Autumn 2022

Regional Water Resources Plan–Eastern and Midlands

Strategic Environmental Assessment

Appendix H: Study Area 2 – Environmental Review

Tionscadal Éireann
Project Ireland
2040

Data disclaimer: This document uses best available data at time of writing. Some sources may have been updated in the interim period. As data relating to population forecasts and trends are based on information gathered before the Covid 19 Pandemic, monitoring and feedback will be used to capture any updates. The National Water Resources Plan will also align to relevant updates in applicable policy documentation.

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

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1 Introduction and Background

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

This Study Area 2 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 2 within the Eastern and Midlands Region for the options and approaches considered and as outlined in the Study Area 2 Technical report (RWRP-EM Appendix 2). 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-EM provides a framework to identify potential solutions to address identified need. The key stages of the process are illustrated in Figure 1.1 and summarised below:

1) Identifying need – based on SDB and/or Drinking Water Safety Plan Barrier Assessment;
2) Scoping of the study area (WRZs) – understanding the study area and the existing conditions of assets, supply and demand issues; as well as environmental constraints and opportunities;
3) Identifying potential options for consideration relevant to the study area;
4) Coarse screening – assessing the unconstrained options and eliminate any that will not be viable;
5) Further option definition, information collection and preliminary costing;
6) Fine screening – options assessment and scoring against the key criteria with further removal of options identified as unviable and development of feasible options for costing and scoring assessment update;
7) Approach appraisal – comparison and assessment of combinations of options identified to meet the predicted supply demand deficit to determine the Preferred Approach; and
8) Monitoring and Feedback – a process for monitoring the implementation of the plan and responding to changes to policy and guidelines and to information changes which will feed into

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

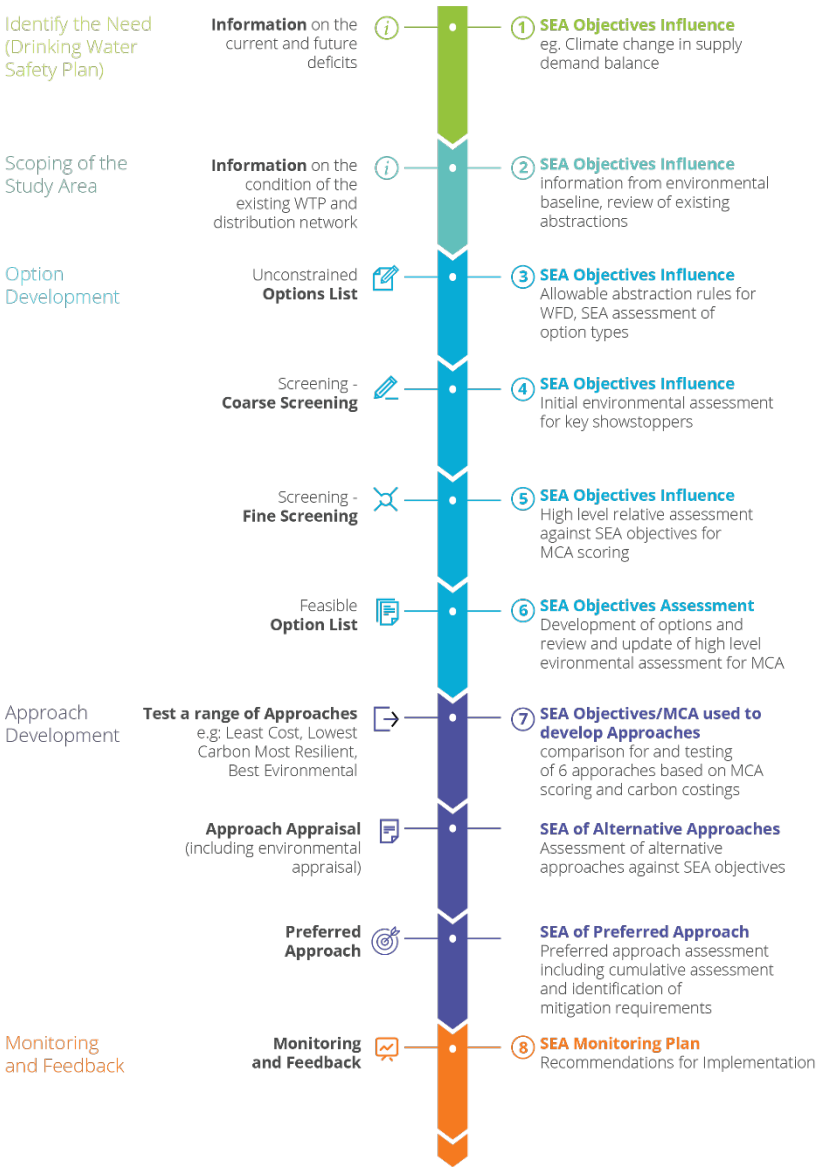

Figure 1.1 Option and Approach Development Process

1.2 Regional Plan Strategic Environmental Assessment

The four RWRPs, implementing Phase 2 of the NWRP, are each subject to a separate SEA process. The study area assessments will follow the outline methodology established by the Framework Plan. The SEA Environmental 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 (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	Water quality and resources Prevent deterioration of the WFD status of waterbodies with regard to both water quality and quantity due to Irish Water's activities. Contribute towards the "no deterioration" WFD condition and, where possible, to the improvement of waterbody status for rivers, lakes, transitional and coastal waters, and groundwater to at least 'Good' status.
	Flood risk Protect and, where possible, reduce risk from ground water and surface water flooding as a result of Irish Water's activities.
Biodiversity	Protect and, where possible, enhance terrestrial, aquatic and soil biodiversity; particularly regarding European sites and protected species in providing water services.
Material assets	Minimise resource use and waste generation from, new or upgraded, existing water services infrastructure and management of residuals from drinking water treatment - to protect human health and the ecological status of waterbodies. Minimise impacts on other material assets and existing water abstractions.
Landscape and visual amenity	Protect and, where possible, enhance designated landscapes in providing water services.
Climate change	Climate change mitigation Minimise contributions to climate change emissions to air (including greenhouse gas emissions) as a result of Irish Water's activities.
	Climate change adaptation

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

If appropriate, the Preferred Approach identified for SA2 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 SA2 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 SA2 are provided in chapter 9 of this review.

1.6 Study Area 2

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

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

This Appendix reports on SA2, the location of SA2 in relation to the Eastern and Midlands Region is shown in Figure 1.2.

Study Area 2 lies within the counties of Carlow, Kildare and Wicklow and its total area is approximately 545 km^2. There are no principal settlements (with a population of over 10,000) within SA2. The largest settlement is Baltinglass, with a population of 2,137 (CSO, 2016a), as shown in Figure 1.3.

