and indirect and direct impacts. Mitigation requirements to avoid or reduce effects have also been taken into consideration. Table 5.2 provides a breakdown of the infrastructural components and Table 5.3 provides an assessment summary of the options included in the SA Preferred Approach. Individual options assessments are available on request. The overall Preferred Approach assessment, including all the options combined, is summarised in Table 7.1.

Table 5.2 Component Table

Option Reference	New / Refurbished Pipeline	New WTP	Upgrade WTPs	New / Upgraded Abstractions	WTPs Decommissioned	Abstractions Abandoned	Raw Water Storage	Treated Water Storage
SA4-098	-	-	✓	-	-	-	-	-
SA4-099	-	-	✓	-	-	-	-	-
SA Option 1 (SA4-010, SA4-36a, SA4-046, SA4-052, SA4-053, SA4-060, SA4-066, SA4-071, SA4-077, SA4-020, SA4-063)	✓	-	-	-	✓	-	-	✓

Table 5.3 Options Assessment Summary

Option Reference*	Option Description	Phase	Protect Public Health and Promote Wellbeing (P1, P2, P3)	Protect and Enhance Biodiversity and Contribute to Resilient Ecosystems (B1, B2, B3, B4, B5)	To Protect Landscapes, Townscapes and Visual Amenity (L1)	Protect and Where Appropriate Enhance, Built and Natural Assets and Reduce Waste (M1, M2)	Reduce Greenhouse Gas Emissions (C1)	Contribute to Environmental Climate Change Resilience (R1, R2, R5)	Protect and Improve Surface Water and Groundwater Status (W1, W2, W3)	Avoid Flood Risk (W5)	Protect and Where Appropriate, Enhance Cultural Heritage Assets (CH1)	Protect Quality and Function of Soils (G1)
SA4-099	No deficit - water quality upgrade required only	Construction	-	-	0	0	0	0	0	0	0	0
		Operation	+	-	0	0	0	0	0	0	0	0
SA4-098	No deficit - water quality upgrade required only	Construction	-	-	0	0	0	0	0	0	0	0
		Operation	+	0	0	0	0	0	0	0	0	0
SA4-010 (SA Option 1)	New connection point from NSS connecting to Ballany	Construction	--	--	--	--	-	0	0	0	-	-
		Operation	++	-	++	0	-	++	0	0	0	0
SA4-36a		Construction	--	--	--	--	-	0	0	0	-	-

Option Reference*	Option Description	Phase	Protect Public Health and Promote Wellbeing (P1, P2, P3)	Protect and Enhance Biodiversity and Contribute to Resilient Ecosystems (B1, B2, B3, B4, B5)	To Protect Landscapes, Townscapes and Visual Amenity (L1)	Protect and Where Appropriate Enhance, Built and Natural Assets and Reduce Waste (M1, M2)	Reduce Greenhouse Gas Emissions (C1)	Contribute to Environmental Climate Change Resilience (R1, R2, R5)	Protect and Improve Surface Water and Groundwater Status (W1, W2, W3)	Avoid Flood Risk (W5)	Protect and Where Appropriate, Enhance Cultural Heritage Assets (CH1)	Protect Quality and Function of Soils (G1)
(SA Option 1)	New connection point from NSS connecting to Mullingar Regional	Operation	++	-	++	0	-	++	0	0	0	0
SA4-046 (SA Option 1)	New connection point from NSS connecting to Clonard/Abbeysfields Housing Estate	Construction	--	--	--	--	-	0	0	0	-	-
		Operation	++	-	++	0	-	++	0	0	0	0
SA4-052 (SA Option 1)	New connection point from NSS connecting to Longwood	Construction	--	--	--	--	-	0	0	0	-	-
		Operation	++	-	++	0	-	++	0	0	0	0
SA4-053		Construction	--	--	--	--	-	0	0	0	-	-

Option Reference*	Option Description	Phase	Protect Public Health and Promote Wellbeing (P1, P2, P3)	Protect and Enhance Biodiversity and Contribute to Resilient Ecosystems (B1, B2, B3, B4, B5)	To Protect Landscapes, Townscapes and Visual Amenity (L1)	Protect and Where Appropriate Enhance, Built and Natural Assets and Reduce Waste (M1, M2)	Reduce Greenhouse Gas Emissions (C1)	Contribute to Environmental Climate Change Resilience (R1, R2, R5)	Protect and Improve Surface Water and Groundwater Status (W1, W2, W3)	Avoid Flood Risk (W5)	Protect and Where Appropriate, Enhance Cultural Heritage Assets (CH1)	Protect Quality and Function of Soils (G1)
(SA Option 1)	New connection point from NSS connecting to Enfield	Operation	++	-	++	0	-	++	0	0	0	0
SA4-060 (SA Option 1)	New connection point from NSS connecting to Ardcarraig Clogherinkoe	Construction	--	--	--	--	-	0	0	0	-	-
		Operation	++	-	++	0	-	++	0	0	0	0
SA4-066 (SA Option 1)	New connection point from NSS connecting to Edenderry & Rhode	Construction	--	--	--	--	-	0	0	0	-	-
		Operation	++	-	++	0	-	++	0	0	0	0
SA4-071 (SA Option 1)	New connection point from NSS	Construction	--	--	--	--	-	0	0	0	-	-
		Operation	++	-	++	0	-	++	0	0	0	0

Option Reference*	Option Description	Phase	Protect Public Health and Promote Wellbeing (P1, P2, P3)	Protect and Enhance Biodiversity and Contribute to Resilient Ecosystems (B1, B2, B3, B4, B5)	To Protect Landscapes, Townscapes and Visual Amenity (L1)	Protect and Where Appropriate Enhance, Built and Natural Assets and Reduce Waste (M1, M2)	Reduce Greenhouse Gas Emissions (C1)	Contribute to Environmental Climate Change Resilience (R1, R2, R5)	Protect and Improve Surface Water and Groundwater Status (W1, W2, W3)	Avoid Flood Risk (W5)	Protect and Where Appropriate, Enhance Cultural Heritage Assets (CH1)	Protect Quality and Function of Soils (G1)
	connecting to Daingean											
SA4-077 (SA Option 1)	New connection point from NSS to Walsh Island	Construction	--	--	--	--	-	0	0	0	-	-
		Operation	++	-	++	0	-	++	0	0	0	0
SA4-020 (SA Option 1)	Rationalise Ballymahon to Mullingar WRZ	Construction	--	--	--	--	-	0	0	0	-	-
		Operation	++	-	++	0	-	++	0	0	0	0
SA4-063 (SA Option 1)	New connection point from NSS to Geashill	Construction	--	--	--	--	-	0	0	0	-	-
		Operation	++	-	++	0	-	++	0	0	0	0

* Note SA Option is the same as Group Option

** Total lifetime tCO_2e categories: minor beneficial = -ve negligible/neutral = <1000 minor = 1000 to <10,000, Moderate = 10,000 to <50,000, Major = 50,000+

5.2 Additional Measures

In addition to the SA Preferred Approach supply options, Irish Water is already implementing measures across the three pillars of Lose Less, Use Less and Supply Smarter to improve the level of service to their customers in this study area. These are described in the SA4 Technical Report and include leakage reduction and water conservation.

