

Autumn 2022



Draft Regional Water Resources Plan – North West

Strategic Environmental Assessment

Appendix H: Study Area F – Environmental Review



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

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Table of Contents

1	Introduction and Background	2
1.1	Options Assessment Methodology	2
1.2	Regional Plan Strategic Environmental Assessment	3
1.3	Study Area: Strategic Environmental Assessment	4
1.4	Study Area: Water Framework Directive	5
1.5	Study Area: Appropriate Assessment	5
1.6	Study Area F	5
2	Study Area F Environmental Baseline Context	9
2.1	Population, Economy, Tourism and Recreation, and Human Health	9
2.1.1	Population	9
2.1.2	Economy and Employment	10
2.1.3	Tourism and Recreation	10
2.1.4	Human Health	11
2.2	Water Environment	12
2.2.1	Water Framework Directive	14
2.2.2	Flood Risk	18
2.3	Climate Change	19
2.4	Biodiversity, Flora and Fauna	23
2.4.1	Designated Sites	23
2.4.2	Habitats	26
2.4.3	Species	27
2.5	Material Assets	28
2.6	Landscape and Visual Amenity	30
2.6.1	Landscape and Visual	30
2.6.2	Seascape	34
2.7	Air Quality and Noise	34
2.7.1	Air Quality	34
2.7.2	Noise	34
2.8	Cultural Heritage	35
2.9	Geology and Soils	36
2.10	Summary of Key Issues and Trends over the Plan Period	37
3	Environmental Assessment – Options Appraisal	41
3.1	Overview	41

3.2	Stage 3: Unconstrained Options	41
3.2.1	Existing Groundwater Abstractions.....	42
3.2.2	New Ground water Abstractions.....	42
3.2.3	Sustainable Abstraction in Options Assessment.....	42
3.3	Stage 4: Coarse Screening	43
3.4	Stage 5: Fine Screening	44
3.5	Stage 6: Feasible Options List	45
4	Environmental Assessment – Approach Development	47
4.1	Introduction to Approach Development	47
4.2	Stage 7: Approach Development Process	48
4.2.1	Environmental Assessment in the Approach Development process	49
4.3	SAF Approach Development Process	51
4.4	Comparison of SAF Approaches	56
4.4.1	SA Approach 1 (SA Combination 1) (LCo, QD).....	58
4.4.2	SA Approach 2 (SA Combination 2) (LC)	59
4.4.3	SA Approach 3 (SA Combination 6) (BE, BA).....	59
4.4.4	SA Approach 4 (SA Combination 12) (MR)	60
4.5	SAF Approach Assessment Comparison	60
4.5.1	Selection of the SA Preferred Approach.....	63
5	SAF Preferred Approach Strategic Environmental Assessment	65
5.1	SAF Preferred Approach Options	65
5.2	Additional Measures	75
5.2.1	Leakage Reduction	75
5.2.2	Water Conservation.....	75
5.3	Interim Solutions	75
5.4	Approach Uncertainty and Adaptability	75
6	SEA Cumulative Effects for SAF Preferred Approach	79
6.1	Cumulative Effects ‘Within Plan’ for SAF	79
6.1.1	Cumulative Effects during Construction	80
6.1.2	Cumulative Effects during Operation.....	82
6.2	Cumulative Effects with Other Developments	83
6.2.1	Cumulative Effects during Construction	83
6.2.2	Cumulative Effects during Operation.....	89
7	Strategic Environmental Assessment Summary	92

8	Water Framework Directive Summary	100
9	Appropriate Assessment Summary	102
10	Recommendations for Implementation	104
	References	105
Appendix A	Fine Screening Summaries	A-1
Appendix B	SA Approaches for SAF	B-1
Appendix C	Figure Index Tables	C-1



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 North West Region (referred to as the Regional Plan). The Regional Plan includes seven individual study area reviews (SAA-G) as appendices.

This Study Area F Environmental Review includes:

- Context for the Study Area Environmental Review;
- Environmental baseline;
- 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 F within the North West Region for the options and approaches considered and as outlined in the Study Area F Technical Report (draft RWRP-NW Appendix 6). 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 as part of 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-NW 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 (Water Resource Zones (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.

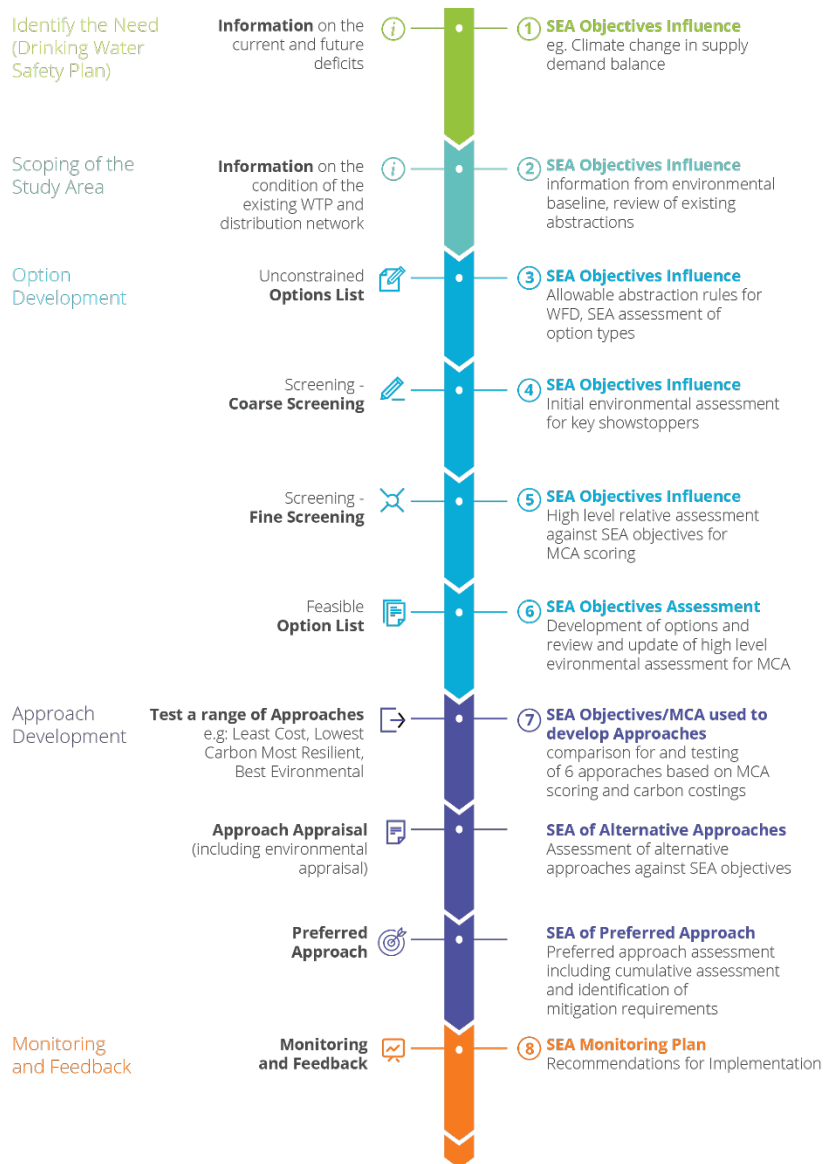


Figure 1.1 Option and Approach Development Process

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 Reports are being 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 (Council 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 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 and consulted on 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	<u>Water quality and resources</u> 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.
	<u>Flood risk</u> 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	<u>Climate change mitigation</u> Minimise contributions to climate change emissions to air (including greenhouse gas emissions) as a result of Irish Water’s activities.
	<u>Climate change adaptation</u>

SEA Topic	SEA Objective
	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 North West 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 North West region. The conclusions of that cumulative assessment are presented in the SEA Environmental Report for the North West region.

If appropriate, the Preferred Approach identified for SAF 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 SAF 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 SAF are provided in chapter 9 of this review.

1.6 Study Area F

The North West Region is subdivided into seven 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 SAF, the location of SAF in relation to the North West Region is shown in Figure 1.2.

Study Area F lies within the counties of Roscommon, Leitrim, Longford, Galway, Sligo, Cavan, Mayo, and Westmeath and its total area is approximately 3,990 km². There is one principal settlement (with a population of over 10,000) within SAF, namely Longford (CSO, 2016a), as shown in Figure 1.3.

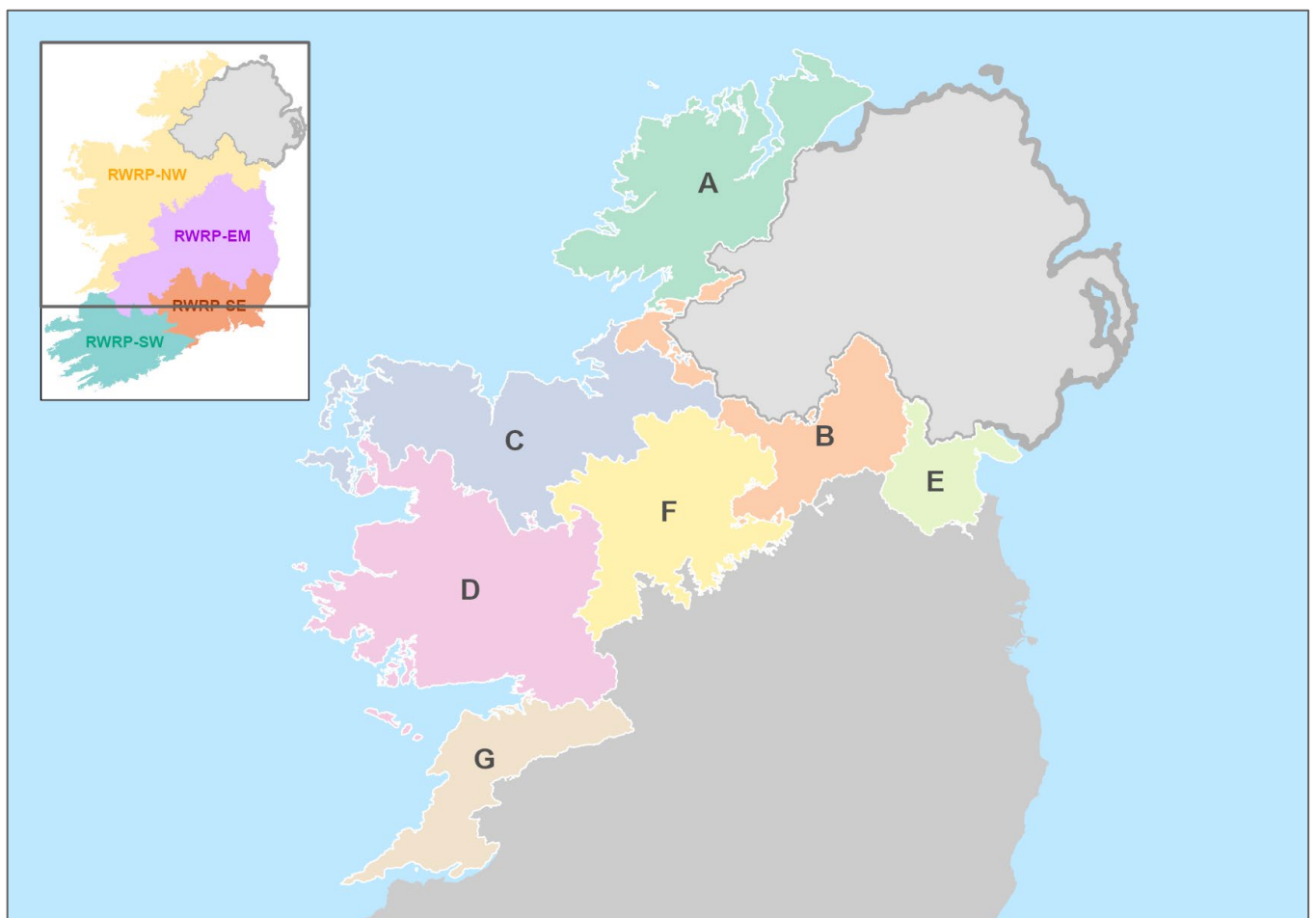


Figure 1.2 North West Region Study Areas

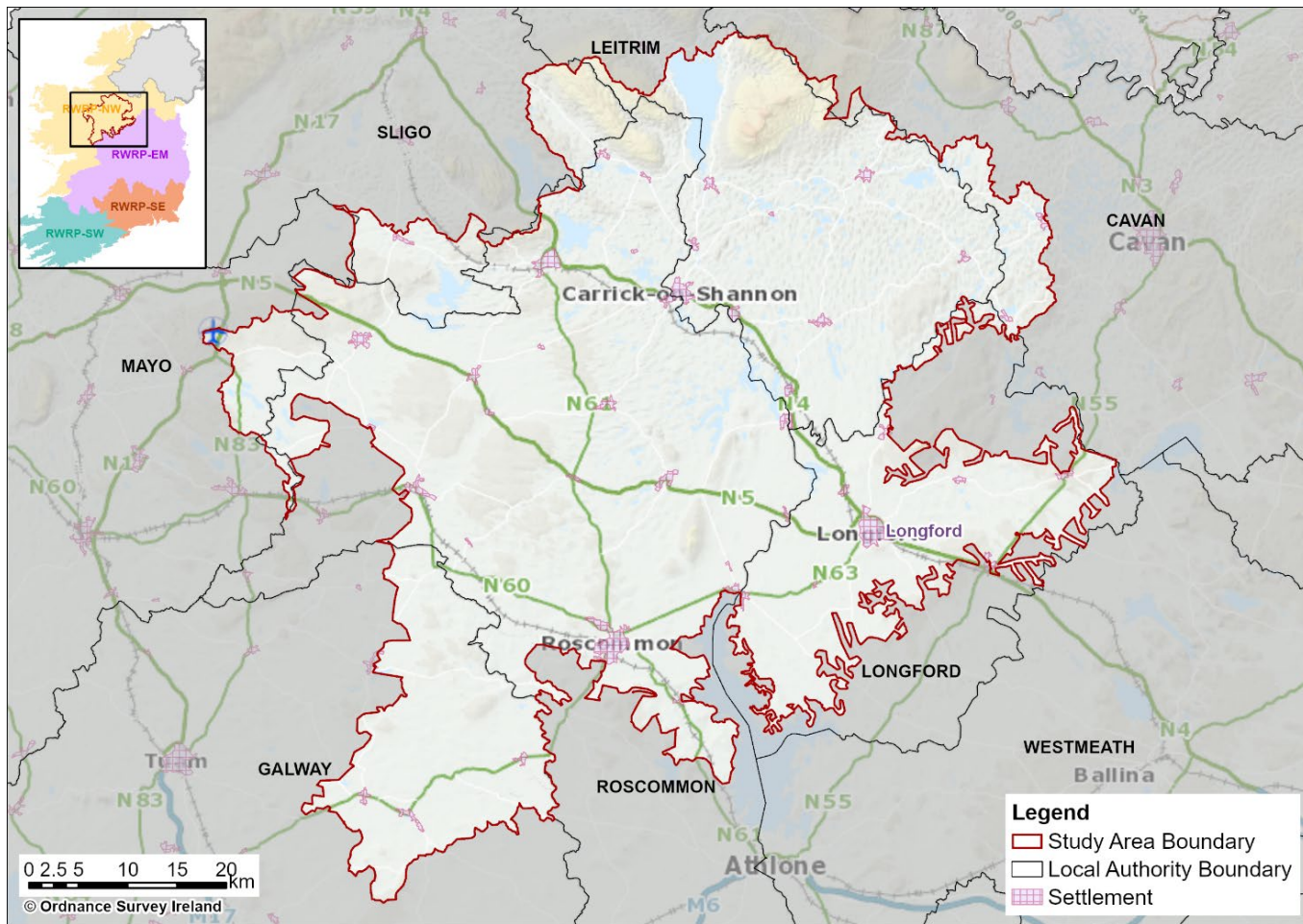


Figure 1.3 Study Area F



2

Study Area F Environmental Baseline Context

2 Study Area F Environmental Baseline Context

This chapter provides environmental baseline information for SAF 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 implementation 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 Plan 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 WRZ's 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 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 SAF

WRZ Reference Number and Name	Total Population Served (2019)*	% Population Change (2019-2044)*
2600SC0007 - Arigna Regional PWS	816	15.3
0200SC0001 - Arvagh PWS (GWS Import)	377	15.3

WRZ Reference Number and Name	Total Population Served (2019)*	% Population Change (2019-2044)*
1200SC0001 - Ballymoe P.S.	707	15.3
2600SC0008 - Boyle Regional	7,247	17.0
1700SC0001 - Carrick-on-Shannon	15,791	20.7
2600SC0003 - Castlerea PWS	3,969	10.0
2000SC0002 - Granard	2,647	15.3
1100SC0001_F - Kilkerrin Moylough	1,575	15.3
0200SC0005 - Killeshandra PWS (GWS Import)	415	15.3
2000SC0001 - Lanesboro & Newtowncashel	5,309	20.7
2000SC0005 - Longford Central	17,147	34.3
1100SC0001_I - Mountbellew P.S.	3,425	15.3
2600SC0002 - North East Regional PWS	8,134	17.5
2600SC0009 - North Roscommon Regional Water Supply Scheme	8,074	15.3
2600SC0004 - Roscommon Central Water Supply Scheme	9,942	28.4

*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

SAF had a below average household disposable income per person in 2019 (CSO, 2022a), and an unemployment rate of 4.7% in West, 4.5% in the Midlands, and 3.8% in the Border region of the country (CSO, 2022b).

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 Q1 2022 was 335 for the West region, 325 for the Midlands region, and 284 for the Border region (CSO, 2022c).

2.1.3 Tourism and Recreation

Tourism in SAF 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 Roscommon has been described as “*the Land of Memories*”, and a county of castles and ancient kings, of stately homes and spectacular landscapes offering heritage, outdoor walking trails, waterscapes, and a number of other recreational activities (Explore Roscommon, 2022).

Additionally, the study area is partially located within Ireland’s Ancient East, which is part of a tourism development strategy that covers the South, East and part of the Midlands. This strategy places

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). There are no National Parks within SAF. 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 Border, Midlands, and West 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 Border, Midlands, and West Regions within Ireland

Region	Life Expectancy (CSO, 2020a)	Participation in Sports, Fitness or Recreational Physical Activities (% of Persons Aged 15+) (CSO, 2020b)	Air Quality (EPA, 2021a)
Border	Male: 79.5 Female: 83.5	35%	Good
Midlands	Male: 80.0 Female: 83.2	47%	Good
West	Male: 78.7 Female: 84.5	56%	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 SAF.

Table 2.3 Areas Supplied by the WTPs in SAF

Water Treatment Plants	Water Resource Zone	Local Authority Supplied
Castletenison WTP	2600SC0007 - Arigna Regional PWS	Roscommon
Ballymoe WTP	1200SC0001 - Ballymoe P.S.	Galway
Rockingham WTP	2600SC0008 - Boyle Regional	Roscommon
Carrick on Shannon WTP	1700SC0001 - Carrick-on-Shannon	Leitrim
Castlerea (Longford Springs) WTP	2600SC0003 - Castlerea PWS	Roscommon
Lough Kinale WTP	2000SC0002 - Granard	Longford

Water Treatment Plants	Water Resource Zone	Local Authority Supplied
Kilkerrin Moylough WTP	1100SC0001_F - Kilkerrin_Moylough	Galway
Lanesboro (ESB Site) WTP, Lanesboro (Lisrevagh) WTP and Newtowncashel WTP	2000SC0001 - Lanesboro & Newtowncashel	Longford
Lough Forbes WTP	2000SC0005 - Longford Central	Longford
Ballygar WTP and Mountbellew WTP	1100SC0001_I - Mountbellew P.S.	Galway
Grange WTP	2600SC0002 - North East Regional PWS	Roscommon
Lough Gara WTP	2600SC0009 - North Roscommon Regional Water Supply Scheme	Roscommon
Ballinagard Spring WTP, Knockcroghery (Toberog) WTP and Lecarrow (Toberreoge) WTP	2600SC0004 - Roscommon Central Water Supply Scheme	Roscommon

Currently for day-to-day operations, 9 out of 15 of the WRZs in the area have a current and future projected SDB deficit (based on a ‘Do Minimum’ approach – see section 4 for further clarification). While sufficient on normal weather conditions, several would fail in drought. Longford Springs underwent night-time restrictions in June 2020. Furthermore, the nearby borehole had been used to supplement the spring supply. This ceased on Wednesday 8th July as spring water had replenished sufficiently following the rain over the preceding few weeks.

Poor water quality can be linked to risks to health. The Barrier Assessment identified 6 of the 18 WTPs within the study area are at high risk of failing to achieve Irish Water’s conservative Barrier Assessment standards. Particularly in relation to bacteria and viruses (Barrier 1) and chlorine residuals in their networks (Barrier 2.1) (see Table 2.1 in the SAF 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. Currently, there are two WRZs on the EPA Remedial Action List within SAF, Longford Central and North East Regional. Irish Water is currently progressing immediate corrective action in relation to a number of supplies within SAF in advance of the NWRP. Details of these are included in the SAF 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 SAF.