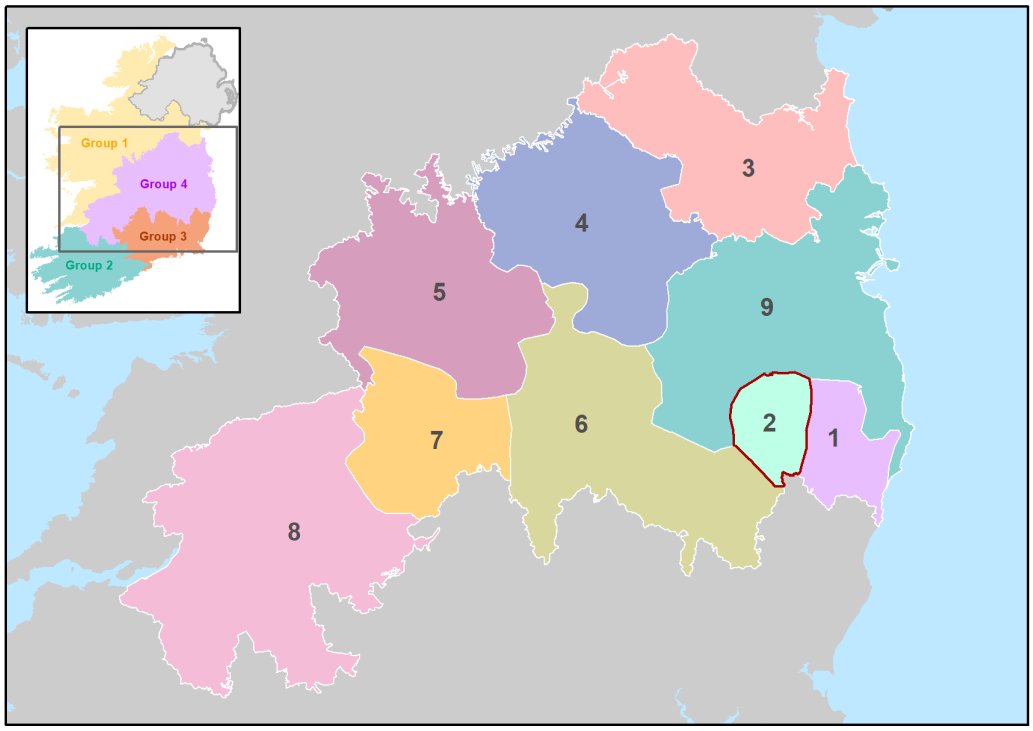

Figure 1.2 Eastern and Midlands Region Study Areas

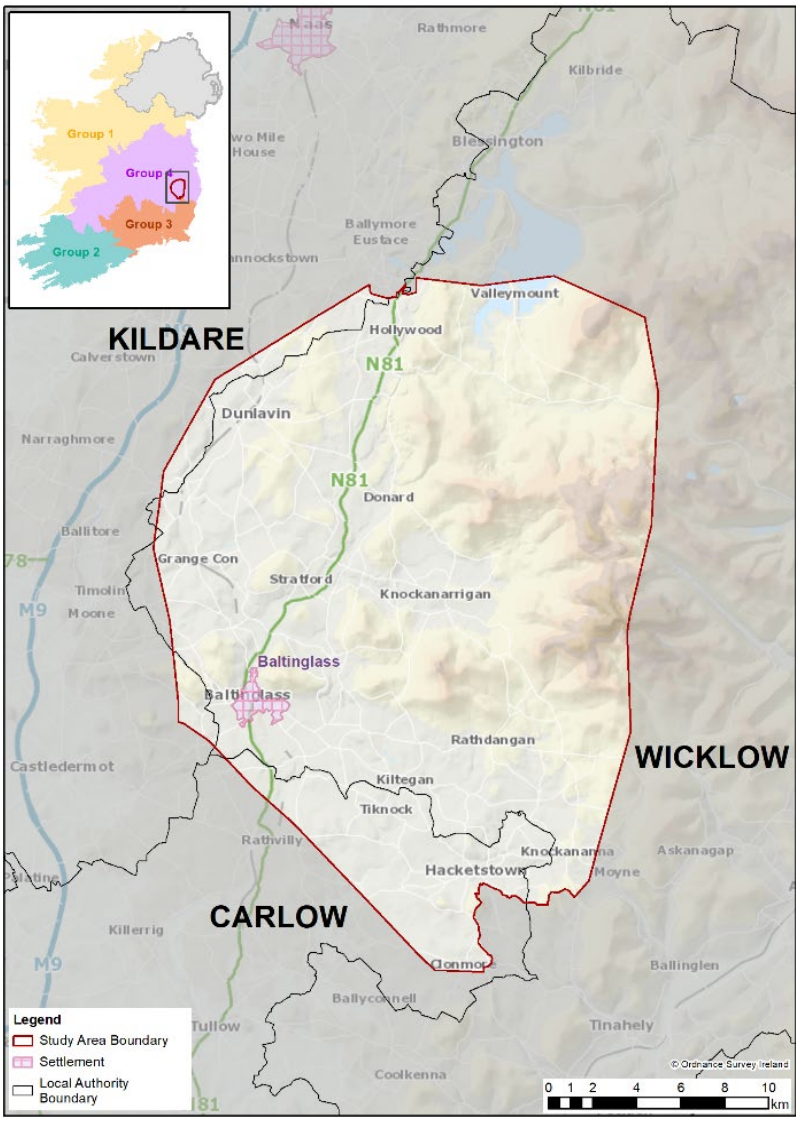

Figure 1.3 Study Area 2

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Study Area 2 Environmental Baseline Context

2 Study Area 2 Environmental Baseline Context

This chapter provides environmental baseline information for SA2 regarding the following key environmental topics in the SEA:

- Population, Economy, Tourism and Recreation, and Human Health;
- Water Environment;
- Biodiversity, Flora and Fauna;
- Material Assets;
- Landscape and Visual Amenity;
- Air Quality and Noise;
- Climate Change;
- Cultural Heritage;
- Geology and Soils; and
- Summary of key issues and trends over the plan period within the study area.

The baseline environment considers key indicators characterising the current situation in the study area and how these aspects are likely to develop over the Framework Plan's planning period. This includes issues relating to pressures on the environment or the sensitivity of the environment to change. This chapter is intended to support and add to the baseline environmental information for the Regional Plan SEA Environmental Report t, 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 SA2

WRZ Reference Number and Name	Total Population Served (2019)*	% Population Change (2019-2044)*
3400SC0008 - Ballyknockan Valleymount Public Supply	392	+15.3%
3400SC0003 - Baltinglass Public Supply	2,470	+15.3%

WRZ Reference Number and Name	Total Population Served (2019)*	% Population Change (2019-2044)*
3400SC0004 - Dunlavin Public Supply	975	+15.3%
3400SC0019 - Grangecon Public Supply	51	+15.3%
0100SC0005 – Hacketstown	610	+15.3%
3400SC0005 - Hollywood Donard Public Supply	907	+15.3%
3400SC0011 - Kiltegan Public Supply	286	+15.3%
3400SC0015 - Knockananna Public Supply	211	+15.3%
3400SC0023 - Knockanarrigan Davidstown Public Supply	225	+15.3%
3400SC0052 – Knocknagilky	1	+15.3%
3400SC0014 - Rathdangan Public Supply	130	+15.3%
3400SC0009 - Stratford Public Supply	582	+15.3%

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

2.1.2 Economy and Employment

SA2 had an above average household disposable income per person in 2016 (CSO, 2016b), and an unemployment rate of 7.5% in the Mid-East region of the country (CSO, 2017a).

Population increase and expected economic growth has meant that housing and sustainable urban development have been made a priority for the National Development Programme; therefore, to supply the demand there is an aim to increase housing stock. The number of new dwellings completed in Q3 2020 was 1,303 for the Mid-East region and 441 for the South-East region (CSO, 2020a).

2.1.3 Tourism and Recreation

Tourism in SA2 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 Wicklow has been described as "*the garden of Ireland*", containing Ireland's largest national park and emphasising outdoor recreation as a key asset for the area (Visit Wicklow, 2020).