5.2.1 Leakage Reduction

The leakage reduction measures across the public water supply are based on what Irish Water assess to be both achievable and sustainable and include:

- Ongoing leakage management, including active leakage control, pressure management, and find and fix activities to offset Natural Rate of Leakage Rise;
- Net leakage reductions targets have been applied to the SDB deficit to move towards achieving the national Sustainable Economic Level of Leakage (SELL) target prioritised based on:
    - Supply demand deficit;
    - Existing abstractions with sustainability issues; and
    - Drought impacts.
- Additional leakage targets to achieve SELL and reduce leakage levels to 21% of demand in the WRZs: Geashill PWS, Ballymahon, Edenderry/Rhode, Walsh Island PWS, Mullingar Regional, Daingean PWS and Ballany.

5.2.2 Water Conservation

At present, Irish Water is conducting pilot studies in relation to water conservation stewardship in businesses and is actively progressing water conservation messaging campaigns. During drought conditions in 2018, a Water Conservation Order was implemented, in order to protect their water supplies and reduce pressure on the natural environment during this period. Irish Water will continue to promote 'Water Conservation Activities', collecting and monitoring data over a number of years to assess the benefits. As part of the Framework Plan, Irish Water have not applied reductions to the SDB for unquantifiable water conservation gains. However, they do assume that any gain will offset consumer usage growth factors.

5.3 Interim Solutions

The SA4 Technical Report identifies potential interim solutions that allow shorter term interventions to be identified and prioritised, when needed. These are expected to be small scale, within site works and are not likely to give rise to significant environmental effects. However, they would need to be subject to relevant assessments, including AA screening as and when they are required.

5.4 Approach Uncertainty and Adaptability

A summary of the adaptability criteria and sensitivity analysis Irish Water have undertaken for the SA4 Preferred Approach is provided in the SA4 Technical report. A high-level assessment of what this could mean for the SEA is shown in Table 5.4.

Table 5.4 SA4 Sensitivity Analysis and Environmental Impacts

Uncertainty	Likelihood	Increase/ Decrease in Deficit	Environmental Impacts Relative to Assessment of Preferred Approach Key: Green - Positive Amber - Negative
Sustainability	Moderate/High (as our current abstractions are large compared to the water bodies from which they abstract)	+ 800 m^3/d	The impact of sustainability reductions would reduce the volumes that can be abstracted from Irish Water's existing sources; therefore, increasing the SDB deficit. Irish Water's outline sustainability assessments would mean a potential significant increase in deficit for SA4 based on the large reductions in the sustainable abstraction amounts from both Lough Owel and Lough Lene. However, the Preferred Approach involves the decommissioning of the Lough Owel source and augmenting SA4 with connections to the New Shannon Source.
			The SA Preferred Approach addresses reduction, although additional sustainability reductions could add pressure for additional supply from outside the study area.
Climate Change	High (international climate change targets have not been met)	+1,000 m^3/d	Higher climate change scenarios would impact Irish Water's existing supplies and result in decreased water availability at certain times of year. Within SA4, the existing lake abstraction from Lough Bane and Lough Lene would be vulnerable to increased climate change impact scenarios. However, these sources are decommissioned as part of the Preferred Approach. The existing river abstraction from River Inny is a large source that is resilient to any increased climate change impacts. Regarding the existing/new groundwater abstractions, there is more difficulty and uncertainty in assessing increased climate change impacts, however it is understood that generally groundwater will be more resilient than surface water sources.
			Potential for additional abstraction pressure unless optimisation can address.
Demand Growth	Low/Moderate (growth has been based on policy)	-3,942 m^3/d	The impact of lower than expected growth would reduce the SDB deficit and the overall need requirement. The SDB deficit is spread across eight of the thirteen individual WRZs and is driven by quality and quantity issues. In this rural area, growth is relatively low.

Uncertainty	Likelihood	Increase/ Decrease in Deficit	Environmental Impacts Relative to Assessment of Preferred Approach Key: Green - Positive Amber - Negative
			This could allow lower than expected energy and carbon and reduce expected abstraction requirements
Leakage Targets	Low (Irish Water is focused on sustainability and aggressive leakage reduction)	+251 m^3/d	The impact of lower than expected leakage savings would increase the SDB deficit and the overall need requirement. Due to the length and condition of Irish Water's networks, Irish Water could potentially fail to achieve target leakage reductions within the timeframes set out. However, as Irish Water is committed to achieving leakage reductions, the likely scenario would be an extension in the period of time taken to achieve leakage targets as opposed to accepting lower targets.
			This could increase carbon emissions and the effects of abstraction pressure on the environment
	Moderate/High (Irish Water is focused on sustainability and aggressive leakage reduction)	-8,785 m^3/d	Increased leakage savings beyond SELL would reduce the SDB deficit and the overall need requirement. The need drivers in SA4 are across all thirteen WRZs and are driven by quality as well as availability issues and the requirement to move away from the Lough Owel source.
			This could allow lower than expected energy and carbon and reduce expected abstraction requirements

6

SEA Cumulative Effects for SA4 Preferred Approach

6 SEA Cumulative Effects for SA4 Preferred Approach

Secondary, cumulative and the synergistic nature of the effects of the SA4 Preferred Approach proposals are required to be considered as part of SEA. These include:

- 'Within plan' or 'in-combination' effects; and
- Interaction with other plans and programmes.

Cumulative effects are also considered for the proposals across the nine study areas within the Eastern and Midlands Region and reported in the SEA Environmental Report of the Regional Plan. Further consideration of any inter regional cumulative effects will be addressed in each Regional Plan SEA sequentially.

6.1 Cumulative Effects 'Within Plan' for SA4

The potential 'within plan' cumulative effects for SA4 are considered at the following different levels:

- Option level: Identification of mutually exclusive or dependent options – this was considered through the options screening and approach development process;
- SA approaches: Cumulative effects are taken into account in the selection of approaches for key aspects such as abstraction from the same waterbody through the sustainability rules applied for Irish Water abstractions (see section 3.2);
- SA Preferred Approach: The combined effect of options within the SA Preferred Approach – these are addressed in this chapter; and
- Eastern and Midlands Region level: Considering combined effects from proposals in the nine study areas (see the SEA Environmental Report of the Regional Plan).

For cumulative effects to occur, there needs to be an overlap of temporal periods in some way for the impact and/or the effect. For example, two schemes being constructed at the same time could result in cumulative traffic movements, while two schemes being operated together could result in additional 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 (Table 6.1). However, this is very unlikely to be the case for construction impacts due to budget resources and regulatory constraints.

The assessment has considered the cumulative effects across all environmental topics to identify those interactions that are likely to generate significant effects. These are likely to be around:

- Biodiversity – for example, a cumulative loss of habitats or changes to a habitat's quality through changes in water quality or groundwater levels;
- Water environment (surface water and groundwater WFD status) – for example, changes to water flow due to combined abstraction pressure;
- People and health – for example, disruption due to 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 also reported here to identify potential requirements for mitigation. Combined effects on climate change adaptation are also considered.