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

Table 2.4 Catchments within SAF (EPA, 2020)

WFD Catchments	Total Catchment Area (km ²)	Catchment Area within SAF (km ²)
Corrib	3,114	22
Erne	3,441	429
Moy and Killala Bay	2,352	22
Sligo Bay & Drowse	1,606	59
Upper Shannon (26A)	604	373
Upper Shannon (26B)	674	652
Upper Shannon (26C)	1,500	1,413
Upper Shannon (26D)	1,598	733
Upper Shannon (26E)	582	241
Upper Shannon (26F)	1,229	46
Upper Shannon (26G)	383	1.3

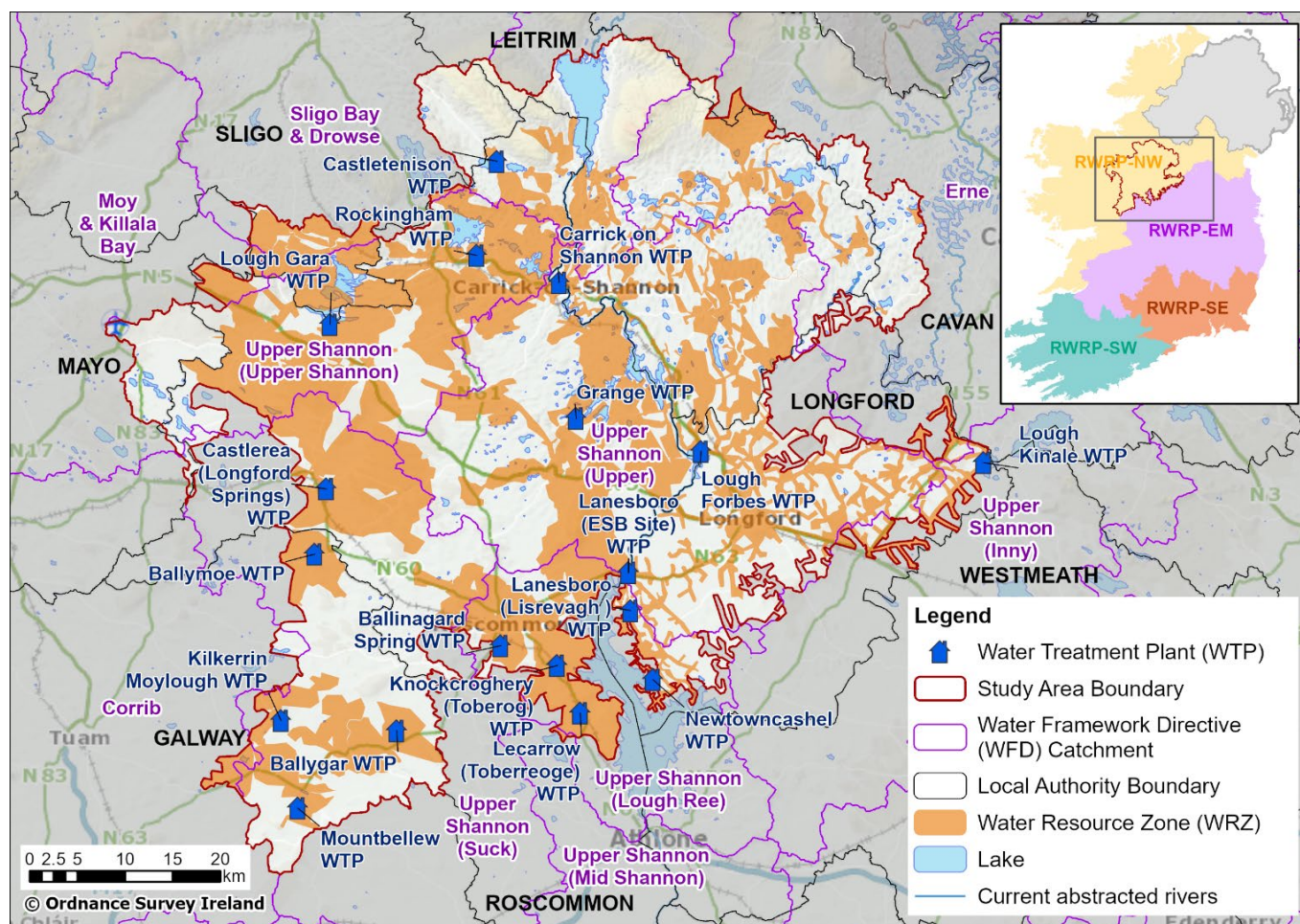


Figure 2.1 Water Environment of SAF

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 Government is currently developing new legislation dealing with water abstractions, with the Water Environment (Abstractions and Associated Impoundments) Bill being published in September 2022. As this legislation is still undergoing the legislative process, and the associated regulations and guidance are not yet available Irish Water does not yet have full visibility of the future regulatory regime. In addition, the exact level of abstraction at each source will depend on future licensing processes, with the EPA as the relevant adjudicator.

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 SAF 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 pending Abstraction Legislation on the SAF Supplies, Irish Water have assessed the potential impacts on their five surface water abstractions: River Shannon (Carrick-on-Shannon), Lough Kinale (Granard), Lough Forbes (Longford Central), Lough Gara (North Roscommon Regional Water Supply Scheme), and Grange Lough (Lisheen) (North East Regional PWS). Based on this initial assessment, there are no sustainability issues predicted with the volumes abstracted at these surface water sources. However, under the proposed regulatory regime, this will be adjudicated by the EPA.

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 eight WFD catchments in SAF and the total number of surface and groundwater waterbodies within SAF are provided in Table 2.5 below.

Table 2.5 WFD Waterbodies within SAF (EPA, 2021b, 2021c, 2021d, 2021e and 2021f)

Waterbody Type	Water Catchments	Number of Waterbodies	Number of Waterbodies Rated Below Moderate
Rivers	Corrib	2	0
	Erne	22	5
	Moy and Killala Bay	3	0

Waterbody Type	Water Catchments	Number of Waterbodies	Number of Waterbodies Rated Below Moderate
	Sligo Bay & Drowse	8	1
	Upper Shannon (26A, 26B, 26C, 26D, 26E, 26F and 26G)	155	36
Lakes	Corrib	0	0
	Erne	18	9
	Moy and Killala Bay	0	0
	Sligo Bay & Drowse	1	0
	Upper Shannon (26A, 26B, 26C, 26D, 26E, 26F and 26G)	47	5
Transitional and Coastal	N/A	0	0
Groundwater	N/A	43	0

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, 2021g, 2021h, 2021i, 2021j and 2021k) are:

- Corrib: Hydromorphology (60%) and Agriculture (28%);
- Erne: Agriculture (84%) and Other* (20%);
- Moy & Kilalla Bay: Hydromorphology (69%) and Agriculture (45%);
- Sligo Bay & Drowse: Agriculture (61%), Forestry (32%) and Other* (26%);
- Upper Shannon (26A): Agriculture (45%), Other* (36%) and Hydromorphology (27%);
- Upper Shannon (26B): Hydromorphology (58%), Other* (50%) and Agriculture (42%);
- Upper Shannon (26C): Agriculture (79%) and Hydromorphology (37%);
- Upper Shannon (26D): Agriculture (73%) and Hydromorphology (42%);
- Upper Shannon (26E): Hydromorphology (70%) and Agriculture (60%);
- Upper Shannon (26F): Agriculture (81%) and Urban Wastewater (19%); and
- Upper Shannon (26G): Hydromorphology (75%) and Peat (50%).

The GWDTE-Lough Corrib Fens 3 & 4, Cullies_040 river, Erne_020 river, Corconnelly lake, Gill SO lake and Grange (Sligo)_010 waterbodies are at particular risk of abstraction in SAF. Table 2.6 includes a summary of the 'at risk' waterbodies within SAF.

Table 2.6 Summary of 'At Risk' Waterbodies in SAF (EPA, 2021b, 2021c, 2021d, 2021e and 2021f)

Waterbody Type	Water Catchments	Number of Waterbodies Identified as 'At Risk'	Surface Waterbodies Status 'At Risk' Due to Abstraction Pressure*
Rivers	Corrib	1	0

* Other – abstractions, aquaculture, atmospheric, anthropogenic pressures, historically polluted sites, waste, water treatment and invasive species have all been grouped into "Other" pressure category for the purpose of this report.

Waterbody Type	Water Catchments	Number of Waterbodies Identified as 'At Risk'	Surface Waterbodies Status 'At Risk' Due to Abstraction Pressure*
	Erne	9	
	Moy and Killala Bay	1	
	Sligo Bay & Drowse	4	
	Upper Shannon (26A, 26B, 26C, 26D, 26E, 26F and 26G)	60	
Lakes	Corrib	0	0
	Erne	8	
	Moy and Killala Bay	0	
	Sligo Bay & Drowse	0	
	Upper Shannon (26A, 26B, 26C, 26D, 26E, 26F and 26G)	17	
Transitional and Coastal	N/A	0	0
Groundwater	N/A	0	N/A
Total		100	0

* Based on Irish Water assessment of their current abstractions

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 SAF are listed in Table 2.7. Note that the 'Areas for Action' included in Table 2.7 are from the WFD cycle 3 River Basin Management Plan (RBMP).

Table 2.7 'Areas for Action' within SAF (catchments.ie, 2022)

Areas for Action	Key Reasons for Selection
Camlin	<ul style="list-style-type: none"> Poor water quality observed in Camlin_070 waterbody potentially due to poor fish stocks High levels of ammonia and nutrients observed in Calmin_010 and Calmin_060 waterbodies Pollution pressures from numerous sources on the three waterbodies
Carricknabraher	<ul style="list-style-type: none"> To build on improvements at the Frenchpark wastewater treatment plant There are two deteriorated waterbodies within the catchment The waters in the catchment ultimately flow into Lough Gara.
Castlegar	<ul style="list-style-type: none"> The Shiven (South)_050 are part of the Blue Dot Catchments Programme thus needs to achieve high water quality status

Areas for Action	Key Reasons for Selection
	<ul style="list-style-type: none"> • Shiven (South)_050 is currently at good ecological status thus is failing to meet its high status objective • A number of other waterbodies within the catchment are achieving Poor or Moderate status with a need to improve
Clooneigh	<ul style="list-style-type: none"> • Waterbodies discharge into Lough Ree which is an SAC and SPA for birds • Recent decline in water quality in both waterbodies within the catchment
Cloonlavis/Glore	<ul style="list-style-type: none"> • Local authority currently working to address water quality issues associated with agriculture • Deteriorated waterbodies • One At Risk High Ecological Status objective waterbody • One waterbody failing to meet protected area objectives for drinking water (MCPA) • Two At Risk waterbodies with protected area objectives for Salmon • Subcatchment headwaters – which eventually lead to the River Moy
Cullies	<ul style="list-style-type: none"> • Garty Lough is an important drinking water supply for the Erne Valley Group Water Scheme and protecting the inflowing streams and the lake is particularly important • Cullies_030 waterbody is currently at Poor Status with no known reason/cause • Pollution in waterbodies related to agriculture and failing septic tanks
Island	<ul style="list-style-type: none"> • There are Special Areas of Conservation (SAC), National Heritage Areas (NHAs) and Proposed National Heritage Areas (pNHAs) within the catchment • The Island_030 is part of the Blue Dot Catchments Programme thus needs to achieve and maintain a high water quality status • Some waterbodies in the catchment are failing to meet their high or good quality status objectives
Jiggy/Hind	<ul style="list-style-type: none"> • Two Special Areas of Conservation (SACs) fall partially within the sub-catchment, Lough Ree and Ballinturly Turlough. Both are proposed Natural Heritage Areas (pNHAs) and Lough Ree is also a Special Protection Area (SPA). • All five of the waterbodies within the catchment are either Poor or Moderate water quality status and thus are not meeting Good status objectives
Killukin/Shannon	<ul style="list-style-type: none"> • The Shannon is a source for drinking water for the South Leitrim Regional Water Supply Scheme • The waterbodies within the catchment are either Moderate or Poor water quality status thus need improvement

Areas for Action	Key Reasons for Selection
Lough Allen	<ul style="list-style-type: none"> • Part of a number of SACs and SPAs for wildlife • A number of waterbodies in the area are currently at Moderate or Poor water quality and ecological status • The water quality of a number of waterbodies in the area is unknown
Lough Key	<ul style="list-style-type: none"> • Needs to achieve Good water quality status • Water quality of a number of waterbodies within the catchment is unknown • Boyle_040 and Lough Key deteriorated from Good to Moderate status
Lough Rinn/Forbes	<ul style="list-style-type: none"> • Lough Forbes is the source for drinking water for the Longford Central drinking water supply. • NHA and SAC lie within the Area for Action Boundary • All of the waterbodies within the catchment are either at Moderate or Poor water quality and ecological status
Owengarve Charlestown	Desk study in progress and reasoning pending
Owenmore/Templehouse Lake	Desk study in progress and reasoning pending
Suck	<ul style="list-style-type: none"> • There are numerous nature designations within the Suck Area for Action including SPAs, SACs and NHAs • Decline in the water quality of a number of waterbodies within the catchment, thus they're no longer meeting high status objectives
Templeport	<ul style="list-style-type: none"> • Build on recent action by Cavan Co. Council relating to a direct discharge to Templeport Lake Stream • Bunerky Lake included as it has similar pressures to the river water body • The two water bodies included in the recommended action area are the only water bodies that are less than 'Good' in this sub-catchment • Improvements in these water bodies may protect the current High status in the Blackwater (Newtowngore)_020 river water body
Tulsk	<ul style="list-style-type: none"> • There are numerous nature designations within the Tulsk Area for Action including SPAs, SACs and NHAs • Decline in the water quality of a number of waterbodies within the catchment, thus they're no longer meeting high status objectives
Yellow (Ballinamore)	<ul style="list-style-type: none"> • Water body was at Good status in the 10-12 monitoring cycle. • Single significant pressure identified. • Possibility of quick win and fast improvements

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 Office of Public Works (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. CFRAMS 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 SAF.

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 Irish Water, to, so far as practicable, perform their functions in a manner consistent with the furtherance of the national climate objective and the relevant national and sectoral plans and strategies to mitigate greenhouse gas emissions and adapt to the effects of climate change.

The Department of the Environment, Climate and Communications' Climate Action Plan (CAP) 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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 SAF

County	Key Risk Areas
Cavan (Cavan County Council, 2019)	<ul style="list-style-type: none"> • Increased storms and intensity of rainfall • Flooding • Drought events and water shortages • Increased temperature extremes • Increased risk of new pests and diseases • Adverse impacts on water quality • Changes to distribution and phenology of plant and animal species
Galway (Galway County Council, 2019)	<ul style="list-style-type: none"> • Extreme rainfall • Flooding • Strong winds • Higher temperatures and droughts • Lower temperatures and snowfall
Leitrim (Leitrim County Council, 2019)	<ul style="list-style-type: none"> • Increase in the frequency and intensity of rainfall • Flooding • Droughts and water shortages • Increased frequency and intensity of storms and high wind events • Increased temperatures
Longford (Longford County Council, 2019)	<ul style="list-style-type: none"> • Increased summer temperatures • Reduction of frost days • Increased frequency and intensity of rainfall • Flooding • Increased storm intensity
Mayo	<ul style="list-style-type: none"> • Extreme precipitation

County	Key Risk Areas
(Mayo County Council, 2019)	<ul style="list-style-type: none"> • Increased temperature extremes • Increased intensity and frequency of wind/storms • Increased frequency and intensity of coastal inundation and erosion • Changes to distribution and phenology of plant and animal species
Roscommon (Roscommon County Council, 2019)	<ul style="list-style-type: none"> • Extreme Rainfall • Strong winds • Higher temperatures and droughts • Lower temperatures and snowfall
Sligo (Sligo County Council, 2019)	<ul style="list-style-type: none"> • Increasing temperatures across all seasons • Drought and water shortages in spring and summer • Increased occurrence of extreme precipitation events in winter • Increase in frequency of extreme wind conditions • Reductions in frost and snow • Increase in duration of phenological cycle • Increased frequency and intensity of coastal inundation and erosion
Westmeath (Westmeath County Council, 2019)	<ul style="list-style-type: none"> • Extreme rainfall • Flooding • Wind storms • Higher temperatures and heatwaves • Drought • Low 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 SAF, 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 could 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 SAF there are a number of European, national and locally designated sites, including Special Protected Areas (SPAs), Special Areas of Conservation (SACs), National Parks, Nature Reserves, and proposed Natural Heritage Areas (see Table 2.10 and Figure 2.2 - note that an index key for Figure 2.2 is provided in Appendix C). The European sites (SPAs and SACs), and the potential impacts on them, are discussed in more detail in the NIS.

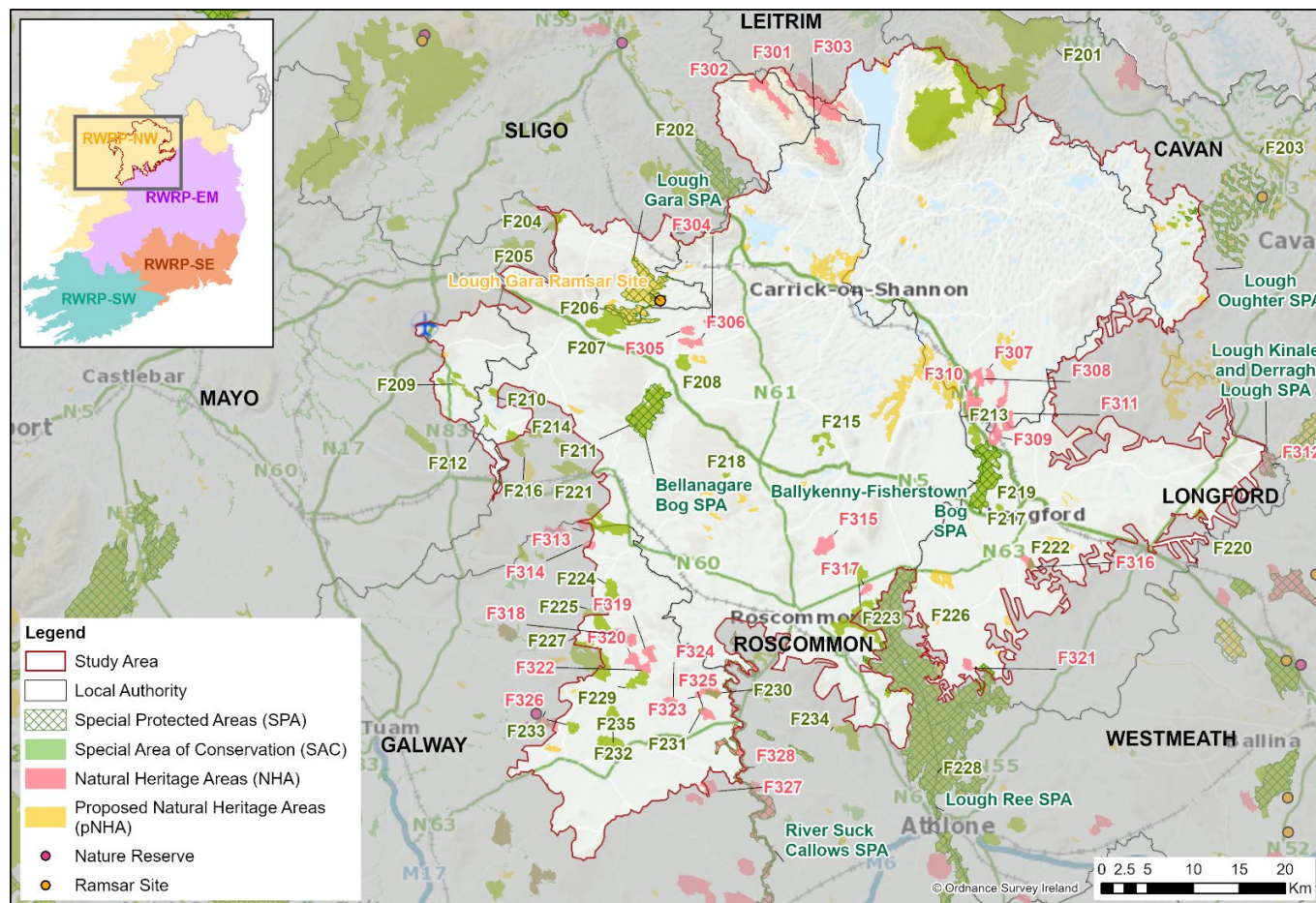


Figure 2.2 Designated Sites in SAF

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

Receptor	Name	Total Number
Special Protected Area (SPA)	Lough Gara SPA	7
	Lough Oughter SPA	
	Lough Kinale and Derragh Lough SPA	
	Lough Ree SPA	
	River Suck Callows SPA	
	Ballykenny-Fisherstown Bog SPA	
	Bellanagare Bog SPA	
	Lough Oughter And Associated Loughs SAC	35

Receptor	Name	Total Number
Special Area of Conservation (SAC)	Kilsallagh Bog SAC	
	Lough Lurgen Bog/Glenamaddy Turlough SAC	
	Shankill West Bog SAC	
	Lough Ree SAC	
	Cuilcagh - Anierin Uplands SAC	
	Bellanagare Bog SAC	
	Callow Bog SAC	
	Urlaur Lakes SAC	
	Corliskea/Trien/Cloonfelliv Bog SAC	
	River Moy SAC	
	Drumalough Bog SAC	
	Camderry Bog SAC	
	Clooneen Bog SAC	
	Corbo Bog SAC	
	Errit Lough SAC	
	Annaghmore Lough (Roscommon) SAC	
	Ardagullion Bog SAC	
	Curraglehanagh Bog SAC	
	Tullaghanrock Bog SAC	
	Lisnageeragh Bog and Ballinastack Turlough SAC	
	Ballygar (Aghrane) Bog SAC	
	Aughrim (Aghrane) Bog SAC	
	Mount Jessop Bog SAC	
	Carrownagappul Bog SAC	
	Cloonshanville Bog SAC	
	Carrowbehy/Caher Bog SAC	
	Derrinea Bog SAC	
	Lough Forbes Complex SAC	
	Fortwilliam Turlough SAC	
	Mullygollan Turlough SAC	
Brown Bog SAC		
Flughany Bog SAC		

Receptor	Name	Total Number
	Lough Arrow SAC	
	Lough Funshinagh SAC	
Ramsar Sites	Lough Gara	1
Nature Reserves	N/A	0
National Parks	N/A	0
Natural Heritage Areas (NHAs)	Moorfield Bog/Farm Cottage NHA	28
	Suck River Callows NHA	
	Ballygar Bog NHA	
	Bracklagh Bog NHA	
	Clooncullaun Bog NHA	
	Funshin Bog NHA	
	Keeloges Bog NHA	
	Kilmore Bog NHA	
	Leaha Bog NHA	
	Aghnamona Bog NHA	
	Bella Bridge Bog NHA	
	Cornaveagh Bog NHA	
	Derrycanan Bog NHA	
	Kilronan Mountain Bog NHA	
	Rinn River NHA	
	Lough Kinale And Derragh Lough NHA	
	Aughrim Bog NHA	
	Castle Ffrench East Bog NHA	
	Derrinlough Bog NHA	
	Cashel Bog (Leitrim) NHA	
	Corracramph Bog NHA	
	Cloonageeher Bog NHA	
Forthill Bog NHA		
Mount Jessop Bog NHA		
Tullaghan Bog (Roscommon) NHA		
Lisnarrigh Bog NHA		
Corry Mountain Bog NHA		

Receptor	Name	Total Number
	Carrane Hill Bog NHA	
Proposed Natural Heritage Areas (pNHAs)	See Figure 2.2	76

2.4.2 Habitats

Table 2.11 lists the percentage of the study area, and the number of hectares, covered by each habitat within SAF; as reported in the Corine land use dataset¹.