Additionally, the study area is 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). For SA2, the national of note in SA2 is Wicklow Mountains National Park. 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 Mid-East region 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 Mid-East Region within Ireland

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

A key issue for public health is reliable access to good quality drinking water. Regulated water service providers have to ensure appropriate standards of supply and be able to cope with drought conditions, peak events, and maintenance of assets. This requires adequate reserve capacity in Irish Water's supplies to provide a 1 in 50 Level of Service. At present, not all supplies within this study area provide the required levels of reserve capacity. Due to the limited historical monitoring of these supplies, particularly in relation to groundwater, this will need to be studied further. Table 2.3 lists the areas supplied by the Water Treatment Plants (WTPs) in SA2.

Table 2.3 Areas Supplied by the WTPs in SA2

WTP	WRZ	Local Authority Supplied
Ballyknockan WTP	3400SC0008 - Ballyknockan Valleymount Public Supply	Wicklow
Baltinglass WTP	3400SC0003 - Baltinglass Public Supply	Wicklow
Dunlavin WTP	3400SC0004 - Dunlavin Public Supply	Wicklow
Grangecon WTP	3400SC0019 - Grangecon Public Supply	Wicklow
Hacketstown WTP	0100SC0005 - Hacketstown	Carlow
Slievecorragh WTP	3400SC0005 - Hollywood Donard Public Supply	Wicklow
Kiltegan WTP	3400SC0011 - Kiltegan Public Supply	Wicklow
Knockananna WTP	3400SC0015 - Knockananna Public Supply	Wicklow
Davidstown WTP	3400SC0023 - Knockanarrigan Davidstown Public Supply	Wicklow

WTP	WRZ	Local Authority Supplied
Knocknagilky WTP	3400SC0052 - Knocknagilky Public Supply	Wicklow
Rathdangan WTP	3400SC0014 - Rathdangan Public Supply	Wicklow
Ballyhook Hill WTP	3400SC0009 - Stratford Public Supply	Wicklow

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

Poor water quality can be linked to risks to health. The Barrier Assessment identified eleven of the twelve WTPs within the study area at high risk of failing to achieve the Irish Water's conservative Barrier Assessment standards in relation to maintaining chlorine residual in the network (Barrier 2.1) and the effectiveness of Irish Water's protozoa removal processes (Barrier 3) (see Table 2.1 in the SA2 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 no WRZs on the EPA Remedial Action List within SA2. Irish Water is currently progressing immediate corrective action in relation to a number of supplies within SA2 in advance of the NWRP. Details of these are included in the SA2 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 SA2.

Table 2.4 provides a summary of the WFD catchments within SA2.

Table 2.4 Catchments within SA2 (EPA, 2020b)

WFD Catchments	Total Catchment Area (km^2)	Catchment Area within SA2 (km^2)
Avoca-Vartry	1,247	23
Barrow	3,025	67
Liffey and Dublin Bay	1,616	118
Slaney and Wexford Harbour	1,981	337

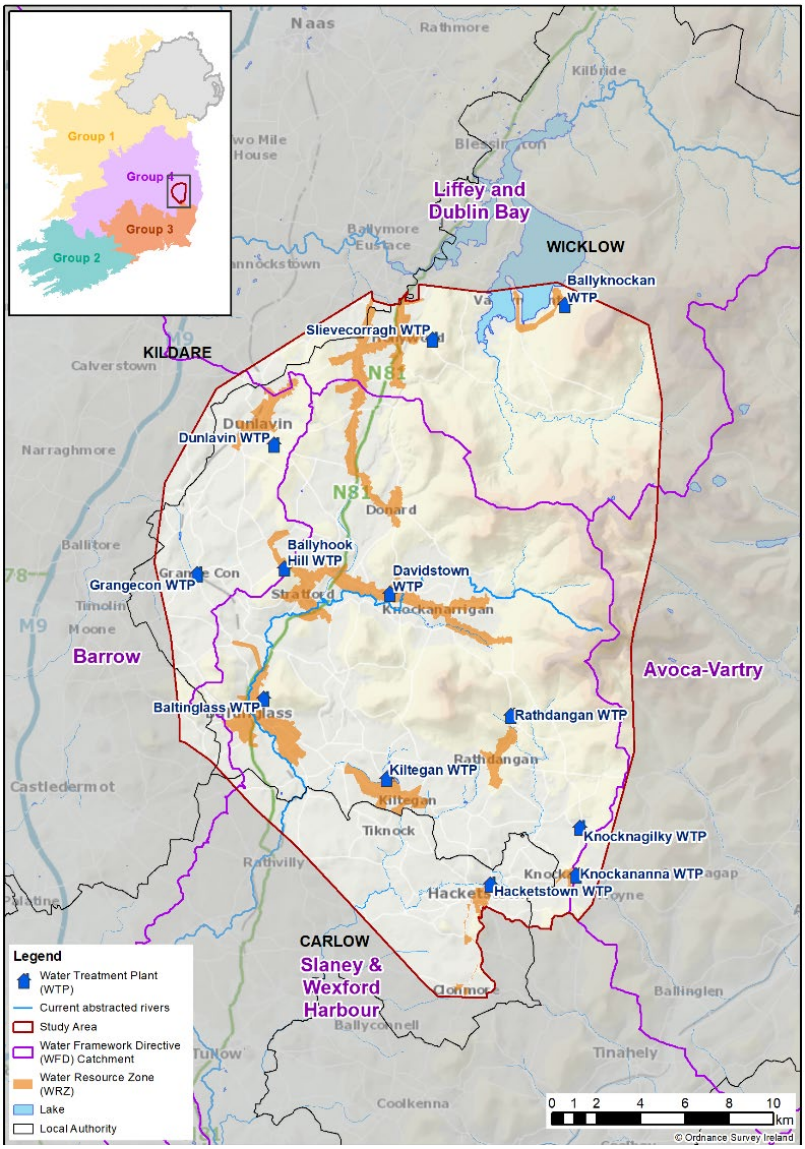

Figure 2.1 Water Environment of SA2

2.2.1 Water Framework Directive

Under the WFD, Ireland must ensure that all waterbodies achieve 'Good' status by 2027. In addition, under the legislation, any modification to a WFD waterbody should not lead to deterioration in either the overall status or any of the WFD water quality parameters.

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

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

On an interim basis, Irish Water has developed an initial desktop assessment based on available information (see SA2 Technical Report). Over the coming years, Irish Water will work with the environmental regulator, the EPA and the Geological Survey of Ireland, to develop desktop and site investigation systems to better understand the sustainability of its groundwater sources.

To understand the potential impact of the Abstraction Legislation on the SA2 supplies, Irish Water has assessed its surface water abstraction for Hacketstown WTP, River Derreen Mill Run (the only surface water abstraction in the study area). Based on this initial assessment, the volume abstracted at Hacketstown would appear to comply with sustainability guidelines (the long term required abstraction requirement is <2% of Q95). However, under the proposed regulatory regime, this will be adjudicated on 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 four WFD catchments in SA2 and the total number of surface and groundwater waterbodies within SA2 are provided in Table 2.5 below.