6.1.1 Cumulative Effects during Construction

In general, the SA Preferred Approach options are geographically spaced out and most are small scale in construction works. Therefore, there are unlikely to be many cumulative effect interactions during construction.

Table 6.1 Potential In-Combination Effects between Preferred Options in SA4

Preferred Approach option references	SA4-099	SA4-098
SA Option 1 (Group option 1)	RB&RB	RB&RN
SA4-098		

Key	
Construction Phase	
Operation Phase	
Construction and Operation	
River Boyne and River Blackwater SAC	RB&RB
River Barrow and River Nore SAC	RB&RN

There could be cumulative effects from habitat degradation and disturbance and spread of invasive species on the River Boyne and River Blackwater SAC if construction of SA4-099 and SA option 1 (see Table 6.1) are concurrent. The River Boyne and River Blackwater SAC is designated for its alkaline fens and alluvial forests habitats and Annex I/II species such as river lamprey, Atlantic salmon and otter. Cumulative construction works could affect water quality through increasing the risk of pollution during works. There is also potential for cumulative effects from habitat degradation impacts on the River Barrow and River Nore SAC if construction of SA4-098 and SA option 1 are concurrent. Potential pollution of watercourses during construction of SA4-098 and SA option 1 could affect QI species and hydrologically connected habitats. With standard good practice mitigations such as having buffers along the edge of the river and having an emergency plan in place during construction, cumulative effects are unlikely to be significant. The impacts on the European designations are provided in the NIS and also summarised in chapter 9 of this review.

6.1.2 Cumulative Effects during Operation

The SEA has not identified, at a plan level, any potential for cumulative effects during operation phase of the SA4 Preferred Approach. Figure 6.1 demonstrates existing abstractions in SA4.

The potential for cumulative effects on groundwater bodies have been considered in a hydrogeological assessment of the groundwater abstractions commissioned by Irish Water (Irish Water, 2022). However, there are no groundwater abstraction to be considered in the SA4 Preferred Approach.

There could be cumulative effects in terms of carbon across the SA Preferred Approach. The whole life carbon estimate (including construction and operation) for the SA Preferred Approach indicates increased contribution to carbon emissions related to carbon embodied in materials used for construction and through operational energy use and water treatment. 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 and therefore the overall carbon efficiency in terms of carbon emissions per ML of supply is an appropriate metric and for SA4 this averages as 3.26 tCO_2e/ML (lifetime sum). Mitigation for carbon emissions could include increased sourcing of energy from renewable sources and improving energy efficiency. This could be undertaken alongside leakage reduction and campaigns to raise awareness of measures to reduce water consumption (which in turn would reduce energy consumption). This could include the promotion of water efficient devices and working with planning authorities and developers to encourage new development to be water efficient.

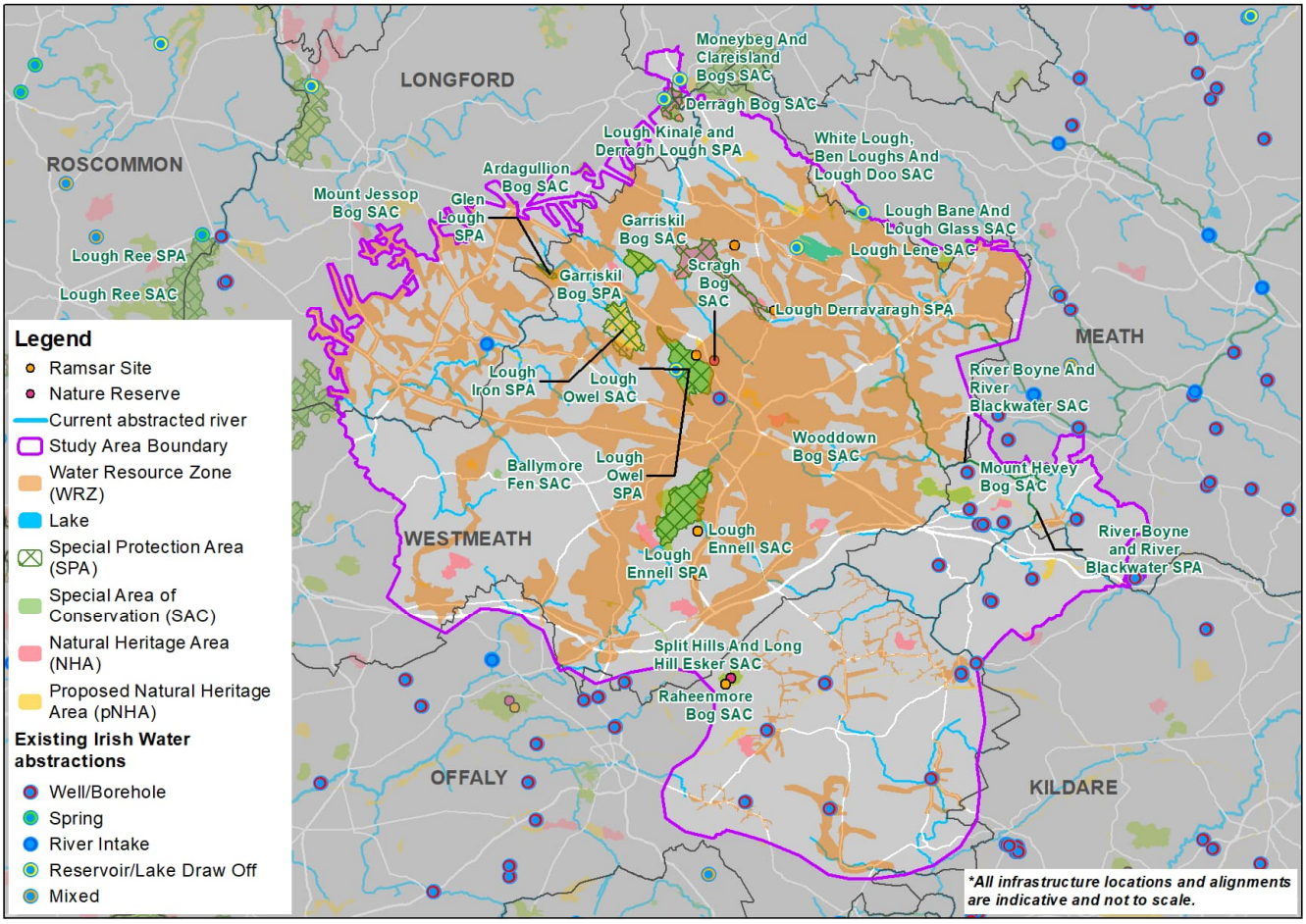

Figure 6.1 SA Preferred Approach Abstractions in SA4

6.2 Cumulative Effects with Other Developments

The SA4 Preferred Approach has been assessed alongside other developments that could occur within the plan area. Potential effects could include increased traffic and noise. These could be mitigated by standard mitigation measures, such as planning of construction traffic routes and informing local

residents about the works. With these standard good practice measures in place, there are unlikely to be significant cumulative effects.

Table 6.2 shows that within SA4 there are a number of regeneration and construction projects clustered around Mullingar and Edenderry. There are also projects located at Abbeyshrule, Castlepollard, Enfield, Granard and Kinnegad. Other developments that were not considered further due to their smaller size for this plan level are the Mullingar Greenway Recreational Hub and the Mullingar Town Bus Service.