Table 2.11 Habitat Areas for SAF (EPA, 2018)

Habitat	Ha	% of Study Area
Agricultural Land		
Pastures	227,132	56.94%
Land principally occupied by agriculture, with significant areas of natural vegetation	65,310	16.37%
Non-irrigated arable land	356	0.09%
Complex cultivation patterns	56	0.01%
Natural Habitats		
Peat bogs	45,962	11.52%
Water bodies	11,049	2.77%
Inland marshes	2,748	0.69%
Natural grasslands	1,626	0.41%
Moors and heathland	533	0.13%
Water courses	429	0.11%
Forest		
Coniferous forest	20,696	5.19%
Transitional woodland-shrub	11,912	2.99%
Mixed forest	4,963	1.24%
Broad-leaved forest	2,118	0.53%

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

- Oligotrophic waters containing very few minerals of sandy plains;
- Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.;
- Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation;
- Natural dystrophic lakes and ponds;

¹ The EPA land use dataset will be used once this is available

- Bog habitats – Active raised bogs, degraded raised bogs still capable of natural regeneration, *Rhynchosporion* depressions, transition mires and quaking bog habitats;
- Bog woodland;
- Alkaline fens;
- Groundwater dependant terrestrial habitats, such as petrifying springs with tufa formation and blanket bogs;
- Northern Atlantic wet heaths with *Erica tetralix*; and
- Turlough ecosystems.

2.4.3 Species

The key species (Nelson et al, 2019) of concern within SAF include:

- Otter (*Lutra lutra*);
- Fish species - Atlantic Salmon (*Salmo salar*), Lamprey species;
- White-clawed Crayfish (*Austropotamobius pallipes*);
- Slender green feather-moss (*Hamatocaulis vernicosus*);
- Geyer's Whorl Snail (*Vertigo geyeri*); and
- Waterbirds of 'qualifying interest' e.g. whooper swan (*Cygnus cygnus*), Greenland white-fronted goose (*Anser albifrons flavirostris*) and winter migratory waders.

The key invasive species to consider (National Biodiversity Data Centre, 2021) for developing options within SAF include:

Animals:

- American mink (*Mustela/Neovison vison*);
- Asian river clam (*Corbicula fluminea*);
- Brown rat (*Rattus norvegicus*);
- Canada goose (*Branta canadensis*);
- Grey squirrel (*Sciurus carolinensis*);
- Greylag goose (*Anser anser*);
- Roach (*Rutilus rutilus*);
- Ruddy duck (*Oxyura jamaicensis*);
- Siberian chipmunk (*Tamias sibiricus*);
- Wild boar (*Sus scrofa*); and
- Zebra mussel (*Dreissena polymorpha*).

Plants:

- American skunk-cabbage (*Lysichiton americanus*);
- Curly waterweed (*Lagarosiphon major*);
- Fringed water-lily (*Nymphoides peltata*);
- Giant hogweed (*Heracleum mantegazzianum*);
- Giant knotweed (*Fallopia sachalinensis*);
- Giant-rhubarb (*Gunnera tinctoria*);
- Himalayan/Indian balsam (*Impatiens glandulifera*);
- Himalayan knotweed (*Persicaria wallichii*);
- Japanese knotweed (*Fallopia japonica*);
- Large-flowered waterweed (*Egeria densa*);
- Parrot's feather (*Myriophyllum aquaticum*);

- Rhododendron (*Rhododendron ponticum*);
- Salmonberry (*Rubus spectabilis*);
- Spanish bluebell (*Hyacinthoides hispanica*);
- Three-cornered leek (*Allium triquetrum*); and
- Waterweeds (*Elodea* spp.)

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 SAF are listed in Table 2.12, such as agricultural land and bog areas.

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 18 WTPs in SAF, meeting the average demand of 45.3 MI/d in 2019.

There are no ports of national or regional significance in SAF, however, there is one canal of regional significance, namely Ballinamore Canal. There are no airports. Other significant transport infrastructure includes the main road network (particularly the N4, N5, N55, N60, N61, and N63).

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

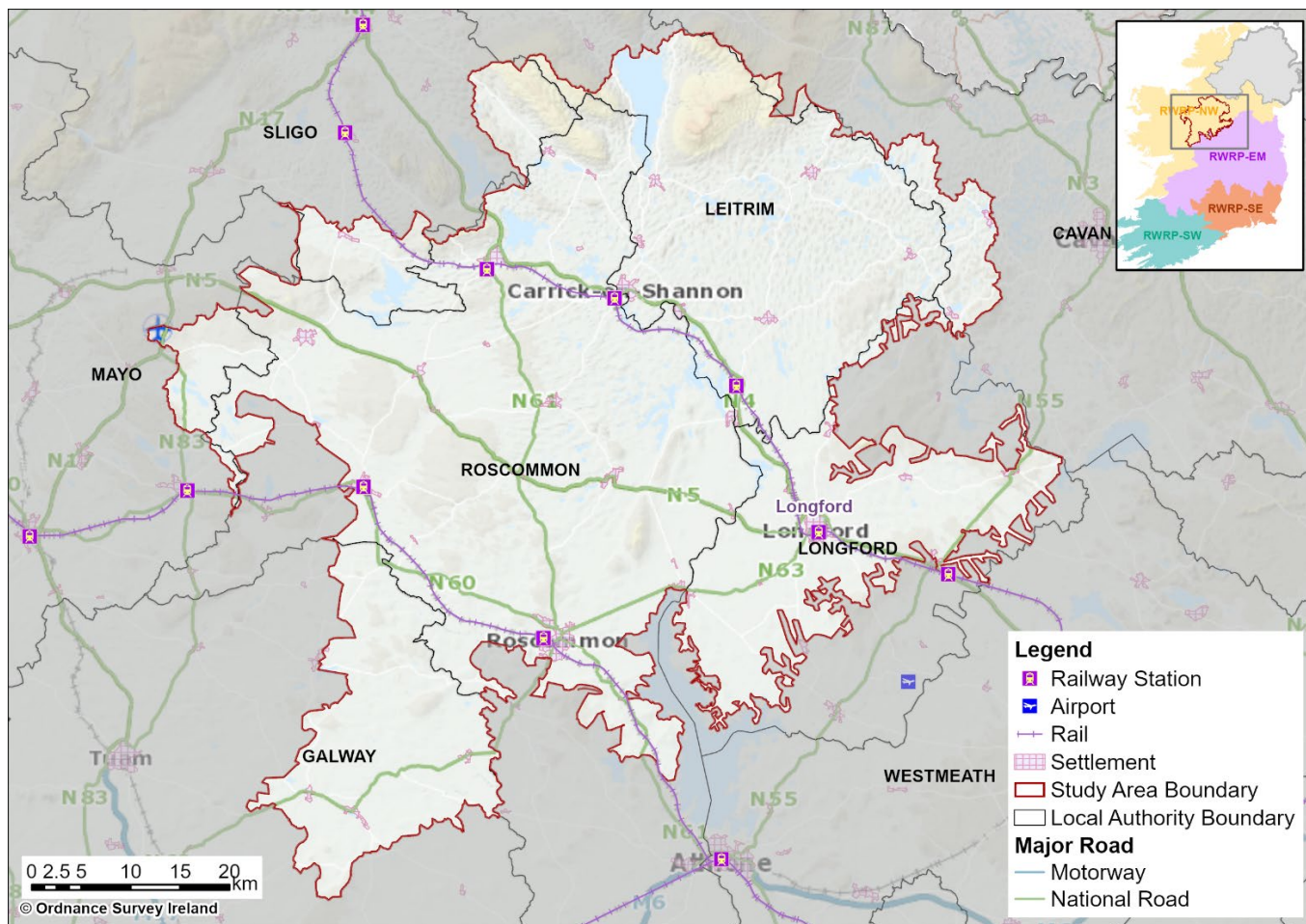


Figure 2.3 Transport Infrastructure in SAF

Table 2.12 Land Use within SAF (EPA, 2018)²

Land use	Ha	% of Study Area	Comparison to Overall North West Region %
Agriculture	292,854	73.42%	57.28%
Urban	3,277	0.82%	1.18%
Natural Habitats	62,346	15.63%	31.76%
Forest	39,689	9.95%	9.47%
Industry	202	0.05%	0.07%
Other	505	0.13%	0.24%

Proposals for other strategic developments within SAF 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.

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

Table 2.13 gives an overview of the project developments which are available from myProjectIreland (2022) for SAF³. 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		
4-Strand Rural Regeneration Intervention for Drumshambo (ExCHANGE)	Energising Boyle Town Centre and King House	Public Realm Plan - Market Square & Main Street
An Bealach Project	Enhancement of Attractiveness of Lanesborough as a Tourism Destination	Rejuvenating Strokestown’s Potential
An Chistin Project	Granard Destination Town	Roscommon Rehabilitation Unit
Athlone to Ballyleague/ Lanesborough Greenway	Historic Granard Motte Project	Roscommon Sewerage Scheme
Autumn View, Summerhill, Carrick on Shannon	Longford Connected	Roscommon Town Centre
Ballaghderreen Public Realm Enhancement	Lough Key to Carrick-on-Shannon Greenway	Royal Canal Branch Line Greenway- Kilashee to Longford Town
Boyle Regeneration	Lough Ree Greenway - Ballyleague/ Lanesborough to Tarmonbarry/ Strokestown/ Roosky	Sacred Heart Hospital, Roscommon.
Carrick On Shannon Community Nursing Unit.	Mid Shannon Wilderness - Corlea Bog Greenway	Smart Green Mohill
Carrick on Shannon to Battlebridge Blueway	Mid Shannon Wilderness Greenway - Kilnacarrow Bridge- Darogue/Ballymacormack	St Joseph's Care Centre, Longford.
Creative Studios Ballaghaderreen	Mohill Public Realm	The Junction, Ballinamore - Regeneration of Ballinamore
DigiWest - Location #2 of 4 - Tulsk	N5 Ballaghaderreen to Scramoge	

2.6 Landscape and Visual Amenity

2.6.1 Landscape and Visual

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

³ Note that the myProjectIreland dataset was taken at a fixed point in time to allow for assessment of cumulative effects. The date for SAF being the 15/04/22.

areas and protected areas at the project level in the future. Table 2.14 shows the sensitivity and value of the Landscape Character Areas (LCAs) within each of the counties listed within the study area⁴.

The value of the landscape in SAF 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 development 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.

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

Landscape Character Area	Sensitivity	Value
County: Cavan (Cavan County Council)		
No values or sensitivity information available		
County: Galway (Galway County Council, 2015)		
Northeast Galway (Balinasloe to Ballymoe)	Low with pockets of Moderate	Low
Shannon and Suck River Valley between Portumna and Ballinasloe	Special	Medium
East central Galway (Athenry, Ballinasloe to Portumna)	Low with pockets of Moderate	Low
Southeast Galway (Clarinbridge to Gort)	Moderate with pockets of High	Medium
Northeast Galway (Tuam environs)	Low with pockets of Moderate	Low
Slieve Aughty Mountains	High	Medium
Northwest Lough Derg	Special	Medium
Lower Burren (Co. Galway portion)	Special with pockets of Moderate	Outstanding
Inveran to Galway City coastline	High with a parallel strip of Special	High
East Connemara Mountains (Moycullen, Oughterard to Loughanillaun)	High with pockets of Special	High
Lough Corrib and environs	Unique with pockets of High and Special	Outstanding
South foothills of east Connemara Mountains (Ouranavilla Tully to Tonabrocky)	Approximately half Special and half High	Medium (pockets of varying landscape value rating)

⁴ As with all the baseline information, the LCA information will be updated as part of regular reviews

Landscape Character Area	Sensitivity	Value
East Galway Bay (Oranmore to Kinvarra Bay and inland to N18 road)	High with a coastal edge of Special	High
West Connemara	Special	Outstanding
Lettermore and Gorumna Islands	High with a coastal edge of Special	High
West foothills of east Connemara Mountains	High	High
Carraroe (Cashla Bay to Glencoh)	High with a coastal edge of Special	High
Bertraghboy bay and eastern banks	Special	High
West Coast (Gorteen bay to Clifden)	Special	Outstanding
West Coast (Clifden to mouth of Killary Harbour)	High with a coastal edge of Special	Outstanding
Killary Harbour and southern banks	Unique with pockets of Special	Outstanding
Connemara National Park (including Lough Fee, Lough Inagh and Derryclare Lough)	Unique	Outstanding
Joyces Country (including Lehanagh Loughs and south Lough Mask)	Unique with pockets of Special	Outstanding
Aran Islands	Unique with pockets of Special	Outstanding
Lough Rea	Special	High
County: Leitrim (Leitrim County Council)		
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	-

Landscape Character Area	Sensitivity	Value
County: Mayo (Mayo County Council)		
No values or sensitivity information available		
County: Roscommon (Roscommon County Council, 2014)		
Lough Allen and Arigna foothills	High	Very High
Upper Shannon and Derreenannagh Drumlin Belt	High	Very High
Lough Corry Drumlin Basin	High	Very High
Kilglass Drumlin Lakelands	High	Very High
Slieve Bawn and Feirish Bogland Basin	High	Very High
Upper Lough Ree Bogland	High	Very High
Mid Lough Ree Pastureland	High	Very High
Lower Lough Ree and Athlone Environs	High	Very High
Cloonown and Shannon Callows	High	Very High
Suck River Source and Lough O'Flynn Boglands and Esker Ridges	High	High
Castlerea and Upper Suck Valley	High	High
Athleague and Lower Suck Valley	High	High
Suck Callows	High	High
Arigna Mountains	High	Very High
Lough Meelagh Drumlins	High	Very High
Lough Key and Boyle River Network	High	Exceptional
Boyle and Curlew Mountains	High	Very High
Plains of Boyle	Medium	Moderate
Elphin Drumlins	Medium	Moderate
Breedoge Bogland Basin	Medium	Moderate
Mullaghnashee Wet Farmland Plateau	Medium	Moderate
Cloona Lough and Lung River Bogland basin	Medium	Moderate
Ballaghaderreen and Bockagh Hill Uplands	Medium	Moderate
Ballinlough Bogland and Esker Ridges	Medium	Moderate
Cloonfad Hills and Esker Ridges	Medium	Moderate
Cloonfad Bog and Upland	Medium	Moderate
Castlerea Raised Bogland	High	High
Tulsk and Rathcroghan Plateau	High	Exceptional

Landscape Character Area	Sensitivity	Value
Strokestown Drumlin and Turlough Belt	Medium	Moderate
Oran Undulating Open Farmland	Medium	Moderate
Scramoge River Basin	Medium	Moderate
Roscommon Town and Hinterland	High	High
Skrine Hill and Limestone Pavement	High	High
Lough Funshinagh, Stone Wall Grasslands and Esker Ridges	Medium	Moderate
Brideswell Esker Belt	Medium	Moderate
Ballydangan Pastures	Medium	Moderate
County: Sligo (Sligo County Council)		
No values or sensitivity information available		
County: Westmeath (Westmeath County Council)		
No values or sensitivity information available		

2.6.2 Seascape

The Regional Seascape Character Assessment for Ireland (2020) presents the Regional Seascape Character Areas (SCAs) for the entire Republic of Ireland. An SCA is defined as “*an area of sea, coastline and land, as perceived by people, whose character results from the actions and interactions of land with sea, by natural and/or human factors*”. The assessment identifies no SCAs in SAF.

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 SAF 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 to 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 N4, N5, N55, N60, N61, and N63.

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 SAF, 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.

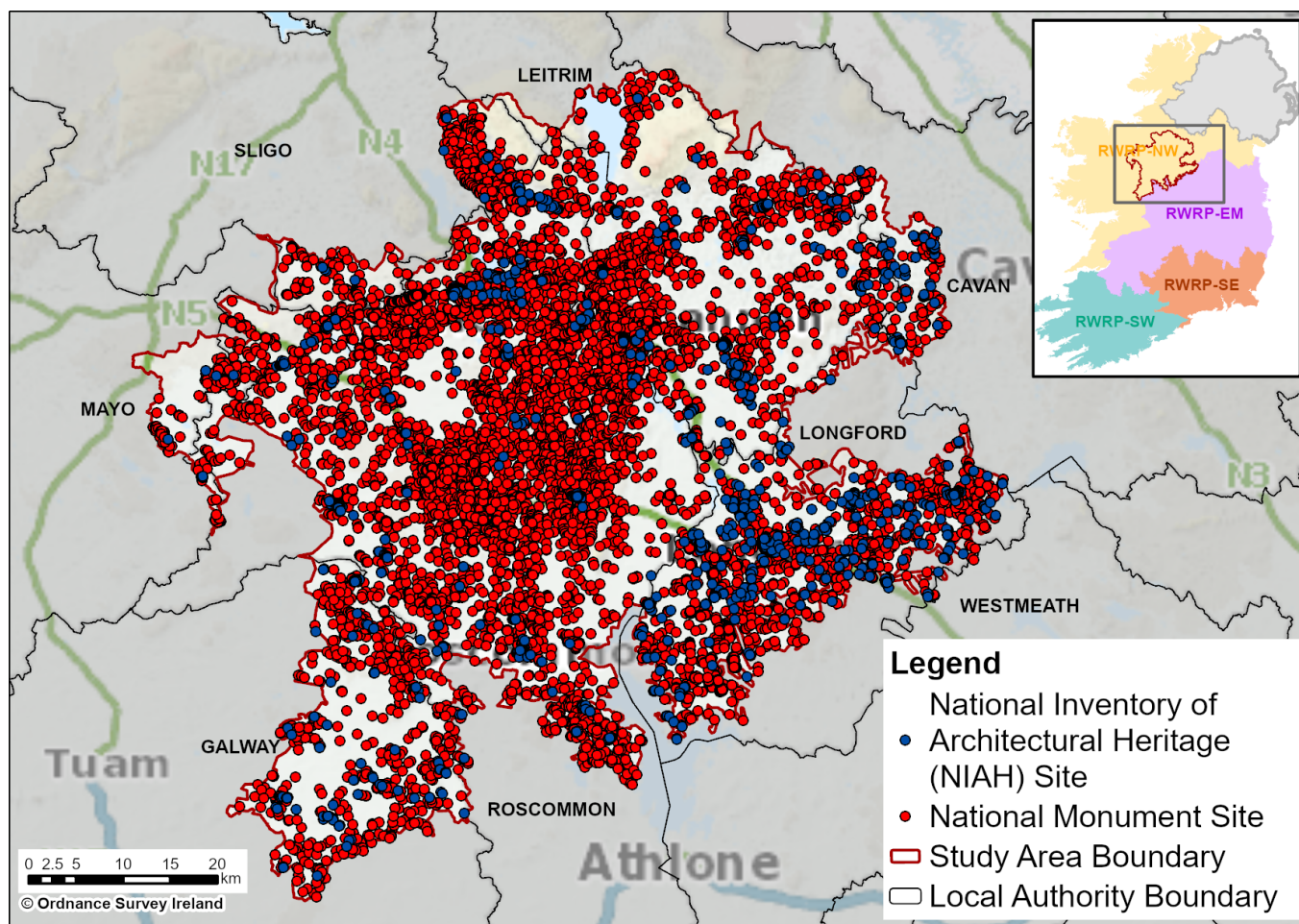


Figure 2.4 SAF Cultural Heritage Assets

Table 2.15 Cultural Heritage Assets within SAF

Assets	Total Number
National Monuments Service Sites	9,708
National Inventory of Architectural Heritage Sites	1,420
Sites and Monuments Record Zones	5,157

2.9 Geology and Soils

Table 2.12 lists the land uses within SAF. SAF predominantly has a peat soil type with areas of fine loam soil to the south-west 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 SAF are shown in Figure 2.5.