Table 2.5 WFD Waterbodies within SA2 (EPA, 2019b, 2019c, 2019d, 2019e and 2019f)

Waterbody Type	Water Catchments	Number of Waterbodies	Number of Waterbodies Rated Below Moderate
Rivers	Avoca-Vartry	7	0
	Barrow	7	1
	Liffey and Dublin Bay	9	0
	Slaney & Wexford Harbour	25	1
Lakes	Avoca-Vartry	0	0
	Barrow	0	0
	Liffey and Dublin Bay	1	0
	Slaney & Wexford Harbour	0	0
Transitional and Coastal	N/A	0	0
Groundwater	N/A	5	0

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

- Avoca-Vartry: Other (54%) (including historically polluted sites, aquaculture, waste, atmospheric and anthropogenic pressures), Agriculture (31%) and Urban Runoff (23%);
- Barrow: Agriculture (75%) and Hydromorphology (31%);
- Liffey and Dublin Bay: Agriculture (51%), Urban Runoff (32%), Urban Wastewater Treatment Plants (23%) and Domestic Wastewater (23%); and
- Slaney & Wexford Harbour: Agriculture (73%) and Other (including abstraction, waste and unknown anthropogenic) (22%).

Table 2.6 includes a summary of the 'at risk' waterbodies within SA2.

Table 2.6 Summary of 'At Risk' Waterbodies in SA2 (EPA, 2019b, 2019c, 2019d, 2019e and 2019f)

Waterbody Type	Water Catchments	Number of Waterbodies identified as 'At Risk'	Surface Waterbodies Status 'At Risk' Due to Abstraction Pressure*
Rivers	Avoca-Vartry	3	0
	Barrow	0	
	Liffey and Dublin Bay	7	
	Slaney & Wexford Harbour	11	
Lakes	Avoca-Vartry	0	0
	Barrow	0	
	Liffey and Dublin Bay	0	
	Slaney & Wexford Harbour	0	
Transitional and Coastal	N/A	0	0
Groundwater	N/A	0	0
Total		**21**	**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 SA2 are listed in Table 2.7. Note that the 'Areas for Action' included in Table 2.7 are from the WFD cycle 2 River Basin Management Plan (RBMP), as the WFD cycle 3 RBMP was undergoing consultation at the time of writing.

Table 2.7 'Areas for Action' within SA2 (catchments.ie, 2021e)

Areas for Action	Key Reasons for Selection
Avonbeg-Avonmore (pH Wicklow 2)	• 2nd pH project to link to the other Wicklow pH project. • Four deteriorated waterbodies • Two High Ecological Status objective water bodies • Headwaters to the Avonbeg and Avonmore rivers
Derreen and Douglas (Kiltegan)	• Protected area objectives not met for Freshwater Pearl Mussel (19 catchments of S.I. 296 2009) • Build on WwTP upgrades at Hacketstown • Active community group • Three of the five water bodies are deteriorated waterbodies • One of the three deteriorated water bodies is a High Ecological Status objective water body • Three potential 'quick wins'
Derry-Coolboy-Rosnastraw	• The most important tributaries on the Slaney for salmon spawning

Areas for Action	Key Reasons for Selection
	• Building on planned instream works by Inland Fisheries Ireland on Coolboy_010 at Coolattin estate • Three potential 'quick wins'. • Eight deteriorated water bodies. • One 'At Risk' High Ecological Status objective water body • Derry_010 is failing its protected area objectives for drinking water (pesticides)
Graney-Lerr	• Potential pilot project to examine nitrate sources from tillage • Addressing a large portion of the eastern Barrow catchment • Important Salmon run on this river • Castledermot tidy towns are very active, an interested community group
Liffey Upper (pH (Wicklow) 1)	• An acid water project in the east • Build on work completed by Wicklow County Council • Headwaters to reservoir • Important for recreation - active angling club in the area
Ow	• High Ecological Status ecological objective waterbody requiring improvement • Building on work that is underway by Coillte • Multi agency collaboration between Coillte, Wicklow County Council and Inland Fisheries Ireland
Slaney	• Building on planned Irish Water improvements at Rathvilly • Four deteriorated waterbodies • Failing protected area objective (salmon) • Water abstraction at Rathvilly • Three potential 'quick wins'

2.2.2 Flood Risk

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

The OPW has been implementing the European Communities (Assessment and Management of Flood Risks) Regulations 2010 mainly through the Catchment Flood Risk Assessment and Management (CFRAM) Programme, through which draft Flood Risk Management Plans have been developed. Approximately 300 Areas for Further Assessment have been established along with a range of measures to reduce or manage the flood risk within each catchment. CRFAMS mapping for all Areas for Further Assessment is available to view on the CFRAMS website (OPW, 2018). Figure 5.4 in the SEA

Environmental Report (Appendix A) provides a summary of surface water and groundwater flood risk from the OPW CFRAMS data for the region including SA2.

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

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

2.3 Climate Change

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

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

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

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

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

The Department of the Environment, Climate and Communications' Climate Action Plan (CAP) published November 2021, replacing CAP 2019, commits to achieving a 51% reduction in overall greenhouse gas emissions by 2030 and reaching net zero carbon emissions by 2050. The aim is for more sustainable growth and to create a resilient, vibrant and sustainable country. The CAP defines a roadmap to this goal and initiates a set of policy actions to achieve this. A detailed sectoral roadmap has also been set out, which is designed to deliver a cumulative reduction in emissions, over the period 2021 to 2030. CAP 2021 updates existing targets with renewable energy to provide 80% of electricity by 2030 and sets targets for sectors including for agriculture and forestry such as woodland planting and improving land management to support carbon sequestration (Department of the Environment, Climate and Communications, 2021).

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

Table 2.8 Summary of Key Points from the 'Water Quality and Water Services Infrastructure' Sectoral Climate Change Plan (Department of Housing, Planning and Local Government, 2019b)

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

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

- Mainstream Adaptation: That climate change adaptation is a core consideration and is mainstreamed in all functions and activities across the local authority. In addition, ensure that local authority is well placed to benefit from economic development opportunities that may emerge due to a commitment to proactive climate change adaptation and community resilience;
- Informed decision making: That effective and informed decision making is based on a reliable and robust evidence base of the key impacts, risks and vulnerabilities of the area. This will support long term financial planning, effective management of risks and help to prioritise actions;

- Building Resilience: That the needs of vulnerable communities are prioritised and addressed, encourage awareness to reduce and adapt to anticipated impacts of climate change, and promote a sustainable and robust action response; and
- Capitalising on Opportunities: Projected changes in climate may result in additional benefits and opportunities for the local area and these should be explored and capitalised upon to maximise the use of resources and influence positive behavioural changes.

In addition to these high-level aims, each local authority is required to identify the key risks to their area; these are provided in Table 2.9.

Table 2.9 Climate Change Risks Identified by Local Authorities in SA2

County	Key Risk Areas
Carlow (Carlow County Council, 2019)	• Heatwaves/drought • Extreme rainfall events • Severe cold spells • Flooding
Kildare (Kildare Country Council, 2019)	• Extreme rainfall events • Windstorms • Extreme heat/drought events • Freezing/snow events
Wicklow (Wicklow County Council, 2019)	• Flooding • Rising sea levels • Extreme rainfall and wind speed/storminess

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 SA2, 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 SA2 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). The European sites (SPAs and SACs), and the potential impacts on them, are discussed in more detail in the NIS.