6.2.1 Cumulative Effects during Construction

The regeneration projects in Mullingar and Edenderry, and to a lesser degree in Enfield, could result in cumulative effects with the SA Preferred Approach if they were to be constructed at the same time (represented in Table 6.2 as 'M', 'E' and 'En', respectively). Potential effects could include increased traffic and noise to the towns. These could be mitigated by standard mitigation measures, such as planning of construction traffic routes and informing local residents about the works. With these standard good practice measures in place, there are unlikely to be significant cumulative effects. There is potential for cumulative effects on cultural heritage assets including archaeological resources related to the total extent of the ground works required, this will need to be considered further as detailed route alignments and site locations are determined along with approaches for more detailed desk studies, investigation and mitigation.

The plan level assessment indicates that there is potential for cumulative effects from habitat degradation and loss, mortality and from spread of invasive species impacts on Lough Ennell SAC and Lough Owel SAC if construction phase of all of the regeneration projects in Mullingar are concurrent with the SA Preferred Approach. Lough Ennell SAC and Lough Owel SAC are approximately 3km south-west and 3.5km north-west of these schemes, respectively. Mullingar is hydrologically connected to Lough Ennel SAC through the River Brosna and Lough Owel SAC is hydrologically connected to Mullingar via Lough Owel Feeder and therefore there may be in-combination effects from pollution and from spread of invasive species during construction. The plan level assessment indicates that there is potential for cumulative effects from habitat degradation impacts on Lough Ree SAC and SPA if construction of The Yard, Abbeyshrule – Community and Economic Hub is concurrent with the SA Preferred Approach. Lough Ree SAC and SPA is approximately less than 15km from The Yard and the SA Preferred Approach. Potential pollution during construction could affect hydrologically connected habitats of the sites. If construction of Historic Granard Motte project is concurrent with the SA approach, there is also potential for cumulative effects from habitat degradation impacts on Lough Derravarragh SPA. The SA approach is 270m away from the Lough Derravarragh SPA an Granard is hydrologically connected to the site through the Rathcronan and Inny Rivers and is approximately 14km away.

With the implementation of mitigations as outlined in section 6.3.3 of the NIS, there will be no adverse cumulative effects on the integrity of the Lough Ennell, Lough Owel and Lough Ree SACs, Lough Ree SPA and Lough Derravarragh SPA.

Table 6.2 Potential Cumulative Effects between Preferred Options and Other Developments in SA4

	Preferred Approach Options		
Project Developments	**SA4-099**	**SA4-098**	**SA Option 1 (Group option 1)**
Ardmore Road, Mullingar			L&L

	Preferred Approach Options		
Project Developments	**SA4-099**	**SA4-098**	**SA Option 1 (Group option 1)**
			M
Mullingar Theatres			L&L
			M
Blackhall, Mullingar			L&L
			M
Mullingar Courthouse - PPP: Ongoing Unitary Charge Payments			L&L
			M
Canal Avenue & Environs Regeneration Project			L&L
			M
Mullingar Radiation Department			L&L
			M
Railway Terrace, Mullingar			L&L
			M
Edenderry Masterplan			E
Libraries Capital Programme - Edenderry Library			E
Edenderry Regeneration - Phase 1			E
Castlepollard Regeneration			
Kinnegad Regeneration			
Community Facilities Enfield			En
The Yard, Abbeyshrule - Community and Economic Hub			LR
Historic Granard Motte Project			LD

Key	
Construction Phase	
Operation Phase	
Construction and Operation	

Key	
Mullingar	M
Edenderry	E
Enfield	En
Lough Ennell SAC and Lough Owel SAC	L&L
Lough Ree SAC and SPA	LR
Lough Derravarragh SPA	LD

6.2.2 Cumulative Effects during Operation

There could be cumulative effects on Lough Ree SAC and SPA and Lough Derravarragh SPA from habitat degradation if operation of the SA4 Preferred Approach and The Yard, Abbeyshrule - Community and Economic Hub project and SA4 Preferred Approach and Historic Granard Motte project are concurrent. Both The Yard and Historic Granard Motte projects could impact the River Inny which is hydrologically linked to the Lough Ree SAC and SPA and Lough Derravarragh in addition to the increase abstraction from the River Inny with the SA4 Preferred Approach. However, with the implementation of standard good practice measures there will be no adverse effects on the integrity of these European sites.

There could be cumulative effects in terms of carbon emissions, as all developments will generate carbon emissions from operation whether this is from routine maintenance activities to water treatment and the energy required for moving water. As outlined in section 6.1.2, any increase in carbon can be considered a significant effect, as these add cumulatively across all developments and contribute to the national target for carbon. The same mitigation measures suggested for the SA4 Preferred Approach apply, including increased sourcing of energy from renewable sources and raising awareness of measures to reduce water consumption (which in turn would reduce energy consumption). Working with third parties, including planning authorities and other developers, to identify water efficient measures and joint promotion of water issues would also further mitigate this effect.

7 Strategic Environmental Assessment Summary

7 Strategic Environmental Assessment Summary

SEA objectives have been taken into account at each stage of the approach development process for SA4 and a range of options and SA Approaches have been considered and assessed, including a 'Do Minimum' approach.

Key beneficial impacts assessed include, up to, moderate beneficial impacts for all options associated with increasing resilience and the quality of water supply for local communities; and the subsequent benefits of this for public health.

Key potential adverse impacts identified at plan level include:

- Potential temporary moderate adverse impacts during construction as a result of direct pipeline crossings of the River Boyne with QIs of Lamprey, and salmon and Lough Iron SPA, which is one of the most important waterbird sites in the midlands. The Lough is also a designated Ramsar site. The NIS identifies mitigation measures to avoid AESI for these sites;
- Potential moderate adverse impacts during construction to Annex species due to presence of otter, bat (Daubenton's and long-eared spp.) and freshwater crayfish (Annex IV), and bird species including barn owl, gull spp., corn-crake and kingfisher in close proximity to the works. Impacts to non-designated wildlife and biodiversity from disturbance are considered moderate adverse during construction;
- Moderate short term adverse impacts during construction to public health and/or quality of life from dust, noise and/traffic in the rural areas;
- Moderate short term adverse effects on landscape character and visual amenity as construction of large scale new network (174km) and assets are required; and
- Moderate adverse effects to built and natural assets with SA option 1 due to the construction of more than 174km of new pipeline required.

Cumulative effects assessment has identified potential significant effects in relation to carbon emissions, individual options are assessed between neutral to major 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 SA4 but does not provide a complete picture as it does not fully take account of efficiencies from replacement of failing infrastructure or 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.

SEA mitigation identified to address the key adverse impacts identified above include further hydrological or hydrogeological modelling (as appropriate) to further inform understanding of potential impacts on the River Boyne and River Blackwater SAC/SPA, River Barrow and River Nore SAC and other European and national designated sites identified as potentially affected by new or increased abstractions from existing surface and groundwater sources (see the NIS of the Framework Plan for further information). Measures to address the cumulative impact for carbon emissions include sourcing the energy supply from renewable sources. All developments will aim to achieve as far as possible requirements for no net loss in biodiversity or enhancement, as set out in the Biodiversity Action Plan (Irish Water, 2021). There may be potential to also provide opportunities for carbon sequestration with biodiversity enhancement. In addition, there are opportunities to reduce water demand (which in turn would reduce energy and carbon) by raising awareness of water issues, promoting water efficient devices and through leakage reduction.