The karst forms a key regionally important aquifer in some areas, underlying much of Roscommon, which consists of clean limestone that has been extensively karstified. This band also extends north into Leitrim and east into Longford. All of the area's groundwater abstractions occur in this setting, with the majority appearing as spring overflows, which serve as points of groundwater discharge. Limestone dissolution during karstification causes groundwater flow to concentrate along certain pathways/conduits (Rkc type aquifers), making it difficult to locate successful wells. Locating high yielding wells in Rkc aquifers can be difficult due to the uneven distribution of permeability; failed and high yielding wells can occur close together. Both point and diffuse recharge occur. Diffuse recharge occurs via rainfall percolating through permeable subsoil and rock outcrops. Despite the presence of peat and till, point recharge to the underlying aquifer occurs by means of swallow holes and collapse features/dolines. The Dinantian (Lower Carboniferous) Impure Limestones are interleaved in places with the Pure Bedded Limestones. The limestones are often characterised by the occurrence of chert and shale bands and are generally less productive than the Pure Bedded Limestones. These rocks occur primarily in the east of the study area in Longford.

The Namurian Sandstones and Shales make up the 'shale uplands' in Leitrim, an area of flat-topped hills. The fractured upper and more permeable layer are unlikely to provide sustainable supplies for larger wells and often contain lesser quality water than the deeper permeable horizons. Groundwater flow in the lesser productive Dinantian Shales and Limestones circulates primarily through fissures as these rocks do not show significant intergranular permeability, and are predominantly interbedded shales and limestones, with little or no sandstone content. Development will usually be possible in local zones (i.e. along faults, fractures and zones of clean limestone).

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, 52 of which have the potential to constrain water resource options in SAF.

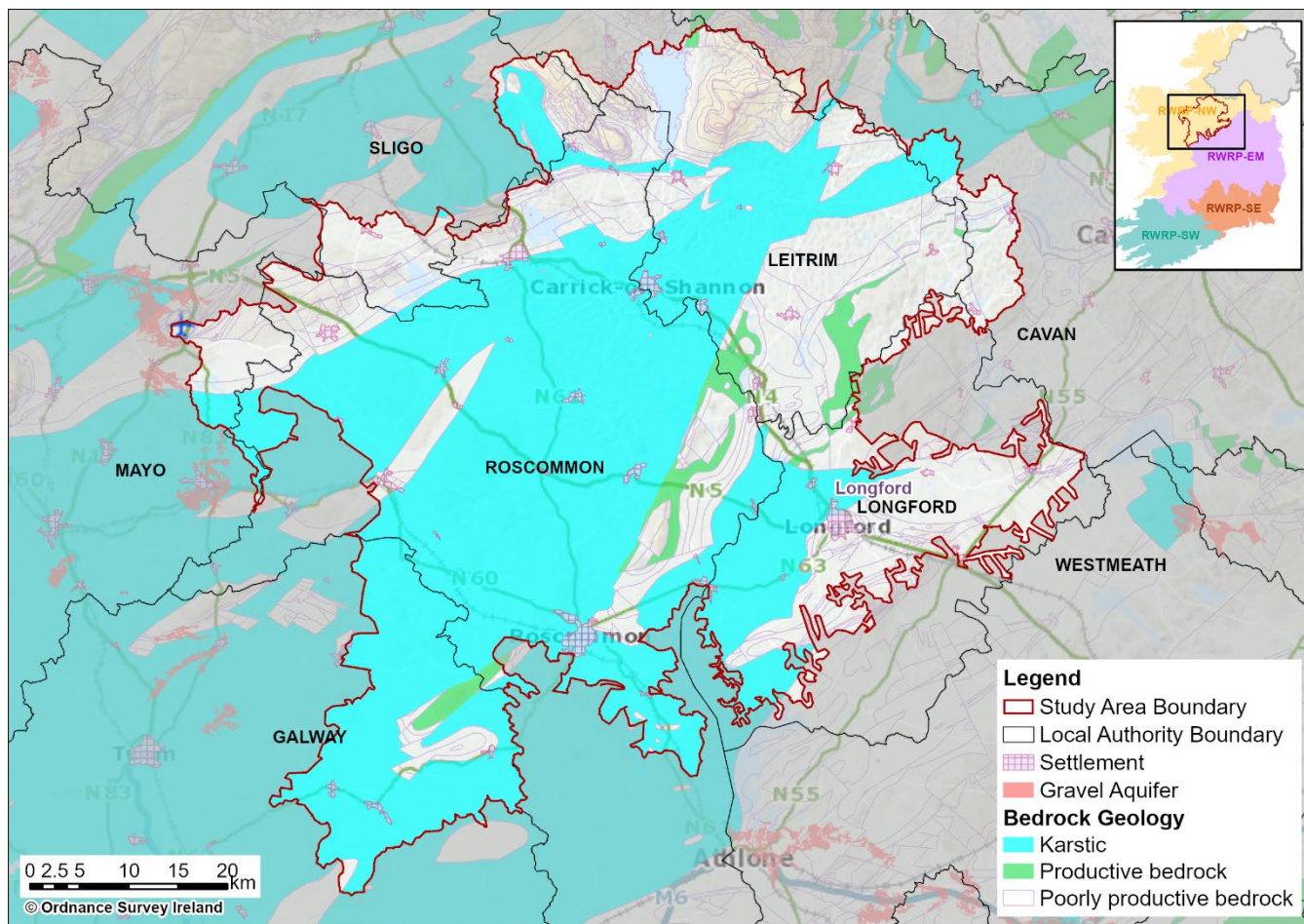


Figure 2.5 SAF Hydrogeology

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 SAF 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	<p>Issues: Increasing population and the increased stress of climate change on water quality and water resources could affect health and well-being.</p> <p>Opportunities: Irish Water will put in place plans to assess water quality and measures to address risks as part of the Regional Plan</p> <p>Irish Water has ongoing activities to improve the Supply Demand Balance in SAF, including, leakage management and water conservation measures.</p> <p>Raising awareness of the importance of water conservation and efficiency measures, and the value of the environment for health and wellbeing, can play an</p>	Climate change, biodiversity, water environment, material assets and landscape and visual amenity

SEA Topic	Issues and Opportunities	Interrelated Topics
	important part in water planning. Valuing access to environment for recreation.	
Water Environment	<p>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 SAF, 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 SAF Technical Report). This has been used to inform options identification and appraisal.</p> <p>Irish Water will update its sustainability analysis and impact on their baseline Supply Demand Balance (SDB) calculations when regulatory assessment for the new legislation is undertaken.</p> <p>Opportunities: To take account of identified pressure on the water environment in the selection of solutions for SAF.</p>	Biodiversity and climate change
Biodiversity, Flora and Fauna	<p>Issues: SAF has a number of designated area sites, including a few small, water dependent Special Areas of Conservation (SAC), such as the Lough Forbes Complex SAC and Callow Bog SAC. There are some sections of the Upper Shannon catchment with WFD High Status Objectives (HSOs), but none designated for <i>Margaritifera</i> (Freshwater Pearl Mussel).</p> <p>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</p>	Water resources, water quality and climate change
Material Assets	<p>Issues: WTP assets and network infrastructure requiring improvement or replacement</p> <p>Opportunities: Improvements to support reliability of access to good quality water.</p>	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 wellbeing
Air Quality and Noise	No specific issues identified for the baseline for SAF.	Health and wellbeing
Climate Change	Issues: Climate change issues regarding sea level rise, flooding, extreme weather events and changes in seasonal weather patterns. Climate change has been	Biodiversity and water environment

SEA Topic	Issues and Opportunities	Interrelated Topics
	<p>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.</p> <p>Opportunities: Additional management to minimise impact on supply and the environment, vulnerability to climate change and drought is required.</p>	
Cultural Heritage	<p>Issues: Known cultural heritage and archaeological assets and potential unknown archaeological assets.</p>	Health and wellbeing
Geology and Soils	<p>Issues: General need for good soil conservation and retention of nutrients and carbon in soil resources</p> <p>Opportunities: Potential benefits from soil conservation for biodiversity, water quality and water retention also.</p>	Biodiversity, water quality, landscape and climate change
Additional interrelated aspects	<p>Issues: Poor water quality requiring additional water treatment and affecting aquatic biodiversity.</p> <p>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 this has not been specifically studied in this study area.</p>	



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 SAF 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 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 SAF are Stages 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 the 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 sites 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 174 unconstrained options were identified for SAF 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 6 of the SEA Environmental Report for the RWRP-NW. 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 174 unconstrained options, 54 were rejected after being analysed against the coarse screening criteria of resilience, deliverability and environment.

Sustainability reasons for rejecting options were identified for 16 options. Table 3.2 provides the options that were rejected on a sustainability basis and not considered suitable to address the deficit for the WRZs located in SAF. The full rejection register, including both the coarse and fine screening (where applicable) is provided in Annex B of the SAF Technical Report.

Table 3.2 Coarse Screening Rejection Register

Option Reference	Option Description	Rejection Reasoning
SAF-025	Raw water impoundment in cutaway bog area to capture flood water in Lanesboro & Newtowncashel WRZ	A bog is located on a regionally important aquifer (Karstified) presenting a water quality issue. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.
SAF-003	New riverbank filtration adjacent to River Shannon at Carrick-on-Shannon to supply deficit in South Leitrim RWSS WRZ	Abstracting the volume of water required is considered unfeasible. Therefore, this option did not meet the requirements of the

Option Reference	Option Description	Rejection Reasoning
SAF-017	Increase GW abstraction from ESB well and extend supply from Lanesboro into Newtowncashel and upgrade WTP	Environmental, Resilience or Deliverability criteria.
SAF-037	Develop new wellfield in North East Regional PWS and supply deficit to neighbouring WRZs	
SAF-113	Develop new wellfield in North East Regional and supply neighbouring WRZs	
SAF-114		
SAF-115		
SAF-116		
SAF-117		
SAF-008	Partly supply deficit from Arigna (Co. Roscommon) to Drumshambo	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving WFD objectives. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.
SAF-099		
SAF-147	Maintain supply to Arvagh WRZ from Erne Valley GWS.	
SAF-150	Keep supplying Killeshandra WRZ from Erne Valley GWS.	
SAF-151	Recommission Portaliffe WTP (Mill Lough) and supply Killeshandra.	
SAF-019	New riverbank filtration adjacent to River Shannon at Lanesborough to supply deficit in Lanesboro & Newtowncashel WRZ	
SAF-078	New SW abstraction for Kilkerrin Moylough WRZ to supply deficit	This option has a lack of suitable SW river sources in local vicinity that can meet the deficit. This is not a sustainable long-term abstraction to supply deficit. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.

3.4 Stage 5: Fine Screening

A total of 120 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.

No further options were rejected at fine screening in SAF.

3.5 Stage 6: Feasible Options List

A total of 120 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 SAF 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-NW:

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 options⁵ 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 project specific mitigation applied as these can be addressed with general/standard mitigation measures.

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).

Scores of -3 equates to LSEs that may be difficult to mitigate or where uncertainty remains but it is understood at plan level that mitigation would be achievable, noting that further project level assessments are required to confirm this.

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.

STEP 0 Best AA	If there is an option that meets the Objectives of the Plan, and is assessed as having no potential impact on a European Site (based on desktop assessment), it is automatically adopted as the Preferred Approach
STEP 1 Least Cost	Compare Least Cost against best AA Approach, and consider again at Step 6
STEP 2 Quickest Delivery	Compare Least Cost against Quickest Delivery Approach and develop Modified Approach if appropriate
STEP 3 Best Environmental	Compare Least Cost or Modified Approach against Best Environmental, and modify approach if appropriate
STEP 4 Most Resilient	Compare Least Cost or Modified Approach against Most Resilient
STEP 5 Least Carbon	Compare Least Cost or Modified Approach against Lowest Carbon
STEP 6 Approach Comparison	Compare output from Steps 1 to 5 against: <ul style="list-style-type: none"> • SEA required outcomes • Best AA outcomes • Sectoral Adaptation Outcomes • Public Expenditure Code Outcomes
STEP 7 Preferred Approach	Select Preferred Approach based on steps 0 to 6

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.

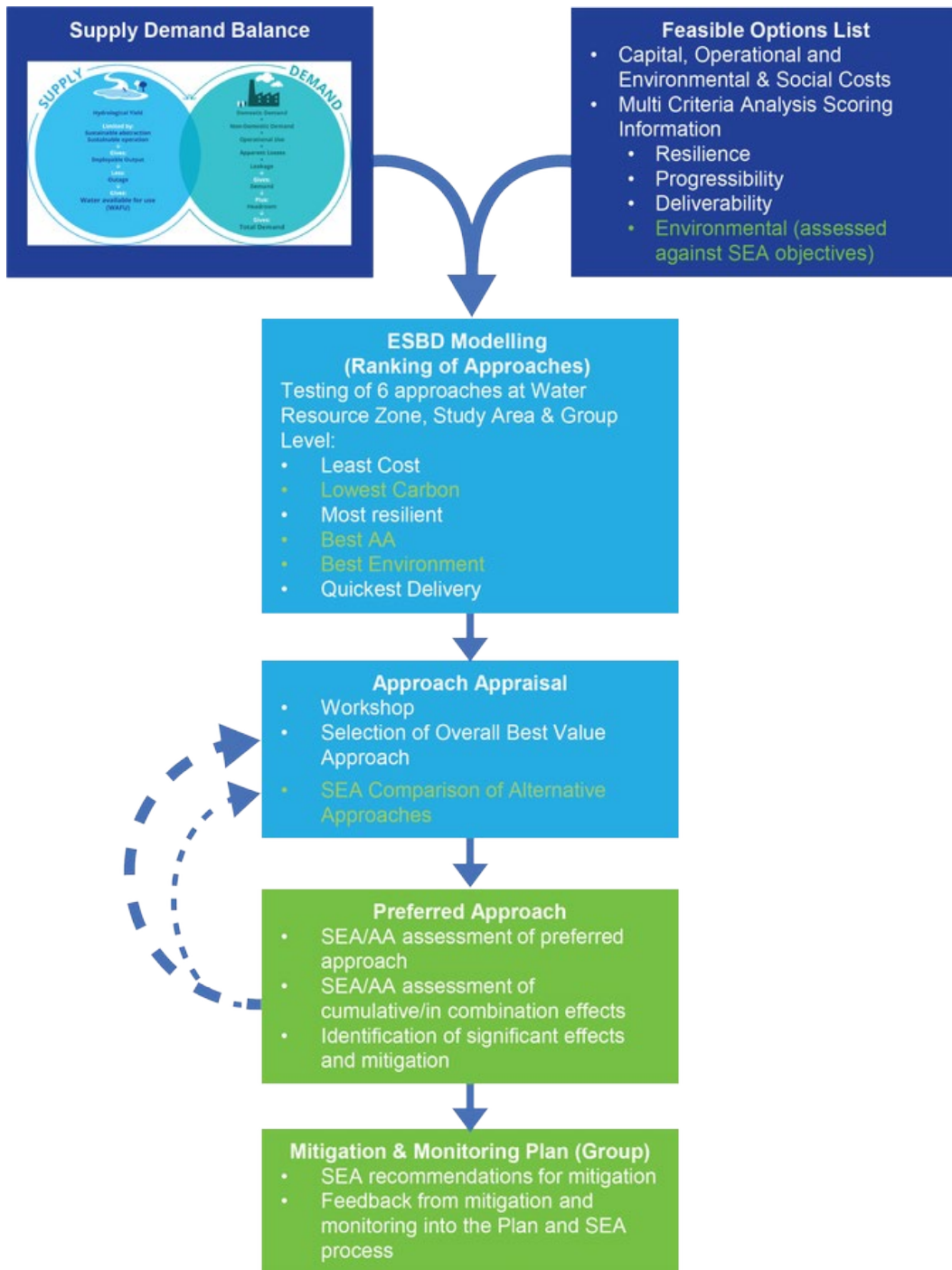


Figure 4.2 Approach Development Process

4.3 SAF Approach Development Process

The approach assessment 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 SAF there are 34 WRZ options and these are listed in Table 5.2 in the SAF 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 4.4).

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 SAF, a total of 13 combinations were compared and presented in Table 4.2. The WRZ level preferred approach cannot meet the deficit for the study area as a whole, therefore, it has not been assessed and assigned a score in Table 4.2 for the purposes of determining the best performing alternative within each approach category. Note that the Preferred Approach selected at the end of the process has been outlined in red throughout this section.

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

Category	WRZ Level Approach (Cannot meet the deficit)	SA Combination 1 (SA Option 29, 34, 42)	SA Combination 2 (SA Option 2, 42)	SA Combination 3 (SA Option 9, 42)	SA Combination 4 (SA Option 11, 42)	SA Combination 5 (SA Option 14, 42)	SA Combination 6 (SA Option 23, 42)	SA Combination 7 (SA Option 24, 42)	SA Combination 8 (SA Option 29, 42)	SA Combination 9 (SA Option 30, 42)	SA Combination 10 (SA Option 34, 42)	SA Combination 11 (SA Option 37, 42)	SA Combination 12 (SA Option 41, 42)	SA Combination 13 (SA Option 42)
Least Cost		Best*											Worst	
Quickest Delivery		Best											Worst	
Number of -3 Biodiversity Scores		Two -3 scores	One -3 score	One -3 score	One -3 score	One -3 score	No -3 Scores	One -3 score	One -3 score	One -3 score	Two -3 scores	Two -3 scores	One -3 score	One -3 score
Lowest Carbon			Best										Worst	
Most Resilient				Worst									Best	
Best Environmental							Best**					Worst		

Key														
Ranked order (best to worst)	Best													Worst

*Overall combination 1 is within 5% of the other lowest cost combination and involves a rationalisation to Dunmore Glenamaddy which would offer better overall resilience and security of supply. Hence, it has been identified as the least cost approach. Further explanation can be found in section 5.2.3 of the Technical Report.

**Although combination 2 has the best environmental score, it also has a -3 biodiversity score. Therefore, combination 6 is selected as the best environmental as it has no -3 biodiversity scores and a similar environmental score overall.

Through comparing the potential SA combinations, the best SA approach for each of the six approach categories was identified (also see section 5 of the Study Area Technical Report); these aligned as four approaches (see Table 4.3).

Table 4.3 Study Area Approach Categories

Category	SA Approach 1 (SA Combination 1) (SA Option 29, 34, 42)	SA Approach 2 (SA Combination 2) (SA Option 2 and 42)	SA Approach 3 (SA Combination 6) (SA Option 23 and 42)	SA Approach 4 (SA Combination 12) (SA Option 41 and 42)
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 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 (SA Approach 1) (SA combination 1)	Best Appropriate Assessment (SA Approach 3) (SA combination 6)	Quickest Delivery (SA Approach 1) (SA Combination 1) Approach)	Best Environmental (SA Approach 3) (SA combination 6)	Most Resilient (SA Approach 4) (SA combination 12)	Lowest Carbon (SA Approach 2) (SA Combination 2)
SA options (Group options)	No options	SA option 29: 066, 128 SA option 34: 081, 133 SA option 42: 148, 149	SA option 23: 049, 122 SA option 42: 148, 149	SA option 29: 066, 128 SA option 34: 081, 133 SA option 42: 148, 149	SA option 23: 049, 122 SA option 42: 148, 149	SA option 41: 094, 144, 145, 146, 160 SA option 42: 148, 149	SA option 2: 005, 097 SA option 42: 148, 149

Options included	Do Minimum	Least Cost (SA Approach 1) (SA combination 1)	Best Appropriate Assessment (SA Approach 3) (SA combination 6)	Quickest Delivery (SA Approach 1) (SA Combination 1) Approach)	Best Environmental (SA Approach 3) (SA combination 6)	Most Resilient (SA Approach 4) (SA combination 12)	Lowest Carbon (SA Approach 2) (SA Combination 2)
WRZ options	No options	009	001	009	001	001	021
		021	009	021	009	009	030
		030	021	030	021	021	038
		038	030	038	030	030	039
		039	038	039	038	038	040
		052	040	052	040	039	052
		068	059	068	059	052	059
		072	068	072	068	059	068
		084	072	084	072	068	072
		156	076	156	076	156	076
		161	084	161	084	161	084
			156		156		156
			161		161		161

* For the option references - all options are part of SAF e.g. SAF-009 is shown as 009 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 SAF Technical Report.