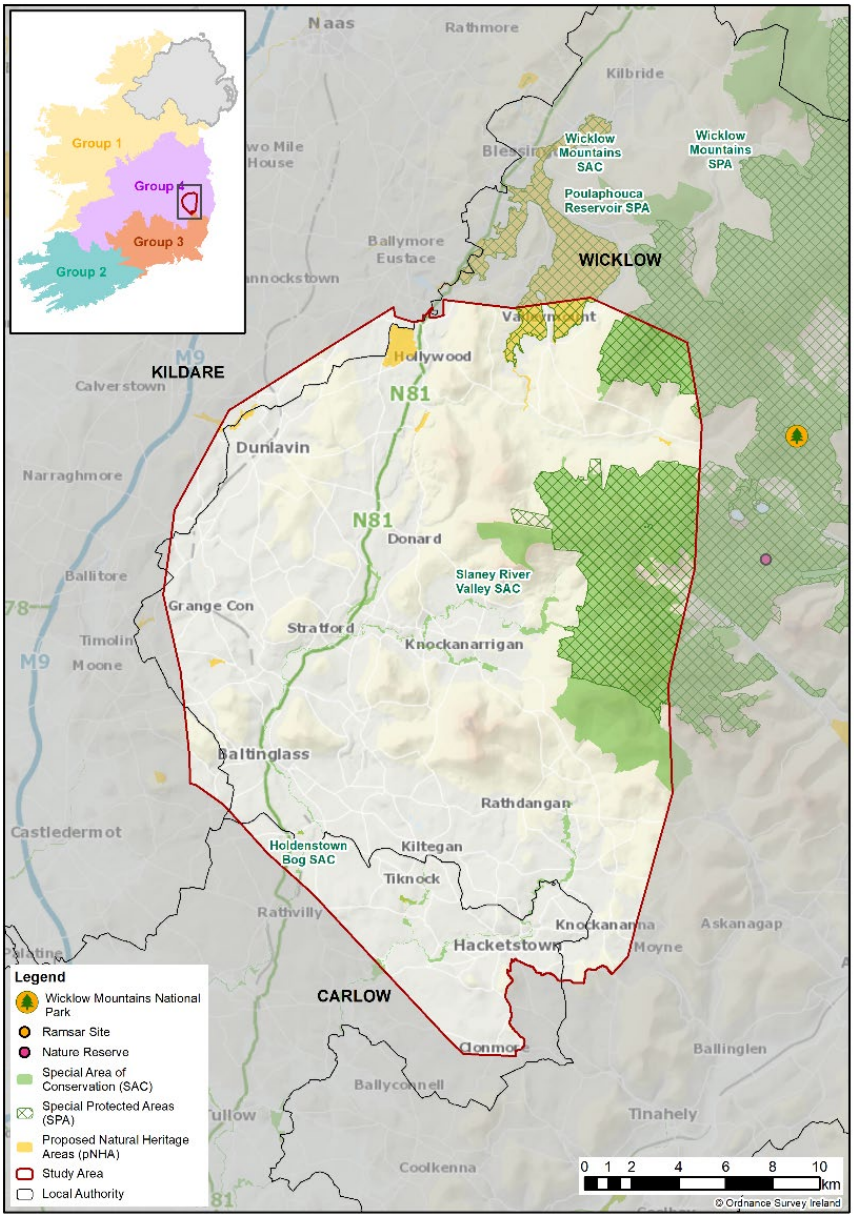

Figure 2.2 Designated Sites in SA2

Table 2.10 Designated Sites within SA2 (NPWS, 2019a)

Receptor	Name	Total Number
Special Protected Area (SPA)	Poulaphouca Reservoir SPA	2
	Wicklow Mountains SPA	
Special Area of Conservation (SAC)	Holdenstown Bog SAC	3
	Slaney River Valley SAC	
	Wicklow Mountains SAC	
Ramsar sites	N/A	0
Nature reserves	N/A	0
National Parks	Wicklow Mountains National Park	1
Natural Heritage Areas (NHAs)	N/A	0

Receptor	Name	Total Number
Proposed Natural Heritage Areas (pNHAs)	Baggot's Wood pNHA	8
	Ballinagee Wood pNHA	
	Dunlavin Marshes pNHA	
	Holdenstown Bog pNHA	
	Hollywood Glen pNHA	
	Lowtown Fen pNHA	
	Newtown Marshes pNHA	
	Poulaphouca Reservoir pNHA	

2.4.2 Habitats

Table 2.11 lists the percentage of the study area, and the number of hectares, covered by each habitat within SA2; as reported in the Corine land use dataset[1].

Table 2.11 Habitat Areas for SA2 (EPA, 2018)

Habitat	Ha	% of Study Area
Agricultural Land		
Pastures	28,625	52.55%
Land principally occupied by agriculture, with significant areas of natural vegetation	3,725	6.84%
Non-irrigated arable land	1,606	2.95%
Complex cultivation patterns	389	0.71%
Natural Habitats		
Peat bogs	6,570	12.06%
Moors and heathland	3,655	6.71%
Natural grasslands	937	1.72%
Water bodies	352	0.65%
Sparsely vegetated areas	134	0.25%
Forest		
Coniferous forest	4,373	8.03%
Transitional woodland-shrub	2,432	4.46%
Mixed forest	1,113	2.04%
Broad-leaved forest	103	0.19%

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

Particularly relevant habitats that depend on the water quality and/or quantity in SA2 are:

- Oligotrophic lake habitats;
- Bog habitats – Active raised bogs, degraded raised bogs still capable of natural regeneration, *Rhynchosporion* depressions, transition mires and quaking bogs;
- Alkaline fens; and
- Groundwater dependant terrestrial habitats, such as petrifying springs with tufa formation and blanket bogs.

2.4.3 Species

The key species and habitats (Nelson et al, 2019) of concern within SA2 include:

- Otter;
- Bat species - Daubenton's bat along the waterways. The most common species in the study area are Common and Soprano pipistrelles and Leisler's bat;
- Fish species (Lamprey, Atlantic salmon and European eel);
- Waterbirds of 'qualifying interest' e.g. Greylag goose (*Anser anser*);
- Other 'qualifying interest' bird species e.g. peregrine falcon and merlin;
- Protected whorl snails e.g. *Vertigo moulinsiana*;
- Fresh-water pearl mussel; and
- Freshwater white-clawed crayfish.

The key invasive species to consider (European Communities (Birds and Natural Habitats) Regulations, 2011) for developing options within SA2 include:

- Himalayan balsam (*Impatiens glandulifera*);
- Japanese knotweed (*Fallopia japonica*);
- New Zealand pigmyweed (*Crassula helmsii*); and
- *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 SA2 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 twelve WTPs in SA2, meeting the demand of 2.67 Ml/d in 2019.

There are no canals or ports of national or regional significance in SA2. There is one airport of local significance, namely Hacketstown Aerodrome. Other significant transport infrastructure includes the main road network (particularly the N81).

Any new infrastructure considered for SA2 will need to take existing as well as planned land zoning and local development into consideration.