In general, these are standard mitigation measures with some specific measures and additional requirements for further assessment or monitoring (see the SEA Appendix and the NIS Appendix for AA and SEA standard mitigation measures respectively).

An overall summary assessment, including potential for cumulative and in-combination effects and other measures, identified to be progressed alongside the supply side options is provided in Table 7.1. Key mitigation and proposed monitoring measures are also shown.

Table 7.1 SEA Summary

SEA Objectives	SA Preferred Approach (PA) (SA Approach 1) Residual Effects Including Mitigation C – Construction (Short Term) O – Operational (Long Term)	Mitigation	Monitoring	
			Study Area Level	Scheme Level
SA Preferred Approach with interim measures as required and a programme of leakage reduction and water conservation measures, taking an adaptive approach to address uncertainty				
1. Protect public health and promote wellbeing	C Minor Adverse to Moderate Adverse O Minor Beneficial to Moderate Beneficial The PA is expected to improve overall drinking water quality reliability and sustainability through the decommissioning of failing WTPs and the replacement of abstractions vulnerable to drought conditions. The PA is expected to reduce risks to access of good quality water supply across different conditions and over the plan period.	Standard good construction practice and consultation Further assessment of risks to water quality and consideration of catchment management initiatives to improve water quality and reduce treatment cost. For example, working with landowners and managers on practices to reduce levels of sediment and pollution from entering water courses through run off.	• Level of service, and the frequency and duration of drought orders • Number of days/hours when water supply to people is disrupted due to drought, freeze-thaw or other service/infrastructure issues • Number of public rights of way closures/diversions and length of paths created compared to loss	• Duration of construction works, and number of complaints received regarding construction works • Duration of temporary closures of footpaths and other recreational assets e.g. walking trails around Mullingar/Lough Enell/Lough Owell and the Grand Canal Way.
2. Protect and enhance biodiversity and	C Minor Adverse to Moderate Adverse O Neutral to Minor Adverse	Routing/siting to avoid impacts. Standard good construction practice and specific measures as	• Temporary and permanent habitats lost vs habitats created/enhanced	• Monitor construction activities to ensure compliance

SEA Objectives	SA Preferred Approach (PA) (SA Approach 1) Residual Effects Including Mitigation C – Construction (Short Term) O – Operational (Long Term)	Mitigation	Monitoring	
			Study Area Level	Scheme Level
contribute to resilient ecosystems	Impacts from construction works for pipelines and service reservoirs on biodiversity. These can be minimised through careful routing and siting. Operational impacts on habitats of the River Boyne and Lough Iron. Potential for construction and operational impacts on European and National designated sites, most notably the River Boyne & River Blackwater SAC and the Lough Iron SPA.	identified in the NIS of the Framework Plan. Design to meet no net loss biodiversity or achieve enhancement, where possible, on or off site and in line with the Biodiversity Action Plan objectives. Further hydrological/hydrogeological assessments to determine impacts on designated sites. Operating rules to limit impacts on European and National sites.	• Site condition and population data for QI of European and National designated sites.	
3. To protect landscapes, townscapes and visual amenity	C Neutral to Moderate Adverse O Neutral to Moderate Beneficial Construction landscape impacts and long term benefits from removal of above ground structures, such as decommissioning WTPs.	Routing and siting to reduce tree loss and appropriate location and design of above ground structures with landscape planting. Reinstatement of land use and vegetation.	• Total working area of pipelines non-designated landscapes • Land use/landscape features re-established for schemes over appropriate period – areas/km successfully restored to meet requirements	• Duration of construction works • Number of complaints received regarding visual impact of construction works

SEA Objectives	SA Preferred Approach (PA) (SA Approach 1) Residual Effects Including Mitigation C – Construction (Short Term) O – Operational (Long Term)	Mitigation	Monitoring	
			Study Area Level	Scheme Level
4. Protect and where appropriate enhance, built and natural assets and reduce waste	C Neutral to Moderate Adverse O Neutral New resources required for construction works, including extensive lengths of pipeline, service reservoirs and new/upgraded WTPs. Ongoing maintenance requirements.	Materials management to be integrated into design to optimise use of existing resources and minimise waste from construction and operation.	• Loss of greenfield land, including agricultural, forestry or other land uses • Disruptions to strategic infrastructure/services • Use of waste management plans • Volume of drinking water treatment residuals sent to landfill	• Construction wastes sent to landfill
5. Reduce greenhouse gas emissions	C Neutral to Minor Adverse O Neutral to Minor Adverse Embodied and operational carbon contribute to national level carbon emission targets. Leakage and water efficiency can contribute to reducing carbon.	Design to minimise embodied carbon emissions and optimise operational efficiency. Seek renewable energy supply sources and optimise use of leakage and water efficiency measures to reduce carbon. Consider offsetting approaches with multiple benefits for water quality, carbon sequestration and linking with other objectives.	• Percentage of energy supply from renewable sources or reduced energy use • Carbon footprint (total tonnes) per year, predicted over plan period, lifetime of schemes and carbon intensity of water resource options (tonnes/Ml/d)	• Carbon footprint (total tonnes) during construction • Operational Carbon Intensity kgsCO2equic/ML

SEA Objectives	SA Preferred Approach (PA) (SA Approach 1) Residual Effects Including Mitigation C – Construction (Short Term) O – Operational (Long Term)	Mitigation	Monitoring	
			Study Area Level	Scheme Level
6. Contribute to environmental climate change resilience	C Neutral O Neutral to Moderate Beneficial Abstractions generally reduce environmental resilience but overall improved flexibility for operation using regional schemes has the potential to reduce pressure on at risk local resources.	Consider how operation can further reduce climate change pressure on at risk sources and associated designations. Sustainability review of sources taking account of groundwater and surface water interconnections.	• WFD waterbody status objectives at risk and designated site condition status • Frequency of drought orders requiring change to normal abstractions/ compensation releases	• None identified
7. Protect and improve surface water and groundwater status	C Neutral O Neutral Generally, new/increased abstractions are limited to allowable limits and have a low risk of adverse effect on WFD waterbody status objectives. Meeting growth in Ballany by transferring water from another WRZ rather than increasing the existing abstraction from Lough Lene which will assist in Lough Lene meeting WFD objectives.	Further investigation to consider effects on groundwater abstraction on the surface water environment.	• WFD waterbody status objectives at risk	• Pollution incidents during construction • Additional monitoring of Lough Lene if needed