Within SAF, this resulted in four approaches being selected from the thirteen SA combinations identified in Table 4.3, 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 four 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 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 (EBS D) tool.

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

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

Key			
Ranked order (best to worst) within the four selected approaches			
Worst			Best
* Although SA approach 2 and 4 have better environmental scores, they also have a -3 biodiversity score. Therefore, SA approach 3 is selected as the best environmental as it has no -3 biodiversity scores and a similar environmental score overall.			

4.4 Comparison of SAF Approaches

An overall summary of the infrastructure components and abstractions for each of the SA approaches identified for SAF 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 (LCo, QD)	SA Approach 2 (LC)	SA Approach 3 (BE, BA)	SA Approach 4 (MR)
New pipeline network (km)	0	50	75	66	20
New WTPs	0	1	1	1	1
Upgrade WTPs	0	16	17	17	14

Infrastructure Summary	Do Minimum	SA Approach 1 (LCo, QD)	SA Approach 2 (LC)	SA Approach 3 (BE, BA)	SA Approach 4 (MR)
New / upgraded abstractions	0	8	9	9	8
WTPs decommissioned	0	2	1	1	4
Abstractions abandoned	0	2	1	1	4
Raw Water Storage	0	0	0	0	0
Treated Water Storage	0	5	6	5	5

A comparative assessment of the four 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 (LCo, QD)	SA Approach 2 (LC)	SA Approach 3 (BE, BA)	SA Approach 4 (MR)	Range (Difference between Lowest and Highest Score)
Population, health, economy and recreation	-3 scores	No Difference				0
	MCA score		Best	Worst		5
Water Environment: quality and resources	-3 scores	Worst	Best	Worst	Worst	1
	MCA score		Best	Worst		5
Biodiversity, Flora and Fauna	-3 scores	Worst		Best		2
	MCA score		Worst		Best	10

Topic	Total No. of	SA Approach 1 (LCo, QD)	SA Approach 2 (LC)	SA Approach 3 (BE, BA)	SA Approach 4 (MR)	Range (Difference between Lowest and Highest Score)
Material Assets	-3 scores	No Difference				0
	MCA score			Best	Worst	5
Landscape and Visual	-3 scores	No Difference				0
	MCA score	Worst	Best	Best		2
Climate Change	-3 scores	No Difference				0
	MCA Score	Worst		Best	Worst	2
Culture, Heritage and Archaeology	-3 scores	No Difference				0
	MCA Score	No Difference				0
Geology and Soils	-3 scores	No Difference				0
	MCA Score	Best	Best	Worst	Best	1

Key

MCA/No. of -3 scores against each criterion

Worst			Best
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*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 construction 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)

SA approach 1, key comparison points:

- Identified as the best in the following categories: Least Cost and Quickest Delivery;
- Option types included:
 - SA option (group option): 2 surface water abstraction options and 1 groundwater abstraction option;
 - WRZ options: 3 groundwater abstraction options, 4 surface water abstraction options and 4 WTP upgrade options;
- Two -3 biodiversity scores associated with:
 - SA option 34: The groundwater abstraction is within the Zone of Contribution (ZOC) for, and has the potential to impact, the Lough Corrib SAC. The Lough Corrib SAC contains a number of Groundwater Dependent Terrestrial Ecosystems (GWDTEs), although more monitoring is required to determine the potential impacts;
 - SAF-052: There is the potential for habitat loss associated with the construction of the new abstraction point and watermains through Callow Bog SAC. There is also the potential for ground disturbance which may cause a change to the hydrological regime of the GWDTEs.
- The key differences regarding infrastructure development for SA approach 1 include the:
 - Lowest number of new/upgraded abstractions (same number as SA approach 4); and
 - The lowest number of treated water storages (same number as SA approach 3 and 4).

4.4.2 SA Approach 2 (SA Combination 2) (LC)

SA approach 2, key comparison points:

- Identified as the best in the Lowest Carbon category;
- Option types included:
 - SA option (group option): 2 surface water abstraction options;
 - WRZ options: 5 groundwater abstraction options, 3 surface water abstraction options and 4 WTP upgrade options;
- One -3 biodiversity score associated with SAF-052: There is the potential for habitat loss associated with the construction of the new abstraction point and watermains through Callow Bog SAC. There is also the potential for ground disturbance which may cause a change to the hydrological regime of the GWDTEs.
- The key differences regarding infrastructure development for SA approach 2 include the:
 - The longest length of pipeline;
 - The highest number of WTP upgrades (same number as SA approach 3);
 - The highest number of new/upgraded abstractions (same number as SA approach 3);
 - The lowest number of WTPs decommissioned and abstractions abandoned (same number as SA approach 3); and
 - The highest number of treated water storages.

4.4.3 SA Approach 3 (SA Combination 6) (BE, BA)

SA approach 3, key comparison points:

- Identified as the best in the following categories: Best Environmental, Best AA and Most Resilient;
- Option types included:

- SA option (group option): 1 groundwater abstraction option and 1 surface water abstraction option;
- WRZ options: 4 groundwater abstraction options, 4 surface water abstraction options and 4 WTP upgrade options;
- No -3 biodiversity scores (so no higher risk options that could impact on European sites); and
- The key differences regarding infrastructure development for SA approach 3 include the:
 - The highest number of WTP upgrades (same number as SA approach 2);
 - The highest number of new/upgraded abstractions (same number as SA approach 2);
 - The lowest number of WTPs decommissioned and abstractions abandoned (same number as SA approach 2); and
 - The lowest number of treated water storages (same number as SA approach 1 and 4).

4.4.4 SA Approach 4 (SA Combination 12) (MR)

SA approach 4, key comparison points:

- Identified as the best in the Most Resilient category;
- Option types included:
 - SA option (group option): 1 surface water abstraction and rationalisation option, and 1 surface water abstraction option;
 - WRZ options: 3 groundwater abstraction options, 5 surface water abstraction options and 3 WTP upgrade options;
- One -3 biodiversity score associated with SAF-052: There is the potential for habitat loss associated with the construction of the new abstraction point and watermains through Callow Bog SAC. There is also the potential for ground disturbance which may cause a change to the hydrological regime of the GWDTEs.
- The key differences regarding infrastructure development for SA approach 4 include the:
 - The shortest length of pipeline;
 - The lowest number of WTP upgrades;
 - The lowest number of new/upgraded abstractions (same number as SA approach 1)
 - The highest number of WTPs decommissioned and abstractions abandoned;
 - No abandoned abstractions; and
 - The lowest number of treated water storages (same number as SA approach 1 and 3).

4.5 SAF 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 -12,993 m³/d in 2019, to a projected maximum of -15,823 m³/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 4.8 shows the SDB for the WRZs in SAF.

Table 4.8 Supply Demand Balance for SAF

WRZ Name	WRZ Code	Population	Maximum Deficit m ³ /day*	
			2019	2044
North Roscommon Regional Water Supply Scheme	2600SC0009	8,074	-1,406	-1,538
Boyle Regional	2600SC0008	7,247	-112	-405
Arigna Regional PWS	2600SC0007	816	No Deficit	No Deficit
Roscommon Central Water Supply Scheme	2600SC0004	9,942	No Deficit	No Deficit
Castlerea PWS	2600SC0003	3,969	-2,128	-2,235
North East Regional PWS	2600SC0002	8,134	No Deficit	No Deficit
Longford Central	2000SC0005	17,147	-3,302	-4,646
Granard	2000SC0002	2,647	-118	-217
Lanesboro & Newtowncashel	2000SC0001	5,309	-299	-481
Carrick-on-Shannon	1700SC0001	15,791	-4,860	-5,327
Ballymoe P.S.	1200SC0001	707	No Deficit	No Deficit
Mountbellew P.S.	1100SC0001_I	3,425	-221	-336
Kilkerrin_Moylough	1100SC0001_F	1,575	-546	-637
Killeshandra PWS (GWS Import)	0200SC0005	415	N/A**	N/A**
Arvagh PWS (GWS Import)	0200SC0001	377	N/A**	N/A**

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

**Note that this WRZ is supplied by a private Group Water Supply, therefore, the water available for use (WAFU) has not been verified for use in the SDB

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 (LCo, QD) (SA Combination 1)	SA Approach 2 (LC) (SA Combination 2)	SA Approach 3 (BE, MR, BA) (SA Combination 6)	SA Approach 4 (MR) (SA Combination 12)
1. Protect public health and promote wellbeing	C	0	-	-	-	-
	O	--	+	+	+	+

SEA Objectives	Phase (Construction (C) / Operation (O))	Do Minimum	SA Approach 1 (LCo, QD) (SA Combination 1)	SA Approach 2 (LC) (SA Combination 2)	SA Approach 3 (BE, MR, BA) (SA Combination 6)	SA Approach 4 (MR) (SA Combination 12)
2. Protect and enhance biodiversity and contribute to resilient ecosystems	C	0	-	-	-	-
	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	-	-	-	-	-
5. Reduce greenhouse gas emissions	C	0	-	-	-	-
	O	-	-	-	-	-
6. Contribute to environmental climate change resilience	C	0	-	-	-	-
	O	-	-	-	-	-
7. Protect and improve surface water and groundwater status	C	0	0	0	0	0
	O	-	-	-	-	-
8. Avoid flood risk	C	0	-	-	-	-
	O	0	0	0	0	0
9. Protect and where appropriate, enhance cultural heritage assets	C	0	-	-	-	-
	O	0	0	0	0	0
10. Protect quality and function of soils	C	0	-	-	-	-
	O	0	0	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 1 (identified as the Preferred Approach) and SA approach 4 are likely to have more beneficial landscape impacts during operation as it decommissions more WTPs. SA approach 1 and 2 are likely to have more adverse impacts to biodiversity during construction as pipeline is significantly longer and within EU sites. SA approach 1, 2, and 4 are likely to have more adverse impacts to biodiversity during operation as there are -3 biodiversity impacts regarding abstraction and pipeline being within European sites. SA approach 3 and 4 have potential for impacts against a wider number of sources, hence, it is likely to have more adverse impacts against water status. SA approach 4 is likely to have a greater adverse impact when compared with SA approaches 1,2 and 3 for materials and waste during construction as the approach involves the construction of more WTPs and more land take is required. SA approach 4 is likely to have a less adverse impact on geology and soils due to the approach requiring the construction of significantly less pipeline.

Mitigation for the Preferred Approach is identified in chapter 5 based on individual options assessments and in chapter 6 in terms of 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

Further consideration for selection of the Preferred Approach was required regarding the Kilkerrin Moylough WRZ. This is because the local solution (SAF-076) proposed as part of SA approach 2 and SA approach 3 involves developing groundwater in the area. The existing groundwater source and recent trial wells have indicated how vulnerable the source is within the WRZ as it is shallow rock and has been found to be high in manganese. SA approach 1 does not include this local option and involves a rationalisation to Dunmore Glenamaddy instead (SA option 34).

SA approach 1 has been selected through the 7 step process and offers better overall resilience and security of supply, therefore, it has been selected as the SA Preferred Approach.

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.



5



**SAF Preferred
Approach:
Strategic
Environmental
Assessment**



5 SAF Preferred Approach Strategic Environmental Assessment

5.1 SAF 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 eleven of the WRZs in the study area. This reflects the small scale of the supplies and difficulties in transporting small volumes of water over long distances. For the other four WRZs, namely Arvagh PWS (GWS Import), Boyle Regional, Kilkerrin/Moylough, and Carrick-on-Shannon, there are three SA options (SA option 29, 34 and 42). These SA options involve the following:

- SA option 29: Interconnect Boyle Ardcarne with South Leitrim WRZ, increase the existing surface water abstraction and upgrade Carrick-on-Shannon WTP and Rockingham WTP;
- SA option 34: Rationalise to Dunmore Glenamaddy, increase existing groundwater abstraction at Gortgarrow Springs, upgrade Gortgarrow Springs WTP and decommission Kilkerrin Moylough WTP.
- SA option 42: Rationalise Arvagh to Gowna WRZ, increase the existing surface water abstraction, and upgrade Smear WTP and Mountbellew WTP.

The SA Preferred Approach for the remaining WRZs involves new and increased groundwater and surface water abstractions, and upgrades to existing WTPs.

Table 5.1 gives a breakdown of the options in SAF and the associated abstractions.

Table 5.1 Preferred Approach Breakdown

WRZ Name and Option Reference*	Option Description	Abstraction / Demand
SAF-068 Arigna Regional PWS 2600SC0007	Arigna Regional Not in deficit - Castletenison WTP Upgrade <ul style="list-style-type: none"> Existing groundwater (GW) source (Lough Allen Uplands). WFD status 2013-2018 – Good 	N/A
SAF-148 & 149 (SA Option 42) 0200SC0001 Arvagh PWS (GWS Import)	Rationalise Arvagh to Gowna WRZ <ul style="list-style-type: none"> Existing surface water (SW) source (Lough Gowna North). WFD status 2013 -2018 – Poor 	No data available as this WRZs source is from a group water scheme import
SAF-072 1200SC0001 Ballymoe P.S.	Ballymoe WTP upgrade - no deficit <ul style="list-style-type: none"> Existing GW source (Suck South). WFD status 2013-2018 – Good 	N/A
SAF-66 & 128 (SA Option 29) 2600SC0008	Interconnect Boyle Ardcarne with South Leitrim WRZ and supply deficit (increase abstraction from Shannon and upgrade WTP)	4,988 m ³ /d

WRZ Name and Option Reference*	Option Description	Abstraction / Demand
Boyle Regional	<ul style="list-style-type: none"> Existing source (Shannon Upper SW source). WFD status 2013-2018 – Poor 	
SAF-039 2600SC0003 Castlerea PWS	<p>Increase GW abstraction at Longford Springs to supply deficit and upgrade WTP</p> <ul style="list-style-type: none"> Existing source (Suck South GW). WFD status 2013-2018 – Good 	3,225 m ³ /d
SAF-030 2000SC0002 Granard	<p>Increase SW abstraction from Lough Kinale, relocate existing intake and upgrade WTP</p> <ul style="list-style-type: none"> Existing source (Lough Kinale lake waterbody (LWB)). WFD status 2013-2018 – Moderate 	2,051 m ³ /d
SAF-081 & 133 (SA Option 34) 1100SC0001_F Kilkerrin/Moylough	<p>Increase abstraction at Gortgarrow Spring and upgrade WTP. Rationalise Kilkerrin/ Moylough to Dunmore/ Glenamaddy.</p> <ul style="list-style-type: none"> Existing source (Clare-Corrib GW). WFD status 2013-2018 – Good 	1,659 m ³ /d
SAF-156 0200SC0005 Killeshandra PWS (GWS Import)	<p>New SW abstraction from Lake Town and new WTP</p> <ul style="list-style-type: none"> Existing source (Town Lough LWB). WFD status 2013-2018 – Poor 	No data available as this WRZs source is from a group water scheme import
SAF-021 2000SC0001 Lanesboro & Newtowncashel	<p>New GW abstraction to supply deficit at Lanesboro & Newtowncashel, upgrade Lisreevagh WTP</p> <ul style="list-style-type: none"> Existing source (Funshinagh GW). WFD status 2013-2018 – Good 	4,116 m ³ /d
SAF-009 2000SC0005 Longford Central	<p>Increase surface abstraction from Lough Forbes and upgrade WTP</p> <ul style="list-style-type: none"> Existing source (Lough Forbes SW). WFD status 2013-2018 – Moderate 	10,971 m ³ /d
SAF-084 1100SC0001_I Mountbellew	<p>Increase GW abstraction for Mountbellew WRZ to supply deficit</p> <ul style="list-style-type: none"> Existing source (South Suck GWB). WFD status 2013-2018 – Good 	2,482 m ³ /d
SAF-161 2600SC0002 North East Regional PWS	<p>Not in deficit - WTP Upgrade</p> <ul style="list-style-type: none"> Existing source (Grange Lough LWB). WFD status 2013-2018 – Good 	N/A
SAF-052 2600SC0009	<p>Abandon existing intake. New intake from middle lake to meet full demand. New raw water mains to existing WTP. Upgrade of WTP to meet full demand.</p>	10,247 m ³ /d

WRZ Name and Option Reference*	Option Description	Abstraction / Demand
North Roscommon RWSS	<ul style="list-style-type: none"> Existing source (Lough Gara LWB). WFD status 2013-2018 – Moderate 	
SAF-038 2600SC0004 Roscommon Central WSS	<p>WTP Upgrade - Not in deficit, pump tests to prove high yield spring and boreholes.</p> <ul style="list-style-type: none"> Existing source (Los GW). WFD status 2013-2018 – Good 	N/A
SAF-066 & 128 (SA Option 29) 1700SC0001 Carrick-on-Shannon	<p>Interconnect Boyle Ardcarne with South Leitrim WRZ and supply deficit (increase abstraction from Shannon and upgrade WTP)</p> <ul style="list-style-type: none"> Existing source (Shannon Upper SW). WFD status 2013-2018 – Poor 	13,982 m ³ /d

*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 29, 34 and 42 are labelled as SAF-529, 534 and 542.

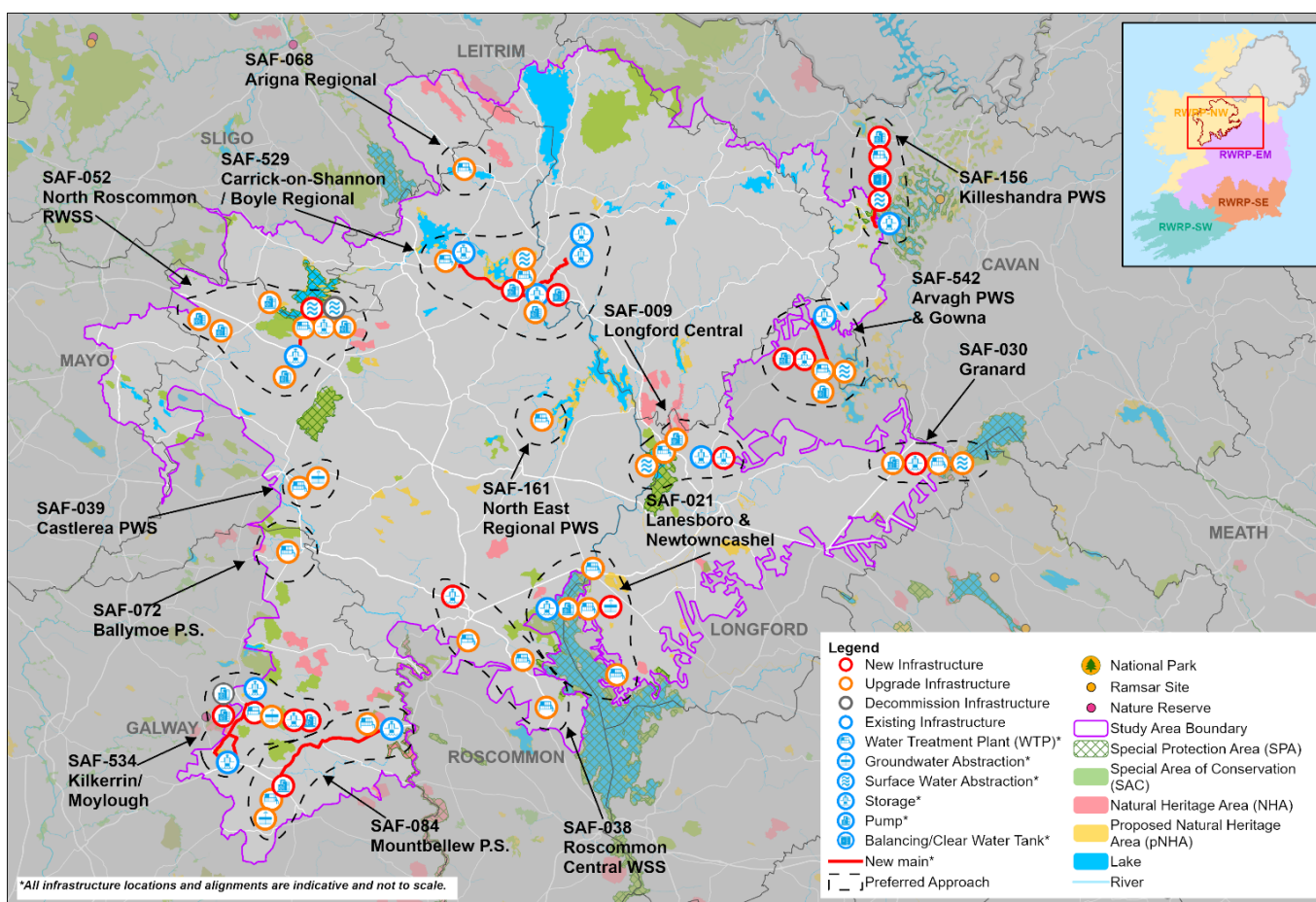


Figure 5.1 SA Preferred Approach and Key Environmental Designations

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
SAF-009	-	-	✓	✓	-	-	-	✓
SAF-021	-	-	✓	✓	-	-	-	-
SAF-030	-	-	✓	✓	-	-	-	✓
SAF-038	-	-	✓	-	-	-	-	✓
SAF-039	-	-	✓	✓	-	-	-	-
SAF-052	✓	-	✓	✓	-	✓	-	✓
SAF-068	-	-	✓	-	-	-	-	-
SAF-072	-	-	✓	-	-	-	-	-
SAF-084	✓	-	✓	✓	✓	-	-	-
SAF-156	✓	✓	-	✓	-	-	-	✓
SAF-161	-	-	✓	-	-	-	-	-
SA Option 29 (SAF-066 & 128)	✓	-	✓	-	-	-	-	-
SA Option 34 (SAF-081 & 133)	✓	-	-	-	✓	✓	-	-
SA Option 42 (SAF-148 & 149)	✓	-	-	-	-	-	-	-