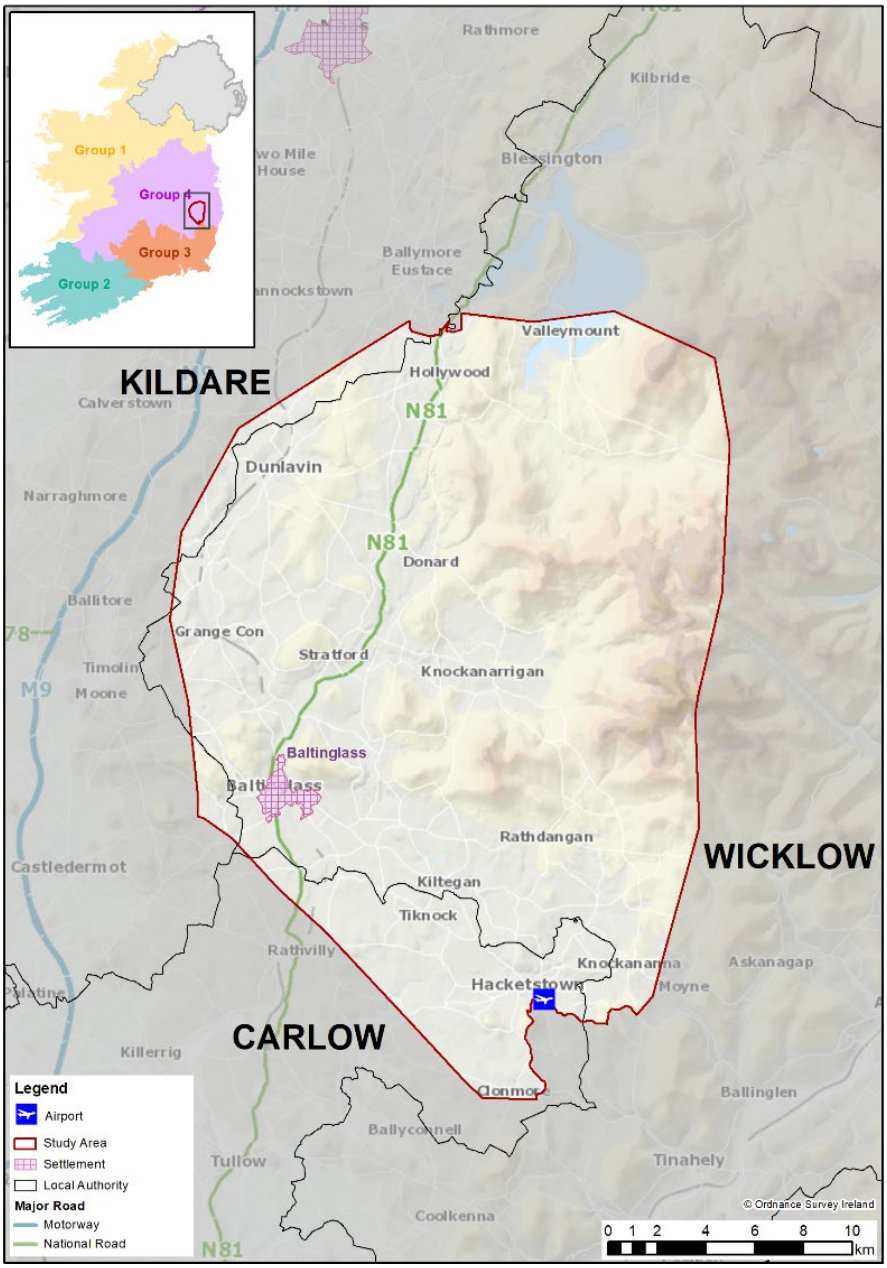

Figure 2.3 Transport Infrastructure in SA2

Table 2.12 Land Use within SA2 (EPA, 2018) [2]

Land use	Ha	% of Study Area	Comparison to Overall Eastern and Midlands Region %
Agriculture	34,345	63.05%	75.52%
Urban	398	0.73%	3.69%
Forest	11,647	21.38%	9.42%
Natural habitats	8,021	14.73%	10.61%
Industry	60	0.11%	0.70%

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

Proposals for other strategic developments within SA2 are considered for the assessment. These are primarily identified from the National Planning Framework and from myProjectIreland, where any relevant projects for the study area are included (other local developments may also be included that are not listed in myProjectIreland if they are considered to be of an appropriate scale). Small scale housing and business development are not considered for this plan level assessment.

Table 2.13 gives an overview of the project developments which are available from myProjectIreland (2021) for SA2[3]. The myProjectIreland map focuses mainly on major projects with costs over €20 million. The map also includes all projects supported to date under the Government's Urban and Rural Regeneration Funds and reflects the full portfolio of projects in the pipeline at present.

Table 2.13 Proposed New Developments

Development
Making Baltinglass the Hub for South West Wicklow

2.6 Landscape and Visual Amenity

The National Landscape Strategy 2015 - 2025 is in the process of being implemented and will be Ireland's vehicle for complying with the EU Landscape Convention. Landscape assessment guidance is also available from the local authorities. This will be taken into account when identifying landscape character areas and protected areas at the project level in the future. Table 2.14 shows the sensitivity of the Landscape Character Areas (LCAs) within each of the counties listed within the study area. No data is available for the values of the LCAs within the counties[4].

The value of the landscape in SA2 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 SA2 (Ordnance Survey Ireland. n.d.)

Landscape Character Area	Sensitivity
County: Carlow (Carlow County Council, 2015)	
Killeshin Hills	Medium
Central Lowlands	Low
Blackstairs and Mount Leinster Uplands	High
River Slaney - East Rolling Farmland	Medium
County: Kildare (Kildare County Council, 2017)	
North-western Lowlands	Low

[3] Note that the myProjectIreland dataset was taken at a fixed point in time to allow for assessment of cumulative effects. The date for SA2 being the 15//01/21.
[4] As with all the baseline information, the LCA information will be updated as part of regular reviews

Landscape Character Area	Sensitivity
Northern Lowlands	Low
Central Undulating Lands	Low
Southern Lowlands	Low
Eastern Transition Lands	Medium
South-eastern Uplands	Medium
Western Boglands	High
Eastern Uplands	High
Chair of Kildare	Special
Northern Hills	Special
River Liffey	Special
River Barrow	Special
The Curragh	Unique
Pollardstown Fen	Unique
County: Wicklow (Wicklow County Council, 2016)	
Western Corridor	Medium
Blessington LAP	Low
Poulaphuca Reservoir	High
Mountain Uplands	High
Glencree / Glencullen	High
Northern Mt. Lowlands	High
Bray Environs Masterplan	Low
Coastal Area	High
Greystones / Delgany LAP	Low
Eastern Corridor	Medium
Newtown Mount Kennedy LAP	Low
Ashford LAP	Low
Wicklow Town Environs	Low
Rural Area	Medium
Southern Hills	High
Rural Area	Medium
Southern Mt. Lowlands	High
Baltinglass Hills	High

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 SA2 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 N81.

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 SA2, 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.