SEA Objectives	SA Preferred Approach (PA) (SA Approach 1) Residual Effects Including Mitigation C – Construction (Short Term) O – Operational (Long Term)	Mitigation	Monitoring	
			Study Area Level	Scheme Level
8. Avoid flood risk	C Neutral O Neutral	Siting and design of schemes to take account of flood risk and design for flood risk resilience.	• Number of options at risk of flooding at each AEP level	• Lost time to flooding • Lost time to power supply interruptions
9. Protect and where appropriate, enhance cultural heritage assets	C Neutral to Minor Adverse O Neutral Potential construction impacts on unknown archaeological interest. Impacts on known interests are expected to be avoided.	Standard good practice approaches to minimise potential impacts.	• Number of archaeological assets adversely affected by water resource options • Number of options that are rerouted to avoid cultural heritage impacts • Number of schemes including improvements to access recording of archaeological assets or communication/ interpretation of interest features	• Number of archaeological finds recorded during construction
10. Protect quality and function of soils	C Neutral to Minor Adverse O Neutral Potential for loss and damage to valuable soils during construction but impacts to geological assets are expected to be avoided.	Standard good practice to conserve and reinstate soils.	• Soil Management Plans implemented • Volume of contaminated land restored, or soils removed	• Total volume of soil removed or reused on site

8

Water Framework Directive Summary

8 Water Framework Directive Summary

Through the options identification and assessment process new options considered have been restricted to those expected to meet estimated sustainability requirements and all options have been assessed based on conservative allowable abstraction constraints. The options identified in SA4 are expected to be sustainable, based on additional plan level desk-based assessment, in terms of avoiding deterioration of WFD status or avoiding conflict with meeting WFD objectives.

There are no groundwater abstractions associated with the SA4 Preferred Approach. However, impacts, including cumulative effects with non Irish Water abstractions, will need to be considered in further detail as part of project level consenting to demonstrate both sustainability for any connected surface waterbodies and groundwater dependent habitats and protected areas.

9 Appropriate Assessment Summary

9 Appropriate Assessment Summary

The NIS of the Regional Plan's conclusions for SA4, regarding 'In-combination effects with other plans and projects' and 'In-combination effects between Preferred Options', as set out below, and are included in more detail in Appendix E of the NIS for the Regional Plan.

Potential in-combination effects with other projects and plans were identified for the preferred options on the Lough Ennell SAC & SPA, Lough Owel SAC & SPA, Lough Derravarragh SPA, and Lough Ree SAC & SPA. The potential effects include habitat degradation, habitat loss, disturbance and spread of invasive non-native species. However, the assessment concluded that with the mitigation identified there will be no adverse effects on the integrity of the European site in-combination with other plans or projects.

Potential in-combination effects between preferred options were identified for the River Boyne & River Blackwater SAC and the River Barrow & River Nore SAC if construction of options is concurrent. The potential impacts include disturbance, habitat degradation and the spread of invasive non-native species. With the implementation of mitigation as detailed in Appendix E of the NIS, there will be no adverse effects on the integrity of European sites.

10 Recommendations for Implementation

10 Recommendations for Implementation

Environmental actions for the implementation plan and the draft Monitoring Plan are identified in:

- SEA Environmental Report of the Framework Plan – this includes general proposals and standard mitigation requirements (also see SEA Environmental Report Appendix); and
- SEA Environmental Report of the Regional Plan - this includes specific mitigation and monitoring requirements for Eastern and Midlands Region options and cumulative effects.

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Appendix A Fine Screening Summaries

Key			
0 Neutral	-1 Minor adverse	-2 Moderate Adverse	-3 Major adverse
	1 Minor beneficial	2 Moderate Beneficial	3 Major Beneficial

Table A.1 Fine Screening Summary of Rationalisation Options in SA4

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA4-013	Supply Ballymahon from Lough Forbes, Increase Abstraction and Upgrade WTP									0	0	-13
SA4-039	Increased Abstraction at Lough Ree and Upgrade Existing Athlone WTP to Supply Full Demand to Mullingar									0	0	-17

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA4-041	Rationalise Mullingar to Longford Central (Lough Forbes Abstraction =338Ml/d)									0	0	-16
SA4-44a	Rationalisation of Meadowview to Abbeyfields is Complete - New BH and Upgrade Abbeyfields WTP to Supply Clonard Village									0	0	-7
SA4-44b	Rationalise Longwood to Abbeyfield (Clonard) WRZ - 0.8Ml/d									0	0	-10
SA4-045	Rationalise Clonard (Abbeyfield and Meadowfield WRZs) to Enfield WRZ									0	0	-11
SA4-050	Rationalise Longwood to Enfield WRZ									0	0	-11

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA4-051	Rationalise Longwood to Abbeyfield (Clonard) WRZ - 0.8Ml/d									0	0	-10
SA4-055	Rationalise Enfield WRZ to Johnstown Bridge									0	0	-16
SA4-070	Rationalise Daingean to Edenderry/ Rhode WRZ									0	0	-13

Table A.2 Fine Screening Summary of Interconnection Options in SA4

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA4-018	Interconnect Ballymahon and Lanesboro WRZs (New GW Required at Lanesboro)									2	0	-18
SA4-021	Increase Abstraction/ Capacity at Athlone WTP to Supply Mullingar Regional & Ballymahon WRZs									1	0	-19
SA4-040	Increase Abstraction/ Capacity at Athlone WTP to Supply Mullingar Regional & Ballymahon WRZs									1	0	-19
SA4-074	Interconnect Clonbullogue & Walsh Island WRZs - 0.3Ml/d									0	0	-8

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA4-102	Interconnect Clonbullogue & Walsh Island WRZs - 0.3Ml/d									0	0	-8

Table A.3 Fine Screening Summary of Groundwater Options in SA4

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA4-016	New GW at Keenagh to Supply Deficit in Ballymahon (Funshinagh GWB - Karstic)									0	0	-18

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA4-017	Partially Supply Mullingar Regional WRZ from Additional GW at Moate - 2Ml/d									0	0	-15
SA4-028	Partially supply Mullingar Regional WRZ from additional GW sites at Arden, Kilbeggan and Moate									2	0	-19
SA4-29a	New GW Abstraction at Moate to Partly Supply Deficit in WRZ									0	0	-11
SA4-29b	Partially Supply Mullingar Regional WRZ from Additional GW at Moate - 2Ml/d									0	0	-16
SA4-030	New GW Abstraction at Annagh to Partly Supply Deficit in WRZ									0	0	-13

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA4-031	Partially supply Mullingar Regional WRZ from additional GW sites at Arden, Kilbeggan and Moate									2	0	-19
SA4-033	Increase GW Abstraction at Portlaoise to Partly Supply Deficit in WRZ									2	0	-19
SA4-034	New GW Abstraction at Clonard County Meath to Partly Supply Deficit in WRZ									0	0	-15
SA4-047	Increase GW Abstraction to Supply Deficit									0	0	-7
SA4-048	Increase GW Abstraction to Supply Deficit in Longwood WRZ									0	0	-9

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA4-049	New GW at Longwood - Locally Import Gravel Aquifer									0	0	-8
SA4-56a	Rationalise Clonard (Abbeyfield and Meadowfield WRZs) to Enfield WRZ									0	0	-11
SA4-56b	Rationalise Longwood to Enfield WRZ									0	0	-11
SA4-56c	New GW at Enfield WTP									0	0	-8
SA4-057	Increase GW Abstraction to Supply Deficit in Enfield WRZ									1	0	-12
SA4-059	Increase GW Abstraction at Ardcarraig Clogherinkoe									0	0	-7
SA4-061	Increase GW Abstraction at Geashill									1	0	-12