*SA Options are the same as Group Options

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)
SA Option 42 (SAF-148 & 149)	Rationalise Arvagh to Gowna WRZ and increase SW abstraction and supply Arvagh	Construction	-	-	-	-	-	-	0	0	-	-
		Operation	+	0	0	0	-	-	-	0	0	0
SAF-068	Arigna Regional PWS not in deficit - Castletenison WTP Upgrade	Construction	-	0	0	0	0	0	0	0	0	0
		Operation	+	0	0	0	0	0	0	0	0	0
SA Option 29 (SAF-066 & 128)	Interconnect Boyle Ardcarne with South Leitrim WRZ and supply deficit	Construction	-	-	-	-	-	-	0	-	-	-
		Operation	+	0	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 (L-1)	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)
SAF-072	Ballymoe WTP upgrade - no deficit	Construction	-	-	0	0	0	0	0	0	0	0
		Operation	+	-	0	0	0	0	0	0	0	0
SAF-039	Increase GW abstraction at Longford Springs to supply deficit and upgrade WTP	Construction	-	-	0	0	0	-	0	0	0	0
		Operation	+	-	0	0	0	-	-	0	0	0
SAF-030	Increase SW abstraction from Lough Kinale, re-locate existing intake and upgrade WTP	Construction	-	-	-	-	0	-	0	0	0	-
		Operation	0	-	0	0	0	-	-	0	0	0
SAF-156		Construction	-	-	-	-	-	-	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 (L-1)	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)
	New SW abstraction from Lake Town and new WTP	Operation	-	-	-	0	-	-	-	0	-	0
SAF-021	New GW abstraction to supply deficit at Lanesboro & Newtowncashel, upgrade Lisreevagh WTP	Construction	-	-	-	-	-	-	0	0	0	0
		Operation	++	-	0	0	-	-	-	0	0	0
	Rationalise to Dunmore Glenamaddy	Construction	-	-	-	-	-	-	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 (L-1)	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 34 (SAF-081 & 133)	and increase abstraction at Gortgarrow Spring WTP	Operation	+	-	+	0	-	-	-	0	0	0
SAF-009	Increase SW abstraction from Lough Forbes and upgrade WTP	Construction	-	-	-	-	-	-	0	-	0	0
		Operation	0	-	0	0	-	-	-	0	0	0
SAF-084	Increase GW abstraction for Mountbellew WRZ to supply deficit	Construction	-	-	-	-	-	-	0	0	-	-
		Operation	+	-	+	0	-	-	-	0	0	0
SAF-161		Construction	-	-	0	0	0	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 (L-1)	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)
	Not in deficit - Grange WTP upgrade	Operation	+	0	0	0	0	0	0	0	0	0
SAF-052	Abandon existing intake. New intake from middle lake to meet full demand. New 1.6km raw water mains to existing WTP. Upgrade of WTP to meet full demand.	Construction	-	-	-	-	-	-	0	0	-	-
		Operation	+	-	+	0	-	-	-	0	0	0
SAF-038	WTP Upgrade - Roscommon Central	Construction	-	-	-	-	-	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 (L-1)	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)
	WSS not in deficit, pump tests to prove high yield spring and boreholes	Operation	0	0	0	0	-	0	0	0	0	0

*SA Options are the same as Group Options

**Total lifetime tCO₂e 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 SAF Technical Report and include leakage reduction and water conservation.

5.2.1 Leakage Reduction



The Leakage reduction measures across the public water supply considered for SAF are based on what we 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 (NRR); and
- Net leakage reductions targets have been applied to 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 following WRZs: Kilkerrin Moylough, Mountbellew P.S., Carrick-on-Shannon, Lanesboro & Newtowncashel, Longford Central, North East Regional PWS, Castlerea PWS, Roscommon Central Water Supply Scheme, Boyle Regional, and North Roscommon Regional Water Supply Scheme.

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 SAF 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 SAF Preferred Approach is provided in the SAF Technical Report. A high-level assessment of what this could mean for the SEA is shown in Table 5.4.

Table 5.4 SAF 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 Irish Water’s current abstractions are large compared to the waterbodies from which they abstract)	0 m ³ /d	<p>The impact of sustainability reductions would reduce the volumes that can be abstracted from Irish Water’s existing sources, therefore, increasing the SDB deficit. Based on Irish Water’s initial assessment, it is not envisaged that there are sustainability issues with the volumes abstracted at their surface water sources as the five surface water abstractions in SAF are from large resilient sources in the Upper Shannon system.</p> <p>Groundwater sustainability is more difficult to assess at desktop level and further studies will be required to determine their long term sustainability.</p> <p>The SA Preferred Approach addresses reduction and there are no foreseen sustainability issues with current sources. Although additional sustainability reductions could add pressure for additional supply from outside the study area the proposed Preferred Approach is expected to improve resilience and reduce pressure overall.</p>
Climate Change	High (international climate change targets have not been met)	0 m ³ /d	<p>Higher climate change scenarios would impact Irish Water’s existing supplies and result in decreased water availability at certain times of year. Although the likelihood of this scenario is high based on climate change adaptation to date, potential impacts may be mitigated against by optimising Irish Water’s operations on a more environmentally sustainable basis across the range of supplies.</p> <p>Regarding the existing and proposed new groundwater abstractions, there is more difficulty and uncertainty in assessing increased climate change impacts. However, it is generally understood that groundwater will be more resilient than surface water sources.</p> <p>This could result in more pressure on sources, although, the Preferred Approach provides more operational flexibility to use less sensitive water sources.</p>
Demand Growth	Low/Moderate (growth has been based on policy)	-15,823 m ³ /d	<p>The impact of lower than expected growth would reduce the SDB deficit and the overall need requirement. The SDB deficit is currently spread across nine of the fifteen WRZs in the area and is projected to spread across ten. This is</p>

Uncertainty	Likelihood	Increase/ Decrease in Deficit	Environmental Impacts Relative to Assessment of Preferred Approach Key: Green - Positive Amber - Negative
			<p>driven by quality as well as quantity issues. In this rural area, growth is relatively low.</p> <p>This could allow lower than expected energy and carbon costs and lower increased abstraction requirements</p>
Leakage Targets	Low (Irish Water is focused on sustainability and aggressive leakage reduction)	+513 m ³ /d	<p>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.</p> <p>This could increase carbon emissions and the effects of abstraction pressure on the environment.</p>
	Moderate/High (Irish Water is focused on sustainability and aggressive leakage reduction)	-10,431 m ³ /d	<p>Increased leakage savings beyond SELL would reduce the SDB deficit and the overall need requirement. The need drivers span across the WRZs in SAF and are driven by quality as well as availability issues.</p> <p>This could allow lower than expected energy and carbon emissions and lower increased abstraction requirements.</p>



6

SEA Cumulative Effects for SAF Preferred Approach

6 SEA Cumulative Effects for SAF Preferred Approach

Secondary, cumulative and the synergistic nature of the effects of the SAF 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 North West 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 SAF

The potential 'within plan' cumulative effects for SAF 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
- The North West Region level: Considering combined effects from proposals in the seven 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 effect's 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 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 SAF

SAF-021	LR											
SAF-030												
SAF-038	LR	LR										
SAF-039												
SAF-052												
SAF-068												
SAF-084				RSC								
SAF-156												
SAF-161												
SA Option 29 (SAF-066 & 128)												
SA Option 34 (SAF-081 & 133)				RSC				RSC				
SA Option 42 (SAF-148 & 149)								N63	LOC			
Preferred Approach	SAF-009	SAF-021	SAF-030	SAF-038	SAF-039	SAF-052	SAF-068	SAF-084	SAF-156	SAF-161	SA Option 29 (SAF-066 & 128)	SA Option 34 (SAF-081 & 133)

Key	
Construction Phase	
Operation Phase	
Construction and Operation	
Lough Oughter Complex SPA	LOC
Lough Ree SPA	LR
River Suck Callows SPA	RSC
N63 Road	N63

There could be cumulative effects associated with construction in terms of traffic, noise and dust for the options located along the N63 road (indicated by N63 in Table 6.1). These could be mitigated by standard mitigation measures such as planning of construction traffic routes and movements and engaging with local residents about the disruption. With these standard good practice measures in place, there are unlikely to be significant cumulative effects.

There is potential for cumulative effects from disturbance on Lough Ree SPA and River Suck Callows SPA if construction of options SAF-009, 021 and 038 (shown as 'LR' in Table 6.1), and SAF-038, 084, and SA option 34 (shown as 'RSC' in Table 6.1) are concurrent, respectively. There is also potential for cumulative effects from disturbance on Lough Oughter Complex SPA if construction of options SAF-156 and SA option 42 (shown as 'LOC' in Table 6.1) are concurrent. However, these can be managed by standard good practice mitigation, such as having buffers along the edge of the river and having an emergency plan in place during construction. With these standard good practice measures in place, there are unlikely to be significant cumulative effects to the Slaney River Valley SAC. 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

Due to the distances between options the SEA identified, at a plan level, that there are unlikely to be significant cumulative effects outside of the hydrological connections. 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). This hydrogeological assessment considers the abstraction quantities and proximities and concludes that all of the WFD groundwater bodies affected by abstractions have a good quantitative status, therefore, the likelihood of affecting their WFD objectives is low, and no interaction was identified with existing Irish Water abstractions.

The potential for cumulative effects on European designated sites has been considered in the NIS. The NIS concluded that there will be no operational cumulative effects to the sites.

There could also 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 SAF this averages as 0.48 tCO₂e/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.

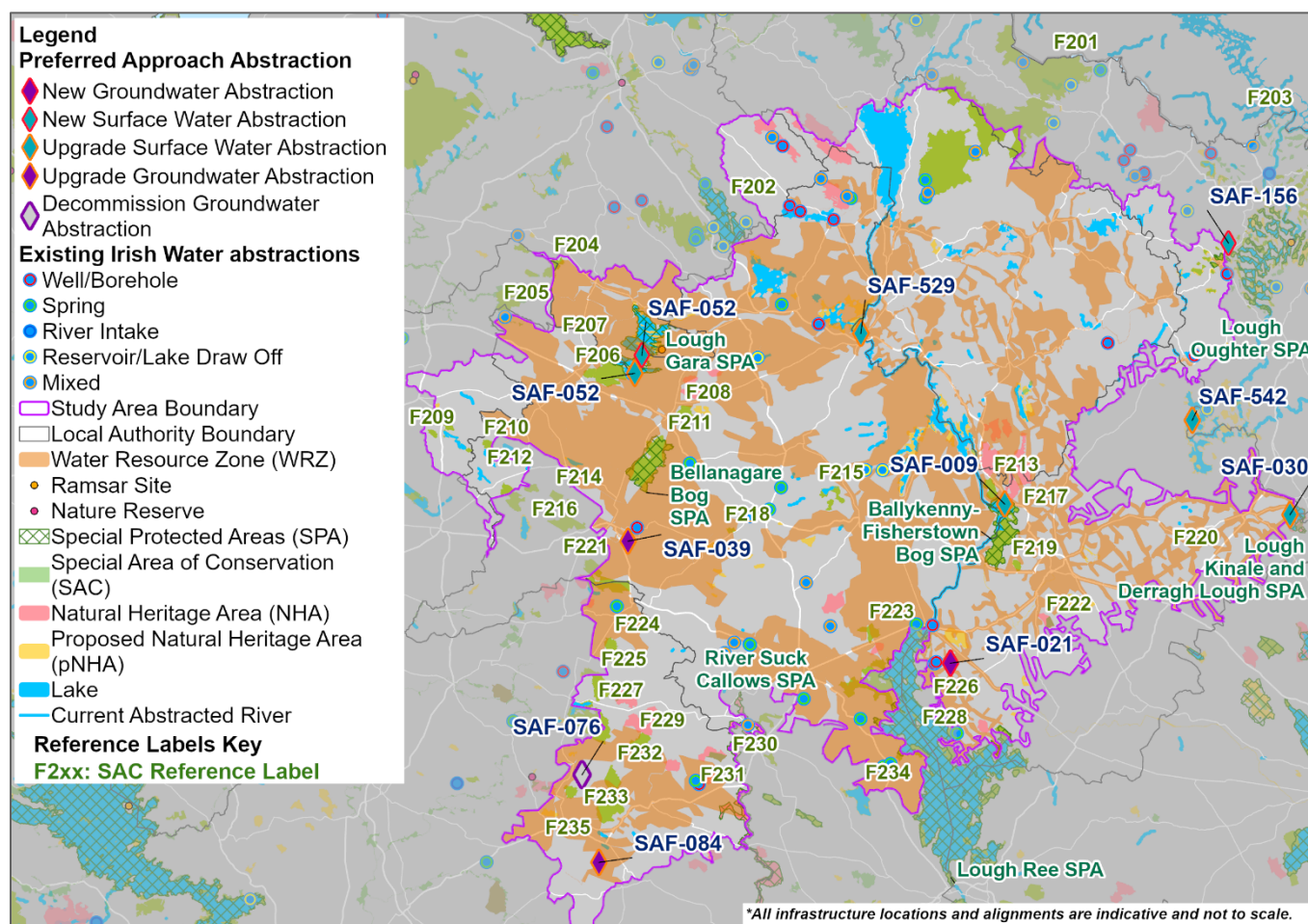


Figure 6.1 SA Preferred Approach Abstractions in SAF

6.2 Cumulative Effects with Other Developments

The SAF Preferred Approach has been assessed alongside other developments that could occur within the plan area. Potential cumulative 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 SAF there are numerous other developments near or in Roscommon and Longford. Other developments that were not considered further due to the size and the distance of the developments from the SA Preferred Approach are the An Chistin Project; Autumn View, Summerhill, Carrick on Shannon; Carrick On Shannon Community Nursing Unit; Creative Studios Ballaghaderreen, DigiWest - Location #2 of 4 - Tulsk; Roscommon Rehabilitation Unit; Sacred Heart Hospital, Roscommon; and St Joseph's Care Centre, Longford.

6.2.1 Cumulative Effects during Construction

The projects near or in Roscommon, Longford and along the N4, N60, N61 and N63 road could result in cumulative effects with the SAF Preferred Approach if they were to be constructed at the same time

(represented in Table 6.2 as 'R', 'L', 'N4', 'N60', 'N61' and 'N63' respectively). Projects near or in Roscommon include the Public Realm Plan - Market Square & Main Street, Roscommon Sewerage Scheme and Roscommon Town Centre. Projects near or in Longford include Longford Connected and the Royal Canal Branch Line Greenway- Kilashee to Longford Town.

Potential effects could include increased traffic and noise to the residential and commercial properties near or in Roscommon and Longford and along the N4, N60, N61 and N63 roads. These could be mitigated by standard mitigation measures, such as planning 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.

The plan level assessment indicates that 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.

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

Preferred Approach Options														
Project Developments	SAF-009	SAF-021	SAF-030	SAF-038	SAF-039	SAF-052	SAF-068	SAF-072	SAF-084	SAF-156	SAF-161	SA Option 29 (SAF-066 & 128)	SA Option 34 (SAF-081 & 133)	SA Option 42 (SAF-148 & 149)
4-Strand Rural Regeneration Intervention for Drumshambo (ExCHANGE)														
An Bealach Project														
Athlone to Ballyleague/ Lanesborough Greenway		N63		N63					N63				N63	
Ballaghdereen Public Realm Enhancement														
Boyle Regeneration				N61										
Carrick on Shannon to Battlebridge Blueway														
Energising Boyle Town Centre and King House				N61										
Enhancement of Attractiveness of Lanesborough as a Tourism Destination	LR1/ BF	LR1/ N63 LR2		LR1/ N63/ LR2					N63				N63	
Granard Destination Town														

Preferred Approach Options														
Project Developments	SAF-009	SAF-021	SAF-030	SAF-038	SAF-039	SAF-052	SAF-068	SAF-072	SAF-084	SAF-156	SAF-161	SA Option 29 (SAF-066 & 128)	SA Option 34 (SAF-081 & 133)	SA Option 42 (SAF-148 & 149)
Historic Granard Motte Project	N4		LKD/ LS/ LD/ GB									N4		
Longford Connected	L/ LR1/ BF/ N4 LF	L/ N63/ LR1		L/ N63/ LR1					N63			N4	N63	
Lough Key to Carrick-on-Shannon Greenway														
Lough Ree Greenway - Ballyleague/ Lanesborough to Tarmonbarry/ Strokestown/ Roosky														
Mid Shannon Wilderness - Corlea Bog Greenway														
Mid Shannon Wilderness Greenway - Kilnacarrow Bridge-Darogue/ Ballymacormack														

Preferred Approach Options														
Project Developments	SAF-009	SAF-021	SAF-030	SAF-038	SAF-039	SAF-052	SAF-068	SAF-072	SAF-084	SAF-156	SAF-161	SA Option 29 (SAF-066 & 128)	SA Option 34 (SAF-081 & 133)	SA Option 42 (SAF-148 & 149)
Mohill Public Realm														
N5 Ballaghaderreen to Scramoge	LF					LG/ BB								
Public Realm Plan - Market Square & Main Street	R/ LR1	R/ N63/ LR1 LR2		R/ LR1/ N61/ LR2/ N63/ RSC	N60				R/ RSC/ FR/ N63/ LC				R/ N63/ RSC	
Rejuvenating Strokestown's Potential														
Roscommon Sewerage Scheme	R/ LR1	R/ N63/ LR1 LR2		R/ LR1/ N61/ LR2/ N63/ RSC	N60				R/ RSC/ FR/ N63/ LC				R/ N63/ RSC	
Roscommon Town Centre	R/ LR1	R/ N63/ LR1 LR2		R/ LR1/ N61/ LR2/	N60				R/ RSC/ FR/ N63/ LC				R/ N63/ RSC	

Preferred Approach Options														
Project Developments	SAF-009	SAF-021	SAF-030	SAF-038	SAF-039	SAF-052	SAF-068	SAF-072	SAF-084	SAF-156	SAF-161	SA Option 29 (SAF-066 & 128)	SA Option 34 (SAF-081 & 133)	SA Option 42 (SAF-148 & 149)
				N63/ RSC										
Royal Canal Branch Line Greenway- Kilashee to Longford Town	L/ LR1/ BF/ N4	L/ N63/ LR1		L/ N63/ LR1					N63			N4	N63	
Smart Green Mohill														
The Junction, Ballinamore - Regeneration of Ballinamore														

Key	
Construction Phase	
Operation Phase	
Construction and Operation	
Corliskea/ Trien/ Cloonfelliv Bog SAC	CTC
Lough Oughter Complex SPA	LOC
Lough Ree SPA	LR1
Lough Ree SAC	LR2
River Suck Callows SPA	RSC
Ballykenny-Fisherstown Bog SPA	BF
Lough Forbes Complex SAC	LF
Lough Kinale and Derragh Lough SPA	LKD
Lough Sheelin SPA	LS
Lough Derravarragh SPA	LD
Garriskil Bog SPA	GB
Lough Gara SPA	LG
Bellanagare Bog SPA	BB
Four Roads Turlough SPA	FR
Lough Croan Turlough SPA	LC
N4 Road	N4
N60 Road	N60
N61 Road	N61
N63 Road	N63
Longford	L
Roscommon	R

6.2.2 Cumulative Effects during Operation

There could be cumulative effects on Lough Ree SAC and Lough Forbes Complex SAC from habitat degradation and water table/availability if operation of the SAF Preferred Approach and Longford Connected, Enhancement of Attractiveness of Lanesborough as a Tourism Destination, Public Realm Plan - Market Square & Main Street, Roscommon Sewerage Scheme, and Roscommon Town Centre are concurrent. There could also be cumulative effects on Lough Forbes Complex SAC from habitat degradation if operation of the SAF Preferred Approach and N5 Ballaghaderreen to Scramoge are concurrent.

The Enhancement of Attractiveness of Lanesborough as a Tourism Destination could impact the River Shannon which is hydrologically linked upstream of the Lough Ree SAC. Longford Connected could

impact the Camlin stream which is hydrologically linked to the Lough Forbes Complex SAC. The Public Realm Plan - Market Square & Main Street, Roscommon Sewerage Scheme, and Roscommon Town Centre schemes could impact the River Hind which is hydrologically connected to the Lough Ree SAC. These hydrological links in combination with the SAF Preferred Approach have the potential to result in cumulative effects during operation. However, with the implementation of standard good practice measures there will be no adverse effects on the integrity of these European sites.

The plan level assessment indicates that 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 SAF 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 SAF and a range of options and SA approaches have been considered and assessed, including a 'Do Minimum' approach.