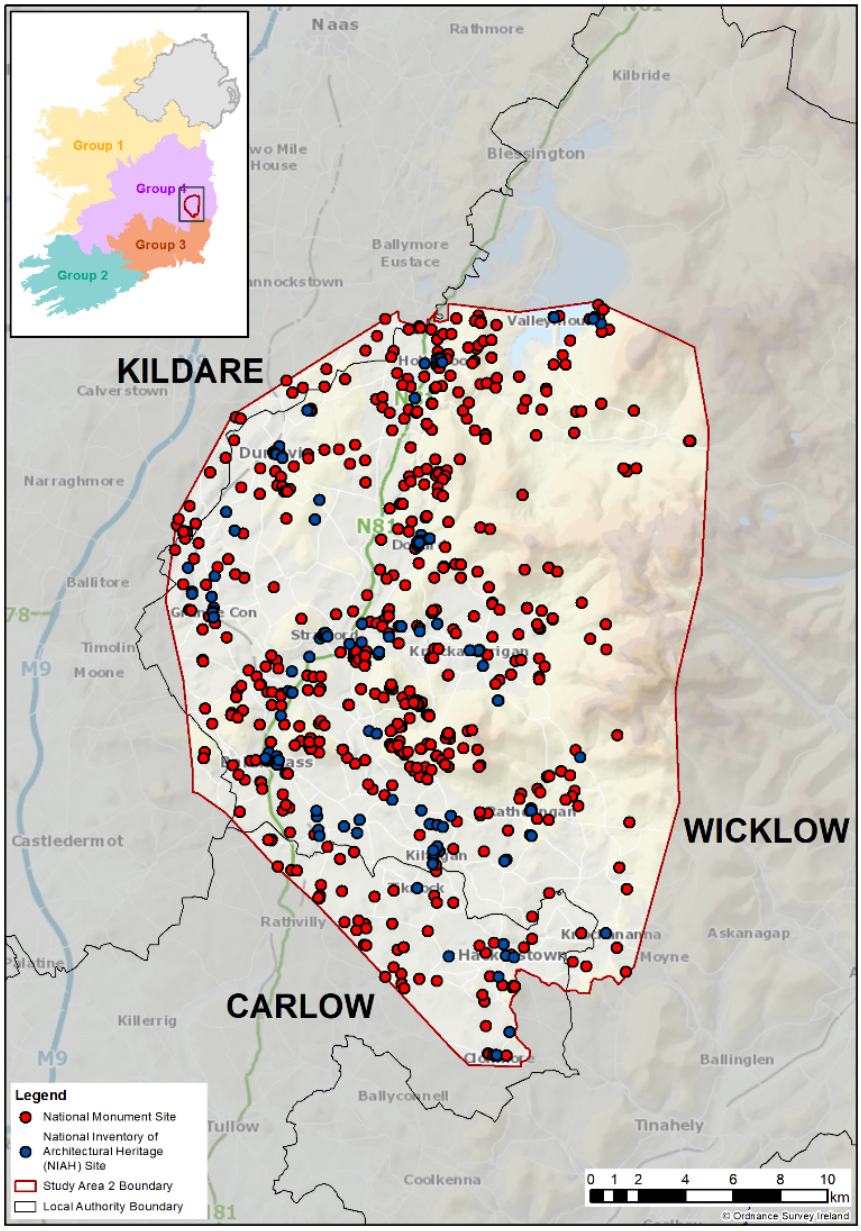

Figure 2.4 SA2 Cultural Heritage Assets

Table 2.15 Cultural Heritage Assets within SA2

Assets	Total Number
National Monuments Service sites	752
National Inventory of Architectural Heritage sites	8
Sites and Monuments Record Zones	356

2.9 Geology and Soils

Table 2.12 lists the land uses within SA2. SA2 predominantly has a fine loamy soil type with areas of peaty soil to the east of the study area (EPA, 2019a).

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

groundwater. The regionally and locally important aquifers with resource potential for SA2 are shown in Figure 2.5.

Due to the underlying granitic and schist geologies, the drainage of the Wicklow Mountains in SA2 gives good surface water availability from the rejected recharge of often heavy rainfall. The large River Slaney catchment basin rises in the West Wicklow Mountains and drains south through the study area. The area also contains part of the upper catchment of the River Liffey which includes Poulaphouca Reservoir – the main water supply source for the Greater Dublin Area (SA9).

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, 8 of which have the potential to constrain water resource options in SA2.

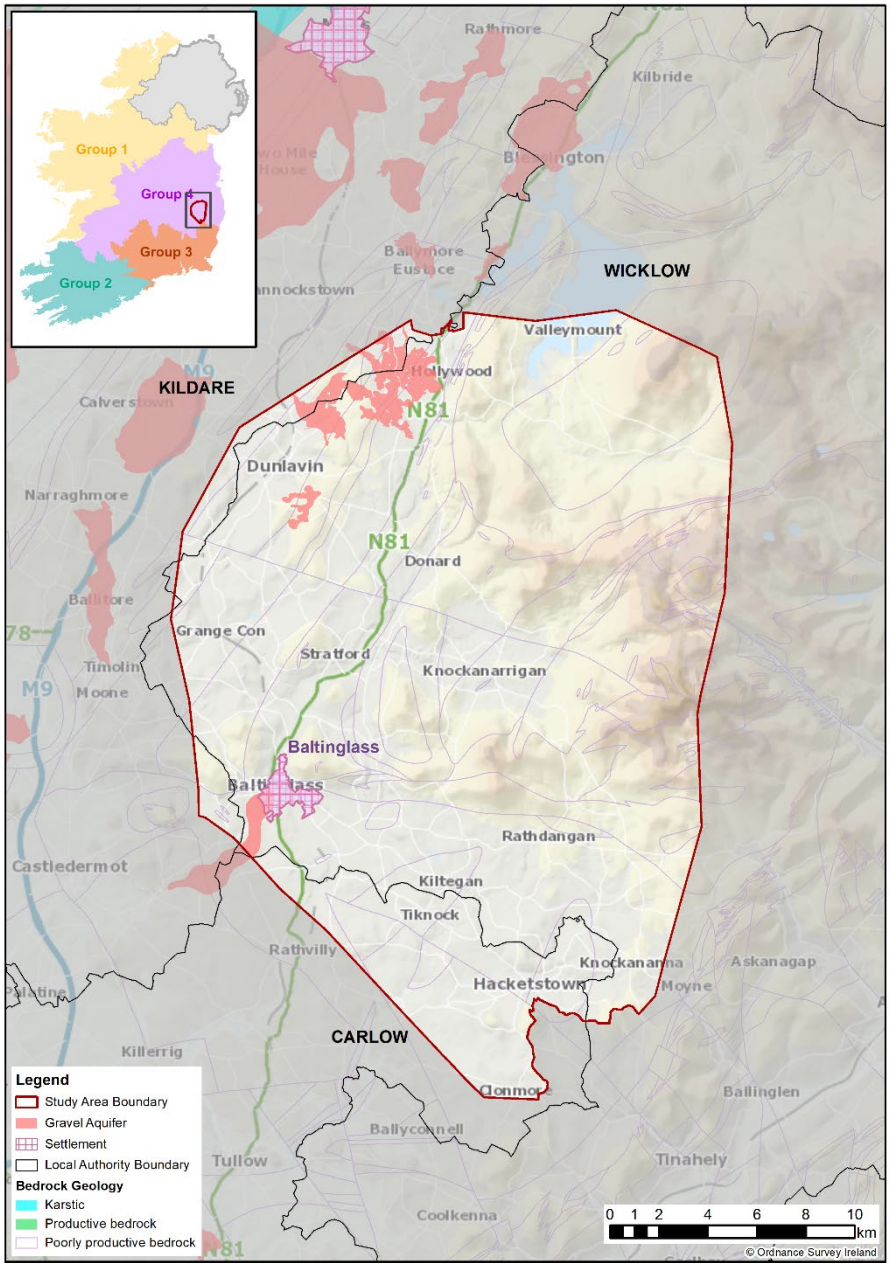

Figure 2.5 SA2 Hydrogeology

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 SA2 are listed in Table 2.16.