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA4-062	New GW Abstraction at Geashill									0	0	-10
SA4-064	Increase GW Abstraction at Edenderry & Rhode WRZ									1	0	-11
SA4-65a	Rationalise Daingean to Edenderry/ Rhode WRZ									0	0	-13
SA4-65b	New GW Source to Supply Edenderry & Rhode WRZ									0	0	-9
SA4-29c	Partially supply Mullingar Regional WRZ from additional GW sites at Arden, Kilbeggan and Moate									2	0	-19
SA4-081	Increase GW Abstraction at Edenderry and Upgrade Edenderry (Toberdaly) WTP									1	0	-13

Table A.4 Fine Screening Summary of Surface Water Options in SA4

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA4-004	New SW Abstraction from Lough Sheelin									0	0	-19
SA4-005	Supply part of Ballany from Kells/Oldcastle WTP - New Source Required									0	0	-9
SA4-006	Supply part of Ballany from Athboy - New Source Required (New Shannon Source)									0	0	-10
SA4-007	Supply part of Ballany from Baileborough PWS - New Source Required									0	0	-16
SA4-008	Supply part of Ballany from Lough Kinale PWS									0	0	-11
SA4-012	Increase SW Abstraction from River Inny									0	0	-10

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA4-015	Supply Edgeworthstown from Lough Forbes - Longford Central WRZ to reduce the demand on Ballymahon									0	0	-11
SA4-022	River Shannon Abstraction (Potential Reuse of old ESB Abstraction License)									0	0	-14
SA4-024	New SW Abstraction from River Inny Located Approx. 10km of the Existing Portloman WTP to Supplement Supply to Mullingar WRZ									1	0	-22
SA4-026	Maintain and Reduce Abstraction from Lough Owel - Close Connection to Canal and Continue Pumping to Canal to									0	0	-11

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
	Maintain Satisfactory Level											
SA4-037	Increase Abstraction at Abbeyshrule WTP and Upgrade WTP to Supplement Supply to Mullingar WRZ									1	0	-18
SA4-067	New SW Source to Supply deficit in Edenderry & Rhode WRZ River Silver									0	0	-17

Table A.5 Fine Screening Summary of Group Water Scheme Options in SA4

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA4-009	Supply Ballany from Neighbouring Group Water Scheme									1	0	-11
SA4-084	Supply Deficit from Neighboring Ballyfore/ Ballykilleen GWS									1	0	-15

Table A.6 Fine Screening Summary of New Shannon Source Options in SA4

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA4-010	New Shannon Source Connection Supply to Mullingar Regional & 10No. Other WRZs - 38.4Ml/d									2	0	-21
SA4-11b	New Shannon Source Connection Supply to Mullingar Regional & Ballany WRZs - 26.7Ml/d									2	0	-20
SA4-019	New Shannon Source Connection Supply to Mullingar Regional & Ballymahon WRZs - 32.6Ml/d									1	0	-18
SA4-020	New Shannon Source Connection Supply to Mullingar Regional & 10No. Other WRZs - 38.4Ml/d									2	0	-21

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA4-36a	New Shannon Source Connection Supply to Mullingar Regional & 10No. Other WRZs - 38.4Ml/d									2	0	-21
SA4-36b	New Shannon Source Connection Supply to Mullingar Regional & Ballany WRZs - 26.7Ml/d									2	0	-20
SA4-36c	New Shannon Source Connection Supply to Mullingar Regional & Ballymahon WRZs - 32.6Ml/d									1	0	-18
SA4-046	New Shannon Source Connection Supply to Mullingar Regional & 10No. Other WRZs - 38.4Ml/d									2	0	-21

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA4-052	New Shannon Source Connection Supply to Mullingar Regional & 10No. Other WRZs - 38.4Ml/d									2	0	-21
SA4-053	New Shannon Source Connection Supply to Mullingar Regional & 10No. Other WRZs - 38.4Ml/d									2	0	-21
SA4-054	Rationalise Enfield WRZ to New Shannon Source (Kilcock Connection) – New Shannon Source Required									0	0	-12
SA4-060	New Shannon Source Connection Supply to Mullingar Regional & 10No. Other WRZs - 38.4Ml/d									2	0	-21

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA4-063	New Shannon Source Connection Supply to Mullingar Regional & 10No. Other WRZs - 38.4Ml/d									2	0	-21
SA4-066	New Shannon Source Connection Supply to Mullingar Regional & 10No. Other WRZs - 38.4Ml/d									2	0	-22
SA4-071	New Shannon Source Connection Supply to Mullingar Regional & 10No. Other WRZs - 38.4Ml/d									2	0	-21
SA4-077	New Shannon Source Connection Supply to Mullingar Regional & 10No. Other WRZs - 38.4Ml/d									2	0	-21

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA4-36d	New Shannon Source Connection to Mullingar Regional WRZ									1	0	-18

Table A.7 Fine Screening Summary of WTP Options in SA4

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA4-098	Upgrade WTP for Water Quality Purposes									0	0	-4
SA4-099	Upgrade Clonbullogue WTP for Water Quality Purposes									0	0	-4

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SA4-100	Upgrade WTP for Water Quality Purposes									0	0	-6
SA4-101	Upgrade WTP for Water Quality Purposes									0	0	-5

Appendix B SA Approaches for SA4

Note: SA Options are also referred to as 'Group' options

WRZ	Preferred Approach - SA Approach 1		Least Cost - SA Approach 1		Quickest Delivery - SA Approach 1	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
3200SC0003: Ballany	SA4-010 New connection point from NSS connecting to Ballany	1	SA4-010 New connection point from NSS connecting to Ballany	1	SA4-010 New connection point from NSS connecting to Ballany	1
3200SC0001: Mullingar Regional	SA4-36a New connection point from NSS connecting to Mullingar Regional	1	SA4-36a New connection point from NSS connecting to Mullingar Regional	1	SA4-36a New connection point from NSS connecting to Mullingar Regional	1
2300SC0012: Clonard/ Abbeysfields Housing Estate	SA4-046 New connection point from NSS connecting to Clonard/Abbeysfields Housing Estate	1	SA4-046 New connection point from NSS connecting to Clonard/Abbeysfields Housing Estate	1	SA4-046 New connection point from NSS connecting to Clonard/Abbeysfields Housing Estate	1
2300SC0016: Longwood WS	SA4-052 New connection point from NSS connecting to Longwood	1	SA4-052 New connection point from NSS connecting to Longwood	1	SA4-052 New connection point from NSS connecting to Longwood	1
2300SC0018: Enfield	SA4-053 New connection point from NSS connecting to Enfield	1	SA4-053 New connection point from NSS connecting to Enfield	1	SA4-053 New connection point from NSS connecting to Enfield	1
1400SC0005: Clonuff	SA4-099 No deficit - water quality upgrade required only	-	SA4-099 No deficit - water quality upgrade required only	-	SA4-099 No deficit - water quality upgrade required only	-