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

Key potential adverse impacts identified at plan level include:

- Moderate adverse effects during operation for SAF-156 as there is the potential for permanent amenity area loss for the new WTP;
- Moderate adverse effects during construction for SA options 34 and SAF-009, 021, 030, 034, 052 and 084 due to the options being within (009, 030 and 052), within the zone of influence of (009, 030, SA option 34 and 084), within the zone of contribution of (021), and/or hydrologically linked to (030, SA option 34, 052 and 084) European designated sites. There is the potential for disturbance to QI species, loss (030 and 052 only) and pollution (030, SA option 34, 052 and 084) of protected and supporting habitats;
- Moderate adverse effects during construction for SAF-156 associated with the new assets and upgrade works and their impacts on non-designated wildlife and biodiversity;
- Moderate adverse effects during operation for SA option 34 as it is within the ZOI of and is hydrologically linked to European designated sites with the potential for habitat degradation and a reduction in flow and water availability;
- Moderate adverse effects to environmental climate change resilience with options SA option 29 and 34, and SAF-039 due to the requirement of increased surface water (SA option 29 and 34) and groundwater (039) abstraction at an unsustainable rate;
- Moderate adverse effects for greenhouse gas emissions associated with SA option 29 and 34, and SAF-009 due to the requirement of pumping water through over 20km of pipeline;
- Major adverse effects during operation for SAF-039 as a result of potential risks to groundwater quality as high level assessment indicates that increase abstraction could cause major adverse long-term impacts to groundwater. Further studies are required to understand impacts and develop mitigation; and
- Moderate adverse effects for SAF-030 during construction as the option is located at a known geological heritage site and there is potential risk of moderate damage to valuable soils with construction of the new asset.

Cumulative effects assessment identified potential significant adverse effects in relation to carbon emissions, although the individual options are assessed as only neutral to moderate in relation to this SEA objective. This is because potential increases in carbon emissions contribute to national emissions. The average carbon intensity from the individual options provides an indicator for the new options in SAF but does not provide a complete picture as it does not fully take account of efficiencies from replacement of failing infrastructure, treatment technology or potential for mitigation, such as 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 includes further hydrological or hydrogeological modelling (as appropriate) to further inform understanding of potential impacts on European and national designated sites identified as potentially affected by increased abstractions from existing surface and groundwater sources (see the NIS of the Framework Plan for further information). Other mitigation identified includes development of construction environmental management plans, public consultation with local residents on disruption during construction and consideration of the waste hierarchy in design. 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 O Moderate Adverse 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.	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> Duration of construction works, and number of complaints received regarding construction works Duration of temporary closures of footpaths and other recreational assets Number of days where recreational uses are impeded
2. Protect and enhance biodiversity and contribute to	C Neutral to Moderate Adverse O Neutral to Moderate Adverse Impacts from construction works for pipelines and service reservoirs on biodiversity. These can be	Routing/siting to avoid impacts. Standard good construction practice and specific measures as identified in the NIS of the Framework Plan.	<ul style="list-style-type: none"> Temporary and permanent habitats lost vs habitats created/enhanced 	<ul style="list-style-type: none"> 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
resilient ecosystems	<p>minimised through careful routing and siting.</p> <p>Potential for construction and operational impacts on European and National designated sites.</p>	<p>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.</p> <p>Further hydrological/hydrogeological assessments to determine impacts on designated sites.</p> <p>Operating rules to limit impacts on European and National sites.</p>	<ul style="list-style-type: none"> Site condition and population data for QI of European and National designated sites 	
3. To protect landscapes, townscapes and visual amenity	<p>C Neutral to Minor Adverse</p> <p>O Minor Adverse to Minor Beneficial</p> <p>Construction landscape impacts and long term impacts from above ground structures, such as new WTPs.</p>	<p>Routing and siting to reduce tree loss and appropriate location and design of above ground structures with landscape planting.</p> <p>Reinstatement of land use and vegetation.</p>	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> Duration of construction works Number of complaints received regarding visual impact of construction works
4. Protect and where appropriate enhance, built	<p>C Neutral to Moderate Adverse</p> <p>O Neutral</p> <p>New resources required for construction works, including</p>	<p>Materials management to be integrated into design to optimise use of existing resources and</p>	<ul style="list-style-type: none"> Loss of greenfield land, including agricultural, forestry or other land uses 	<ul style="list-style-type: none"> Construction wastes sent to landfill

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
and natural assets and reduce waste	lengths of pipeline, service reservoirs and new/upgraded WTPs. Ongoing maintenance requirements.	minimise waste from construction and operation.	<ul style="list-style-type: none"> • Disruptions to strategic infrastructure/services • Use of waste management plans • Volume of drinking water treatment residuals sent to landfill 	
5. Reduce greenhouse gas emissions	<p>C Neutral to Moderate Adverse</p> <p>O Neutral to Moderate Adverse</p> <p>Embodied and operational carbon contribute to national level carbon emission targets.</p> <p>Leakage and water efficiency can contribute to reducing carbon.</p>	<p>Design to minimise embodied carbon emissions and optimise operational efficiency.</p> <p>Seek renewable energy supply sources and optimise use of leakage and water efficiency measures to reduce carbon.</p> <p>Consider offsetting approaches with multiple benefits for water quality, carbon sequestration and linking with other objectives.</p>	<ul style="list-style-type: none"> • 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) 	<ul style="list-style-type: none"> • Carbon footprint (total tonnes) during construction • Operational Carbon Intensity kgsCO₂equic/ML
6. Contribute to environmental climate	<p>C Neutral to Moderate Adverse</p> <p>O Neutral to Moderate Adverse</p> <p>Abstractions generally reduce environmental resilience but</p>	Consider how operation can further reduce climate change pressure on at risk sources and associated designations,	<ul style="list-style-type: none"> • WFD waterbody status objectives at risk and designated site condition status 	<ul style="list-style-type: none"> • None identified

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
change resilience	overall improved flexibility for operation using regional schemes has the potential to reduce pressure on at risk local resources. SA option 29, 34 and SAF-039 require further assessment to understand their sustainability in the longer term.	particularly for SA option 29, 34 and SAF-039. Sustainability review of sources taking account of groundwater and surface water interconnections for SA option 29, 34 and SAF-039.	<ul style="list-style-type: none"> Frequency of drought orders requiring change to normal abstractions/ compensation releases 	
7. Protect and improve surface water and groundwater status	C Neutral O Neutral to Major Adverse Generally, new/increased abstractions are limited to allowable limits and have a low risk of adverse effect on WFD waterbody status objectives.	Further investigation to consider effects on groundwater abstraction on the surface water environment.	<ul style="list-style-type: none"> WFD waterbody status objectives at risk 	<ul style="list-style-type: none"> Pollution incidents during construction
8. Avoid flood risk	C Neutral to Minor Adverse O Neutral Potential loss of flood plain increasing flood risk from construction and location of above	Siting and design of schemes to take account of flood risk and design for flood risk resilience.	<ul style="list-style-type: none"> Number of options at risk of flooding at each AEP level 	<ul style="list-style-type: none"> Lost time to flooding Lost time to power supply interruptions

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
	ground structures for SAF-009 and SA option 29.			
9. Protect and where appropriate, enhance cultural heritage assets	C Neutral to Minor Adverse O Neutral to Minor Adverse Potential construction impacts on unknown archaeological interest. Impacts on known interests are expected to be avoided.	Standard good practice approaches to minimise potential impacts.	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • Number of archaeological finds recorded during construction
10. Protect quality and function of soils	C Neutral to Moderate 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.	<ul style="list-style-type: none"> • Soil Management Plans implemented • Volume of contaminated land restored, or soils removed 	<ul style="list-style-type: none"> • 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 SAF are also 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.

All groundwater bodies used for the SAF abstractions have good quantitative status (Irish Water, 2022), therefore, the likelihood of affecting their WFD objectives in terms of quantitative status is low. However, the Clare-Corrib GWB is currently 'at risk' of failing its WFD objectives. 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 SAF, 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 Forbes Complex SAC, Lough Ree SPA, Lough Ree SAC, Ballykenny-Fisherstown Bog SPA, Lough Kinale and Derragh Lough SPA, Lough Sheelin SPA, Lough Derravarragh SPA, River Suck Callows SPA, Lough Gara SPA, Bellanagare Bog SPA, Four Roads Turlough SPA, and Lough Croan Turlough SPA. The potential effects include habitat degradation, water table/availability, pollution, and disturbance impacts. 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 Lough Oughter Complex SPA, Lough Ree SPA, and River Suck Callows SPA with the potential for disturbance. 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 the North West 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 Augmenting Current Source Options in SAF

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
SAF-166	Augment current sources at Dunmore Glenamaddy and/or Kilkerrin/Moylough and supply Dunmore Glenamaddy, Kilkerrin/Moylough, Mountbellew, Ballygar and Ballymoe									2	0	-21
SAF-167	Augment current sources at Dunmore Glenamaddy and/or Kilkerrin/Moylough and supply Dunmore									2	0	-23

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
	Glenamaddy, Kilkerrin/Moylough, Mountbellew, Ballygar and Ballymoe											
SAF-168	Augment current sources at Dunmore Glenamaddy and/or Kilkerrin/Moylough and supply Dunmore Glenamaddy, Kilkerrin/Moylough, Mountbellew, Ballygar and Ballymoe									2	0	-23
SAF-169	Augment current sources at Dunmore Glenamaddy and/or Kilkerrin/Moylough and supply Dunmore Glenamaddy, Kilkerrin/Moylough, Mountbellew, Ballygar and Ballymoe									2	0	-23

Table A.2 Fine Screening Summary of Critical Infrastructure Options in SAF

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
SAF-095	Critical Infrastructure - part of outline design									0	1	-15

Table A.3 Fine Screening Summary of Ground Water Options in SAF

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
SAF-006	New GW abstraction (Carrick-on-Shannon GWB, Newtown-Ballyconnell GWB, Annaghmore GWB,									1	0	-15

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
	Scramoge North GWB) to supply full/part of the deficit in WRZ											
SAF-010	New GW abstraction (Newtown Forbes GWB) to supply full/part of the deficit in WRZ									0	0	-11
SAF-013	Supply part of the deficit from Lanesboro BHs									1	0	-17
SAF-018	Abandon existing ESB BHs location site with capacity of 1.9MLD (not IW owned). Develop a new wellfield in the vicinity of current BHs.									2	0	-22
SAF-020	Increase GW abstraction at Ballagha Spring (Newtowncashel) and upgrade WTP									1	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
SAF-021	New GW abstraction to supply deficit at Lanesboro & Newtowncashel, upgrade Lisreevagh WTP									0	0	-12
SAF-033	New GW to supply deficit in Granard WRZ, upgrade Lough Kinale WTP									0	0	-14
SAF-039	Increase GW abstraction at Longford Springs to supply deficit and upgrade WTP									1	0	-12
SAF-041	Longford Springs WTP upgrade only									0	0	-1
SAF-049	Increase GW abstraction and interconnect Castlerea Regional WRZ with North Roscommon WRZ									1	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
SAF-053	New GW abstraction - Creevy groundwater source									0	0	-16
SAF-054	New GW abstraction (Swinford Gravels GWB, Gweestion-Moy Gravels Group 1 GWB, Carrick-on-Shannon GWB, Ballymote GWB)									0	0	-15
SAF-059	Increase GW abstraction at Boyle Ardcarne WRZ to supply deficit									0	0	-9
SAF-060	New GW abstraction at Boyle Ardcarne WRZ to supply deficit									0	0	-15
SAF-069	Interconnect with Boyle Ardcarne to supplement this supply									1	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
SAF-076	Increase GW abstraction for Kilkerrin Moylough WRZ to supply deficit									0	0	-10
SAF-077	New GW abstraction for Kilkerrin Moylough WRZ to supply deficit									0	0	-19
SAF-084	Increase GW abstraction for Mountbellew WRZ to supply deficit									0	0	-9
SAF-085	Increase GW abstraction from Balligar spring WRZ to supply deficit									1	0	-12
SAF-086	New GW abstraction for Mountbellew WRZ to supply deficit									0	0	-18
SAF-098	Develop new wellfield in conjunction with GWS augmentation (Polecat Springs) and supply part of the deficit from North									1	0	-19

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
	East Regional WRZ (Co. Roscommon).											
SAF-101	Develop new wellfield in conjunction with GWS augmentation (Polecat Springs) and supply part of the deficit from North East Regional WRZ (Co. Roscommon).									1	0	-20
SAF-104	Supply part Lanesborough & Newtowncashel from North East Regional WSS									1	0	-12
SAF-105	Increase GW Ballinagard spring abstraction to supply Lanesboro & Newcashel WRZ, upgrade WTP									1	0	-15

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
SAF-106	Increase GW abstraction at Ballinagard WTP and supply Lanesboro & Newcashel									0	0	-15
SAF-121	Increase GW abstraction at Ballinagard WTP to fully cover Castlereas demand									1	0	-15
SAF-124	Increase GW abstraction from unnamed spring between Killaturly and Charlestown and supply North Roscommon									2	0	-19
SAF-126	Supply deficit in Boyle from North East Regional PWS									0	0	-22
SAF-131	Increase GW abstraction at Danganbeg WTP and supply Kilkerrin/Moylough									0	0	-15

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
SAF-133	Increase GW abstraction at Gortgarrow Spring, upgrade WTP									1	0	-15
SAF-136	Increase GW spring abstraction at Cloonlaughnan WTP, rationalise the Ballygar WTP and connect Mountbellew to Mount Talbot/Four Roads									2	0	-15
SAF-159	Develop new wellfield - groundwater potential. Supply deficit to neighbouring WRZs									0	0	-19
SAF-157	Increase GW spring abstraction and supply Mountbellew and Ballygar									2	0	-17
SAF-158	Increase GW abstraction and supplement Longford									1	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
	Central from Lanesboro BHs											
SAF-171	Further develop existing TW's at Lough Garra WTP to partly supply full demand (Abandon existing Lough Gara source)									2	0	-24
SAF-172	Further develop existing TW's at Creevy to partly supply full demand (Abandon existing Lough Gara source)									2	0	-24
SAF-173	New GW development in vicinity of Creevy to partly supply full demand (Abandon existing Lough Gara source)									2	0	-24
SAF-174	New GW development in vicinity of Lissian to partly									2	0	-24

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
	supply full demand (Abandon existing Lough Gara source)											
SAF-175	Increase GW abstraction and interconnect Castlerea Regional WRZ with North Roscommon WRZ (Abandon existing Lough Gara source)									3	0	-26

Table A.4 Fine Screening Summary of Ground Water and Interconnection Options in SAF

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
SAF-007	Supply part of the deficit from North East Regional WRZ (Co. Roscommon)									1	0	-19
SAF-014	Supply part of the deficit from North East Regional WRZ (Co. Roscommon)									1	0	-20
SAF-022	Supply part Lanesborough & Newtowncashel from North East Regional WSS									1	0	-12
SAF-024	Supplement Lanesborough with Roscommon Central (Ballinagard WTP)									0	0	-15
SAF-055	Interconnect North Roscommon WRZ and Charlestown WRZ									2	0	-19

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
	(unnamed spring between Killaturly and Charlestown)											
SAF-064	Supply deficit in Boyle from North East Regional PWS									0	0	-22
SAF-089	Increase GW (spring) abstraction at Cloonlaughnan WTP, rationalise the Ballygar WTP and connect Mountbellew to Mount Talbot/Four Roads									2	0	-15
SAF-122	Interconnect Castlereagh Regional WRZ with North Roscommon WRZ									1	0	-17

Table A.5 Fine Screening Summary of Ground Water and Rationalisation Options in SAF

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
SAF-023	Rationalise Lanesborough to Roscommon Central (Ballinagard WTP)									1	1	-14
SAF-048	Rationalise Castlerea Regional WRZ to Roscommon Central									1	1	-14
SAF-079	Rationalise Kilkerrin Moylough to Mid-Galway WRZ									0	1	-14
SAF-081	Rationalise to Dunmmore Glenamaddy									1	1	-14
SAF-090	Increase GW (spring) abstraction at Cloonlaughnan WTP, rationalise the Ballygar WTP and connect									2	0	-15

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
	Mountbellew to Mount Talbot/Four Roads											
SAF-091	Mount Talbot four roads approx. 3km - very good source and can potentially supply Mountbellew									2	1	-16

Table A.6 Fine Screening Summary of Group Water Scheme Options in SAF

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
SAF-034	Supply Granard from neighbouring Group Water Scheme									1	0	-13
SAF-046	Connect neighbouring Group Water Schemes (Carane/Ballintubber, Ballymacurley/Kiltultoge, Shadlough, Grage Lower, Grange/Four-Mile-House, Ogulla/Tulsk, Rathcroghan, Clooneyquinn, Peake Mantua, Creglahan/Cloonchambers, Clooneygrasson, Rathcarren and Donamon) with Castlerea and create a new Mid-Roscommon Water Supply Scheme									0	0	-16

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
SAF-150	Keep supplying Killeshandra WRZ from Erne Valley GWS.									0	0	-11

Table A.7 Fine Screening Summary of Interconnection Options in SAF

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
SAF-050	Interconnect Castlereagh Regional WRZ with Ballymoe WRZ									1	0	-15
SAF-123	Interconnect Castlereagh Regional WRZ with									1	0	-15

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
	Ballymoe WRZ and supply deficit											
SAF-129	Supply deficit from Arigna Regional PWS									1	0	-18
SAF-162	Interconnect Dunmore Glenamaddy, Kilkerrin/ Moylough, Mountbellew, Ballygar and Ballymoe and supply from Tuam									2	0	-18
SAF-163	Interconnect Dunmore Glenamaddy, Kilkerrin/ Moylough, Mountbellew, Ballygar and Ballymoe and supply from Tuam									2	0	-18
SAF-164	Interconnect Dunmore Glenamaddy, Kilkerrin/ Moylough, Mountbellew, Ballygar and Ballymoe and supply from Tuam									2	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
SAF-165	Interconnect Dunmore Glenamaddy, Kilkerrin/ Moylough, Mountbellew, Ballygar and Ballymoe and supply from Tuam									2	0	-18

Table A.8 Fine Screening Summary Surface Water Options in SAF

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
SAF-001	Increase SW abstraction from River Shannon, upgrade Carrick on Shannon WTP									1	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
SAF-002	New SW abstraction from Lough Allen									1	0	-19
SAF-004	Increase SW abstraction from River Shannon and interconnect Boyle Ardcarne and South Leitrim WRZs for increased resilience									1	0	-17
SAF-005	Supply part of SLRWSS from Lough Forbes WTP for increased resilience									1	0	-19
SAF-009	Increase SW abstraction from Lough Forbes and upgrade WTP									1	0	-16
SAF-030	Increase SW abstraction from Lough Kinale, re-locate existing intake and upgrade WTP									0	0	-13
SAF-031	New SW abstraction from Lough Sheelin to supply									1	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
	deficit at Granard WRZ, upgrade Lough Kinale WTP											
SAF-052	Abandon existing intake. New intake from middle lake to meet full demand. New 1.6km raw water mains to existing WTP. Upgrade of WTP to meet full demand.									1	0	-13
SAF-057	New SW abstraction from Lough Arrow to supply deficit at North Roscommon RWSS, new WTP									0	0	-23
SAF-061	New SW abstraction from Lough Key to supply deficit at Boyle Regional, new WTP									0	0	-24

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
SAF-062	New SW abstraction from Lough Allen to supply deficit at Boyle Regional, new WTP									0	0	-17
SAF-063	New SW abstraction from Lough Arrow to supply deficit at Boyle Regional, new WTP									0	0	-23
SAF-087	New SW abstraction from Castlegar River, connection to existing Mountbellew WTP and WTP upgrade to supply deficit									0	0	-11
SAF-097	Increase SW abstraction from Lough Forbes and supplement Carrick-on-Shannon WRZ, upgrade Lough Forbes WTP									1	0	-19

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
SAF-100	Supplement part of Longford Central deficit from Abbeyshrule WTP - River Inny (Ballymahon WRZ)									0	0	-10
SAF-102	Increase SW from Lough Kinale and interconnect Longford Central and Granard to supply deficit and increase resilience									0	0	-13
SAF-108	Increase SW abstraction from River Inny to cover deficit for Ballymahon and supply full demand of Lanesboro & Newtowncashel, upgrade Abbeyshrule WTP									0	2	-8
SAF-109	Increase SW abstraction from Lough Forbes to cover deficit in Longford									1	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
	Central and Lanesboro & Newtowncashel WRZ, upgrade Lough Forbes WTP											
SAF-110	Increase SW abstraction from Lough Forbes to cover deficit in Longford Central and supply full demand for Lanesboro & Newtowncashel WRZ, upgrade Lough Forbes WTP									1	0	-16
SAF-111	Increase SW abstraction from Lough Forbes to cover deficit in Longford Central and Granard WRZ, upgrade Lough Forbes WTP									1	0	-17
SAF-112	Increase SW abstraction from Lough Forbes to cover deficit in Longford									1	0	-16