WRZ	Preferred Approach - SA Approach 1		Least Cost - SA Approach 1		Quickest Delivery - SA Approach 1	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
1400SC0004: Ardcarraig Clogherinkoe	SA4-060 New connection point from NSS connecting to Ardcarraig Clogherinkoe	1	SA4-060 New connection point from NSS connecting to Ardcarraig Clogherinkoe	1	SA4-060 New connection point from NSS connecting to Ardcarraig Clogherinkoe	1
2500SC0005: Edenderry & Rhode	SA4-66 New connection point from NSS connecting to Edenderry & Rhode	1	SA4-66 New connection point from NSS connecting to Edenderry & Rhode	1	SA4-66 New connection point from NSS connecting to Edenderry & Rhode	1
2500SC0014: Daingean	SA4-071 New connection point from NSS connecting to Daingean	1	SA4-071 New connection point from NSS connecting to Daingean	1	SA4-071 New connection point from NSS connecting to Daingean	1
2500SC0007: Clonbullogue	SA4-098 No deficit - water quality upgrade required only	-	SA4-098 No deficit - water quality upgrade required only	-	SA4-098 No deficit - water quality upgrade required only	-
2500SC0006: Walsh Island	SA4-077 New connection point from NSS connecting to Walsh Island	1	SA4-077 New connection point from NSS connecting to Walsh Island	1	SA4-077 New connection point from NSS connecting to Walsh Island	1
2000SC0003: Ballymahon	SA4-020 Rationalise Ballymahon To Mullingar WRZ	1	SA4-020 Rationalise Ballymahon To Mullingar WRZ	1	SA4-020 Rationalise Ballymahon To Mullingar WRZ	1
2500SC0004: Geashill	SA4-063 New connection point from NSS connecting to Geashill	1	SA4-063 New connection point from NSS connecting to Geashill	1	SA4-063 New connection point from NSS connecting to Geashill	1

WRZ	Best Environmental - SA Approach 2		Lowest Carbon - SA Approach 2		Most Resilient - SA Approach 4	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
3200SC0003: Ballany	SA4-010 New connection point from NSS connecting to Ballany	1	SA4-005 Supply part of Ballany from Kells/Oldcastle WTP - New Source Required	-	SA4-010 New connection point from NSS connecting to Ballany	1
3200SC0001: Mullingar Regional	SA4-36a New connection point from NSS connecting to Mullingar Regional	1	SA4-040 Increase Abstraction/ Capacity at Athlone WTP to Supply Mullingar Regional & Ballymahon WRZs	7	SA4-36a New connection point from NSS connecting to Mullingar Regional	1
2300SC0012: Clonard/ Abbeysfields Housing Estate	SA4-046 New connection point from NSS connecting to Clonard/Abbeysfields Housing Estate	1	SA4-047 Increase GW abstraction to supply deficit	-	SA4-046 New connection point from NSS connecting to Clonard/Abbeysfields Housing Estate	1
2300SC0016: Longwood WS	SA4-052 New connection point from NSS connecting to Longwood	1	SA4-049 New GW at Longwood - Locally Import Gravel Aquifer	-	SA4-052 New connection point from NSS connecting to Longwood	1
2300SC0018: Enfield	SA4-053 New connection point from NSS connecting to Enfield	1	SA4-054 Rationalise Enfied WRZ to New Shannon Source (Kilcock connection) - New Shannon Source required	-	SA4-053 New connection point from NSS connecting to Enfield	1

WRZ	Best Environmental - SA Approach 2		Lowest Carbon - SA Approach 2		Most Resilient - SA Approach 4	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
1400SC0005: Clonuff	SA4-099 No deficit - water quality upgrade required only	-	SA4-099 Upgrade Clonbullogue WTP for Water Quality Purposes	-	SA4-099 No deficit - water quality upgrade required only	-
1400SC0004: Ardcarraig Clogherinkoe	SA4-060 New connection point from NSS connecting to Ardcarraig Clogherinkoe	1	SA4-059 Increase GW abstraction at Ardcarraig Clogherinkoe	-	SA4-060 New connection point from NSS connecting to Ardcarraig Clogherinkoe	1
2500SC0005: Edenderry & Rhode	SA4-66 New connection point from NSS connecting to Edenderry & Rhode	1	SA4-65b New GW Source to Supply Edenderry & Rhode WRZ	-	SA4-66 New connection point from NSS connecting to Edenderry & Rhode	1
2500SC0014: Daingean	SA4-071 New connection point from NSS connecting to Daingean	1	SA4-100 Upgrade WTP for Water Quality Purposes	-	SA4-071 New connection point from NSS connecting to Daingean	1
2500SC0007: Clonbullogue	SA4-098 No deficit - water quality upgrade required only	-	SA4-098 Upgrade WTP for Water Quality Purposes	-	SA4-098 No deficit - water quality upgrade required only	-
2500SC0006: Walsh Island	SA4-077 New connection point from NSS connecting to Walsh Island	1	SA4-101 Upgrade WTP for Water Quality Purposes	-	SA4-077 New connection point from NSS connecting to Walsh Island	1
2000SC0003: Ballymahon	SA4-020 Rationalise Ballymahon To Mullingar WRZ	1	SA4-021	7	SA4-020 Rationalise Ballymahon To Mullingar WRZ	1

WRZ	Best Environmental - SA Approach 2		Lowest Carbon - SA Approach 2		Most Resilient - SA Approach 4	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
			Increase Abstraction/ Capacity at Athlone WTP to Supply Mullingar Regional & Ballymahon WRZs			
2500SC0004: Geashill	SA4-063 New connection point from NSS connecting to Geashill	1	SA4-062 New GW abstraction at Geashill	-	SA4-063 New connection point from NSS connecting to Geashill	1

WRZ	Best Appropriate Assessment - SA Approach 1	
	Option Description	SA Option
3200SC0003: Ballany	SA4-010 New connection point from NSS connecting to Ballany	1
3200SC0001: Mullingar Regional	SA4-36a New connection point from NSS connecting to Mullingar Regional	1
2300SC0012: Clonard/Abbeysfields Housing Estate	SA4-046 New connection point from NSS connecting to Clonard/Abbeysfields Housing Estate	1
2300SC0016: Longwood WS	SA4-052 New connection point from NSS connecting to Longwood	1

WRZ	Best Appropriate Assessment - SA Approach 1	
	Option Description	SA Option
2300SC0018: Enfield	SA4-053 New connection point from NSS connecting to Enfield	1
1400SC0005: Clonuff	SA4-099 No deficit - water quality upgrade required only	-
1400SC0004: Ardcarraig Clogherinkoe	SA4-060 New connection point from NSS connecting to Ardcarraig Clogherinkoe	1
2500SC0005: Edenderry & Rhode	SA4-66 New connection point from NSS connecting to Edenderry & Rhode	1
2500SC0014: Daingean	SA4-071 New connection point from NSS connecting to Daingean	1
2500SC0007: Clonbullogue	SA4-098 No deficit - water quality upgrade required only	-
2500SC0006: Walsh Island	SA4-077 New connection point from NSS connecting to Walsh Island	1
2000SC0003: Ballymahon	SA4-020 Rationalise Ballymahon To Mullingar WRZ	1
2500SC0004: Geashill	SA4-063 New connection point from NSS connecting to Geashill	1