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
	Central and supply full demand for North East Regional PWS, upgrade Lough Forbes WTP											
SAF-120	Increase SW abstraction and rationalise Castlerea and Ballymoe									0	0	-22
SAF-125	Increase SW abstraction from Lough Mask to supply deficit at Lough Mask & Westport WRZ, upgrade WTP									0	0	-20
SAF-127	Rationalise Boyle Ardcarne to South Leitrim WRZ (increase abstraction from Shannon and upgrade WTP)									1	0	-16
SAF-128	Interconnect Boyle Ardcarne with South									1	0	-16

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
	Leitrim WRZ and supply deficit (increase abstraction from Shannon and upgrade WTP)											
SAF-130	Increase SW abstraction from Lough Mask to supply deficit at Lough Mask & Westport WRZ, upgrade WTP									0	0	-17
SAF-132	Supply Kilkerrin/Moylough									0	0	-10
SAF-134	Increase SW abstraction from Lough Mask and supply Kilkerrin/Moylough WRZ, upgrade WTP									0	0	-13
SAF-149	Increase SW abstraction and supply Arvagh									0	1	-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
SAF-156	New SW abstraction from Lake Town and new WTP									1	0	-22
SAF-160	Interconnect Dunmore/Glenamaddy, Kilkerrin Moylough, Mountbellew, Ballymoe to create regional scheme for increased resilience and rationalise to Lough Mask									0	0	-16

Table A.9 Fine Screening Summary of Surface Water and Interconnection Options in SAF

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
SAF-012	Supply part of the deficit from Abbeyshrule WTP - River Inny (Ballymahon WRZ)									0	0	-10
SAF-015	Interconnect Longford Central and Granard to supply deficit and increase resilience									0	0	-13
SAF-028	Supply deficit from upgraded Lough Forbes WTP (Longford Central WRZ)									0	0	-15
SAF-032	Supply deficit to Granard from Lough Forbes WTP (Longford)									0	0	-14
SAF-066	Interconnect Boyle Ardcarne with South									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
	Leitrim WRZ and supply deficit											
SAF-096	Interconnect Boyle Ardcarne and South Leitrim WRZs for increased resilience									0	0	-14

Table A.10 Fine Screening Summary of Surface Water and Rationalisation Options in SAF

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
SAF-027	Rationalise Lanesboro & Newtowncashel WRZ to Ballymahon WRZ									0	2	-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
	(upgrade Abbeysrule WTP)											
SAF-029	Rationalise Lanesboro & Newtowncashel WRZ to Longford Central WRZ (upgrade Lough Forbes WTP)									0	2	-12
SAF-036	Rationalise North East Regional to Longford Central (Lough Forbes) for increased resilience									0	2	-12
SAF-047	Rationalise Castlerea Regional WRZ to Lough Mask									0	0	-22
SAF-058	Rationalise NRRWSS to Lough Mask RWSS									0	0	-20
SAF-065	Rationalise Boyle Ardcame to South Leitrim WRZ (increase abstraction from									0	1	-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
	Shannon and upgrade WTP)											
SAF-074	Rationalise Ballymoe to Lough Mask									0	0	-17
SAF-080	Rationalise to Tuam RWSS (Luimnagh)									0	0	-10
SAF-082	Rationalise to Lough Mask									0	1	-12
SAF-144	Interconnect Dunmore/Glenamaddy, Kilkerrin Moylough, Mountbellew, Ballymoe to create regional scheme for increased resilience and rationalise to Lough Mask									0	1	-15
SAF-145	Interconnect Dunmore/Glenamaddy, Kilkerrin Moylough, Mountbellew, Ballymoe to									0	1	-15

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
	create regional scheme for increased resilience and rationalise to Lough Mask											
SAF-146	Interconnect Dunmore/Glenamaddy, Kilkerrin Moylough, Mountbellew, Ballymoe to create regional scheme for increased resilience and rationalise to Lough Mask									0	1	-15
SAF-148	Rationalise Arvagh to Gowna WRZ.									0	1	-9
SAF-094	Interconnect Dunmore/Glenamaddy, Kilkerrin Moylough, Mountbellew, Ballymoe to create regional scheme for increased resilience									0	0	-16

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
	and rationalise to Lough Mask											
SAF-170	Rationalise Ballymoe to Lough Mask									2	0	-25

Table A.11 Fine Screening Summary of WTP Options in SAF

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
SAF-038	WTP Upgrade - Roscommon Central WSS not in deficit, pump tests to prove high yield spring and BHs									0	0	-5

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
SAF-068	Arigna Regional PWS not in deficit - Castletenison WTP Upgrade									0	0	-6
SAF-072	Ballymoe WTP upgrade - no deficit									0	0	-9

Table A.12 Fine Screening Summary of WTP Upgrade Options in SAF

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
SAF-161	Not in deficit - Grange WTP upgrade									0	0	-9

Appendix B SA Approaches for SAF

Note: SA Options are also referred to as Group Options

WRZ	Preferred Approach - SA Approach 1		Least Cost - SA Approach 1		Best Environmental - SA Approach 3	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
2600SC0007: Arigna Regional PWS	SAF-068 Arigna Regional PWS not in deficit - Castletenison WTP Upgrade	-	SAF-068 Arigna Regional PWS not in deficit - Castletenison WTP Upgrade	-	SAF-068 Arigna Regional PWS not in deficit - Castletenison WTP Upgrade	-
0200SC0001: Arvagh PWS (GWS Import)	SAF-148 Rationalise Arvagh to Gowna WRZ.	42	SAF-148 Rationalise Arvagh to Gowna WRZ.	42	SAF-148 Rationalise Arvagh to Gowna WRZ.	42
1200SC0001: Ballymoe P.S	SAF-072 Ballymoe WTP upgrade - no deficit	-	SAF-072 Ballymoe WTP upgrade - no deficit	-	SAF-072 Ballymoe WTP upgrade - no deficit	-
2600SC0008: Boyle Regional	SAF-066 Interconnect Boyle Ardcarne with South Leitrim WRZ and supply deficit	29	SAF-066 Interconnect Boyle Ardcarne with South Leitrim WRZ and supply deficit	29	SAF-059 Increase GW abstraction at Boyle Ardcarne WRZ to supply deficit	-
2600SC0003: Castlerea PWS	SAF-039 Increase GW abstraction at Longford Springs to supply deficit and upgrade WTP	-	SAF-039 Increase GW abstraction at Longford Springs to supply deficit and upgrade WTP	-	SAF-049 Increase GW abstraction and interconnect Castlerea Regional WRZ with North Roscommon WRZ	23
2000SC0002: Granard	SAF-030	-	SAF-030	-	SAF-030	-

WRZ	Preferred Approach - SA Approach 1		Least Cost - SA Approach 1		Best Environmental - SA Approach 3	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
	Increase SW abstraction from Lough Kinale, re-locate existing intake and upgrade WTP		Increase SW abstraction from Lough Kinale, re-locate existing intake and upgrade WTP		Increase SW abstraction from Lough Kinale, re-locate existing intake and upgrade WTP	
1100SC0001_F: Kilkerrin/Moylough	SAF-081 Rationalise to Dunmmore Glenamaddy	34	SAF-081 Rationalise to Dunmmore Glenamaddy	34	SAF-076 Increase GW abstraction for Kilkerrin Moylough WRZ to supply deficit	-
0200SC0005: Killeshandra PWS (GWS Import)	SAF-156 New SW abstraction from Lake Town and new WTP	-	SAF-156 New SW abstraction from Lake Town and new WTP	-	SAF-156 New SW abstraction from Lake Town and new WTP	-
200SC0001: Lanesboro & Newtowncashel	SAF-021 New GW abstraction to supply deficit at Lanesboro & Newtowncashel, upgrade Lisreevagh WTP	-	SAF-021 New GW abstraction to supply deficit at Lanesboro & Newtowncashel, upgrade Lisreevagh WTP	-	SAF-021 New GW abstraction to supply deficit at Lanesboro & Newtowncashel, upgrade Lisreevagh WTP	-
2000SC0005: Longford Central	SAF-009 Increase SW abstraction from Lough Forbes and upgrade WTP	-	SAF-009 Increase SW abstraction from Lough Forbes and upgrade WTP	-	SAF-009 Increase SW abstraction from Lough Forbes and upgrade WTP	-
1100SC0001_I: Mountbellew	SAF-084 Increase GW abstraction for Mountbellew WRZ to supply deficit	-	SAF-084 Increase GW abstraction for Mountbellew WRZ to supply deficit	-	SAF-084 Increase GW abstraction for Mountbellew WRZ to supply deficit	-

WRZ	Preferred Approach - SA Approach 1		Least Cost - SA Approach 1		Best Environmental - SA Approach 3	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
2600SC0002: North East Regional PWS	SAF-161 Not in deficit - Grange WTP upgrade	-	SAF-161 Not in deficit - Grange WTP upgrade	-	SAF-161 Not in deficit - Grange WTP upgrade	-
2600SC0009: North Roscommon RWSS	SAF-052 Abandon existing intake. New intake from middle lake to meet full demand. New 1.6km raw water mains to existing WTP. Upgrade of WTP to meet full demand.	-	SAF-052 Abandon existing intake. New intake from middle lake to meet full demand. New 1.6km raw water mains to existing WTP. Upgrade of WTP to meet full demand.	-	SAF-122 Interconnect Castlerea Regional WRZ with North Roscommon WRZ	23
2600SC0004: Roscommon Central WSS	SAF-038 WTP Upgrade - Roscommon Central WSS not in deficit, pump tests to prove high yield spring and BHs	-	SAF-038 WTP Upgrade - Roscommon Central WSS not in deficit, pump tests to prove high yield spring and BHs	-	SAF-038 WTP Upgrade - Roscommon Central WSS not in deficit, pump tests to prove high yield spring and BHs	-
1700SC0001: South Leitrim Regional Carrick-on-Shannon	SAF-128 Interconnect Boyle Ardcarne with South Leitrim WRZ and supply deficit (increase abstraction from Shannon and upgrade WTP)	29	SAF-128 Interconnect Boyle Ardcarne with South Leitrim WRZ and supply deficit (increase abstraction from Shannon and upgrade WTP)	29	SAF-001 Increase SW abstraction from River Shannon, upgrade Carrick on Shannon WTP	-

WRZ	Quickest Delivery - SA Approach 1		Most Resilient - SA Approach 4		Lowest Carbon - SA Approach 2	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
2600SC0007: Arigna Regional PWS	SAF-068 Arigna Regional PWS not in deficit - Castletenison WTP Upgrade	-	SAF-068 Arigna Regional PWS not in deficit - Castletenison WTP Upgrade	-	SAF-068 Arigna Regional PWS not in deficit - Castletenison WTP Upgrade	-
0200SC0001: Arvagh PWS (GWS Import)	SAF-148 Rationalise Arvagh to Gowna WRZ.	42	SAF-148 Rationalise Arvagh to Gowna WRZ.	42	SAF-148 Rationalise Arvagh to Gowna WRZ.	42
1200SC0001: Ballymoe P.S	SAF-072 Ballymoe WTP upgrade - no deficit	-	SAF-146 Interconnect Dunmore/Glenamaddy, Kilkerrin Moylough, Mountbellew, Ballymoe to create regional scheme for increased resilience and rationalise to Lough Mask	41	SAF-072 Ballymoe WTP upgrade - no deficit	-
2600SC0008: Boyle Regional	SAF-066 Interconnect Boyle Ardcarne with South Leitrim WRZ and supply deficit	29	SAF-059 Increase GW abstraction at Boyle Ardcarne WRZ to supply deficit	-	SAF-059 Increase GW abstraction at Boyle Ardcarne WRZ to supply deficit	-
2600SC0003: Castlereah PWS	SAF-039 Increase GW abstraction at Longford Springs to supply deficit and upgrade WTP	-	SAF-039 Increase GW abstraction at Longford Springs to supply deficit and upgrade WTP	-	SAF-039 Increase GW abstraction at Longford Springs to supply deficit and upgrade WTP	-
2000SC0002: Granard	SAF-030	-	SAF-030	-	SAF-030	-

WRZ	Quickest Delivery - SA Approach 1		Most Resilient - SA Approach 4		Lowest Carbon - SA Approach 2	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
	Increase SW abstraction from Lough Kinale, re-locate existing intake and upgrade WTP		Increase SW abstraction from Lough Kinale, re-locate existing intake and upgrade WTP		Increase SW abstraction from Lough Kinale, re-locate existing intake and upgrade WTP	
1100SC0001_F: Kilkerrin/Moylough	SAF-081 Rationalise to Dunmmore Glenamaddy	34	SAF-144 Interconnect Dunmore/Glenamaddy, Kilkerrin Moylough, Mountbellew, Ballymoe to create regional scheme for increased resilience and rationalise to Lough Mask	41	SAF-076 Increase GW abstraction for Kilkerrin Moylough WRZ to supply deficit	-
0200SC0005: Killeshandra PWS (GWS Import)	SAF-156 New SW abstraction from Lake Town and new WTP	-	SAF-156 New SW abstraction from Lake Town and new WTP	-	SAF-156 New SW abstraction from Lake Town and new WTP	-
200SC0001: Lanesboro & Newtowncashel	SAF-021 New GW abstraction to supply deficit at Lanesboro & Newtowncashel, upgrade Lisreevagh WTP	-	SAF-021 New GW abstraction to supply deficit at Lanesboro & Newtowncashel, upgrade Lisreevagh WTP	-	SAF-021 New GW abstraction to supply deficit at Lanesboro & Newtowncashel, upgrade Lisreevagh WTP	-
2000SC0005: Longford Central	SAF-009 Increase SW abstraction from Lough Forbes and upgrade WTP	-	SAF-009 Increase SW abstraction from Lough Forbes and upgrade WTP	-	SAF-097 Increase SW abstraction from Lough Forbes and supplement Carrick-on-Shannon WRZ, upgrade Lough Forbes WTP	2

WRZ	Quickest Delivery - SA Approach 1		Most Resilient - SA Approach 4		Lowest Carbon - SA Approach 2	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
1100SC0001_I: Mountbellew	SAF-084 Increase GW abstraction for Mountbellew WRZ to supply deficit	-	SAF-145 Interconnect Dunmore/Glenamaddy, Kilkerrin Moylough, Mountbellew, Ballymoe to create regional scheme for increased resilience and rationalise to Lough Mask	41	SAF-084 Increase GW abstraction for Mountbellew WRZ to supply deficit	-
2600SC0002: North East Regional PWS	SAF-161 Not in deficit - Grange WTP upgrade	-	SAF-161 Not in deficit - Grange WTP upgrade	-	SAF-161 Not in deficit - Grange WTP upgrade	-
2600SC0009: North Roscommon RWSS	SAF-052 Abandon existing intake. New intake from middle lake to meet full demand. New 1.6km raw water mains to existing WTP. Upgrade of WTP to meet full demand.	-	SAF-052 Abandon existing intake. New intake from middle lake to meet full demand. New 1.6km raw water mains to existing WTP. Upgrade of WTP to meet full demand.	-	SAF-052 Abandon existing intake. New intake from middle lake to meet full demand. New 1.6km raw water mains to existing WTP. Upgrade of WTP to meet full demand.	-
2600SC0004: Roscommon Central WSS	SAF-038 WTP Upgrade - Roscommon Central WSS not in deficit, pump tests to prove high yield spring and BHs	-	SAF-038 WTP Upgrade - Roscommon Central WSS not in deficit, pump tests to prove high yield spring and BHs	-	SAF-038 WTP Upgrade - Roscommon Central WSS not in deficit, pump tests to prove high yield spring and BHs	-

WRZ	Quickest Delivery - SA Approach 1		Most Resilient - SA Approach 4		Lowest Carbon - SA Approach 2	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
1700SC0001: South Leitrim Regional Carrick-on-Shannon	SAF-128 Interconnect Boyle Ardcarne with South Leitrim WRZ and supply deficit (increase abstraction from Shannon and upgrade WTP)	29	SAF-001 Increase SW abstraction from River Shannon, upgrade Carrick on Shannon WTP	-	SAF-005 Supply part of SLRWSS from Lough Forbes WTP for increased resilience	2

WRZ	Best Appropriate Assessment - SA Approach 3	
	Option Description	SA Option
2600SC0007: Arigna Regional PWS	SAF-068 Arigna Regional PWS not in deficit - Castletenison WTP Upgrade	-
0200SC0001: Arvagh PWS (GWS Import)	SAF-148 Rationalise Arvagh to Gowna WRZ.	42
1200SC0001: Ballymoe P.S	SAF-072 Ballymoe WTP upgrade - no deficit	-
2600SC0008: Boyle Regional	SAF-059 Increase GW abstraction at Boyle Ardcarne WRZ to supply deficit	-
2600SC0003: Castlerea PWS	SAF-049 Increase GW abstraction and interconnect Castlerea Regional WRZ with North Roscommon WRZ	23

WRZ	Best Appropriate Assessment - SA Approach 3	
	Option Description	SA Option
2000SC0002: Granard	SAF-030 Increase SW abstraction from Lough Kinale, re-locate existing intake and upgrade WTP	-
1100SC0001_F: Kilkerrin/Moylough	SAF-076 Increase GW abstraction for Kilkerrin Moylough WRZ to supply deficit	-
0200SC0005: Killeshandra PWS (GWS Import)	SAF-156 New SW abstraction from Lake Town and new WTP	-
200SC0001: Lanesboro & Newtowncashel	SAF-021 New GW abstraction to supply deficit at Lanesboro & Newtowncashel, upgrade Lisreevagh WTP	-
2000SC0005: Longford Central	SAF-009 Increase SW abstraction from Lough Forbes and upgrade WTP	-
1100SC0001_I: Mountbellew	SAF-084 Increase GW abstraction for Mountbellew WRZ to supply deficit	-
2600SC0002: North East Regional PWS	SAF-161 Not in deficit - Grange WTP upgrade	-
2600SC0009: North Roscommon RWSS	SAF-122 Interconnect Castlereagh Regional WRZ with North Roscommon WRZ	23
2600SC0004: Roscommon Central WSS	SAF-038	-

WRZ	Best Appropriate Assessment - SA Approach 3	
	Option Description	SA Option
	WTP Upgrade - Roscommon Central WSS not in deficit, pump tests to prove high yield spring and BHs	
1700SC0001: South Leitrim Regional Carrick-on-Shannon	SAF-001 Increase SW abstraction from River Shannon, upgrade Carrick on Shannon WTP	-

Appendix C Figure Index Tables

Designated Site	Label	Designated Site	Label	Designated Site	Label
SACs (Figure 2.2)					
Cuilcagh - Anierin Uplands SAC	F201	Clooneen Bog SAC	F213	Lisnageeragh Bog and Ballinastack Turlough SAC	F225
Lough Arrow SAC	F202	Drumalough Bog SAC	F214	Fortwilliam Turlough SAC	F226
Lough Oughter And Associated Loughs SAC	F203	Annaghmore Lough (Roscommon) SAC	F215	Lough Lurgeen Bog/Glenamaddy Turlough SAC	F227
Flughany Bog SAC	F204	Carrowbehy/Caher Bog SAC	F216	Lough Ree SAC	F228
River Moy SAC	F205	Lough Forbes Complex SAC	F217	Camderry Bog SAC	F229
Tullaghanrock Bog SAC	F206	Mullygollan Turlough SAC	F218	Aughrim (Aghrane) Bog SAC	F230
Callow Bog SAC	F207	Brown Bog SAC	F219	Ballygar (Aghrane) Bog SAC	F231
Cloonshanville Bog SAC	F208	Ardagullion Bog SAC	F220	Curraglehanagh Bog SAC	F232
Urlaur Lakes SAC	F209	Corliskea/Trien/Cloonfelliv Bog SAC	F221	Shankill West Bog SAC	F233
Derrinea Bog SAC	F210	Mount Jessop Bog SAC	F222	Lough Funshinagh SAC	F234
Bellanagare Bog SAC	F211	Corbo Bog SAC	F223	Carrownagappul Bog SAC	F235
Errit Lough SAC	F212	Kilsallagh Bog SAC	F224		
NHAs (Figure 2.2)					
Corry Mountain Bog NHA	F301	Cloonageeher Bog NHA	F311	Forthill Bog NHA	F321
Carrane Hill Bog NHA	F302	Lough Kinale And Derragh Lough NHA	F312	Leaha Bog NHA	F322
Kilronan Mountain Bog NHA	F303	Moorfield Bog/Farm Cottage NHA	F313	Aughrim Bog NHA	F323

Designated Site	Label	Designated Site	Label	Designated Site	Label
Tullaghan Bog (Roscommon) NHA	F304	Bracklagh Bog NHA	F314	Kilmore Bog NHA	F324
Cornaveagh Bog NHA	F305	Derrycanan Bog NHA	F315	Ballygar Bog NHA	F325
Bella Bridge Bog NHA	F306	Mount Jessop Bog NHA	F316	Derrinlough Bog NHA	F326
Cashel Bog (Leitrim) NHA	F307	Lisnarragh Bog NHA	F317	Castle Ffrench East Bog NHA	F327
Corracramph Bog NHA	F308	Keeloges Bog NHA	F318	Suck River Callows NHA	F328
Rinn River NHA	F309	Funshin Bog NHA	F319		
Aghnamona Bog NHA	F310	Clooncullaun Bog NHA	F320		