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

SEA Topic	Issues and Opportunities	Interrelated Topics
Population, Economy, Tourism and Recreation, and Human Health	**Issues:** Increasing population and the increased stress of climate change on water quality and water resources could affect health and well-being. **Opportunities**: Irish Water will put in place plans to assess water quality and measures to address risks as part of the Regional Plan Irish Water has ongoing activities to improve the Supply Demand Balance in SA2, including, leakage management and water conservation measures. Raising awareness of the importance of water conservation and efficiency measures, and the value of the environment for health and wellbeing, can play an important part in water planning. Valuing access to environment for recreation.	Climate change, biodiversity, water environment, material assets and landscape and visual amenity
Water Environment	**Issues**: The proposed abstraction licensing, aligned to WFD requirements, will require many current abstractions to be licensed and may limit future abstraction or involve significant conditions being imposed at associated sites. For SA2, 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 SA2 Technical Report). This has been used to inform options identification and appraisal. 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. **Opportunities:** To take account of identified pressure on the water environment in the selection of solutions for SA2.	Biodiversity and climate change
Biodiversity, Flora and Fauna	**Issues:** For SA2, almost the entire Slaney watercourse and its main tributaries have been designated as part of the Slaney River Valley SAC and are classified as *Margaritifera* (Freshwater Pearl Mussel) Sensitive Area by the NPWS. It is also considered especially important to	Water resources, water quality and climate change

SEA Topic	Issues and Opportunities	Interrelated Topics
	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	
Material Assets	**Issues:** WTP assets and network infrastructure requiring improvement or replacement **Opportunities**: Improvements to support reliability of access to good quality water.	Health and wellbeing
Landscape and Visual Amenity	**Issues:** Potential for climate change to affect land use and habitats and influencing landscape quality and amenity.	Biodiversity and geology and soils, climate change, health and wellbeing
Air Quality and Noise	No specific issues identified for the baseline for SA2.	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 taken into account in supply forecasts and additional risks to infrastructure and operations will need to be taken into account in planning for drought and freeze/thaw events; and in detailed scheme design and network operation. **Opportunities:** Additional management to minimise impact on supply and the environment, vulnerability to climate change and drought is required.	Biodiversity and water environment
Cultural Heritage	**Issues:** Known cultural heritage and archaeological assets and potential unknown archaeological assets.	Health and wellbeing
Geology and Soils	**Issues**: general need for good soil conservation and retention of nutrients and carbon in soil resources **Opportunities:** potential benefits from soil conservation for biodiversity, water quality and water retention also.	Biodiversity, water quality, landscape and climate change
Additional interrelated aspects	**Issues**: Poor water quality requiring additional water treatment and affecting aquatic biodiversity. **Opportunities:** Potential for catchment management initiatives leading to habitat, water retention, water quality enhancement and soil quality have the potential to provide wider benefits for environmental resilience and water supply; although this has not been specifically studied in this study area.	

3 Environmental Assessment – Options Appraisal

3 Environmental Assessment – Options Appraisal

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

3.1 Overview

Irish Water applied its Options Assessment Methodology from the Framework Plan to identify potential solutions to meet the needs identified in the SA2 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 SA2 are Stage 3-6:

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

3.2 Stage 3: Unconstrained Options

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

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

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

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

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

3.2.1 Existing Groundwater Abstractions

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

3.2.2 New Groundwater Abstractions

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

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

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

3.2.3 Sustainable Abstraction in Options Assessment

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

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

3.3 Stage 4: Coarse Screening

A total of 50 unconstrained options were identified for SA2 and subjected to coarse screening. The coarse screening process assessed the options against the criteria outlined in Table 3.1. This process is summarised in chapter 9 of the SEA Environmental Report for the Framework Plan. The process allows the assessment of the unconstrained options to eliminate any that will not be viable. The focus at this stage is on options that would be difficult to mitigate, those with likely significant effects on European or nationally important sites, or options likely to lead to deterioration of waterbody WFD status.

Table 3.1 Coarse Screening Assessment Criteria

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

Of the 50 unconstrained options, 33 were rejected after being analysed against the coarse screening criteria of resilience, deliverability and environment.

Sustainability reasons for rejecting options were identified for fourteen options. Table 3.2 provides the options that were rejected on an environmental basis and not considered suitable to address the deficit for the WRZs located in SA2. The full rejection register for both the coarse and fine screening (where applicable) is provided in Appendix C of the SA2 Technical Report.

Table 3.2 Coarse Screening Rejection Register

Option Reference	Option Description	Rejection Reasoning
SA2-03a	Rationalise Baltinglass Public Supply to Rathvily via Hacketstown WTP (Upgrade required)	This was considered as part of an SA option (grouped option) to rationalise four WTPs in SA2 to Rathvilly WTP. Rathvilly WTP is identified in the RWRP-EM as having a deficit in the DYCP, therefore, it cannot provide the required supply. The option requires a significant length of the pipeline, over 27km, for a relatively small supply. Therefore, the SA option (grouped option) was considered
SA2-006	Rationalise Baltinglass Public Supply to Rathvilly WTP directly	
SA2-19a	Rationalise Kiltegan Public Supply to Rathvilly via Hacketstown WTP (in Carlow) for long term OPEX savings (not in deficit)	

Option Reference	Option Description	Rejection Reasoning
SA2-021	Rationalise Knockananna Public Supply to Rathvilly, via Hacketstown WTP	not feasible at coarse screening stage, due to age of water and sedimentation, and not taken forward to fine screening. Rationalisation of the WRZs individually or in smaller groups was considered in other options.
SA2-30a	Rationalise Hacketstown to Rathvilly	
SA2-03b	Rationalise Baltinglass Public Supply to Rathvily via Hacketstown WTP (Upgrade required)	This was considered as part of an SA option (grouped option) to rationalise three WTPs in SA2 to Rathvilly WTP. Rathvilly WTP is identified in the RWRP-EM as having a deficit in the DYCP, therefore, it could not provide the required supply. The option requires a significant length of the pipeline, over 27km, for a relatively small supply. Therefore, the grouped option was considered not feasible, due to age of water and possible sedimentation issues, and not taken forward to fine screening. Rationalisation of the WRZs individually or in smaller groups was considered in other options.
SA2-19b	Rationalise Kiltegan Public Supply to Rathvilly via Hacketstown WTP (in Carlow) for long term OPEX savings (not in deficit)	
SA2-30b	Rationalisation Hacketstown to Rathvilly	
SA2-005	New abstraction from River Slaney for Baltinglass	The River Slaney is a WFD high status waterbody and is also designated as the Slaney River Valley SAC. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving high WFD status and also to result in a greater risk of having adverse effects on this European site. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.
SA2-016	New abstraction from River Slaney for Stratford Public Supply	This was considered as part of an SA option (grouped option) to provide deficit to two WTPs by increasing abstraction from the River Slaney. The River Slaney is a WFD high status waterbody and is also designated as the Slaney River Valley SAC Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving high WFD status and also to result in a greater risk of having adverse effects on this European site. Therefore, this option did not meet the
SA2-027	New abstraction from River Slaney for Knockanarrigan Davidstown Public Supply	

Option Reference	Option Description	Rejection Reasoning
		requirements of the Environmental, Resilience or Deliverability criteria.
SA2-029	Increased abstraction from River Derreen for Hacketstown	The River Dereen is a tributary of the River Slaney which is designated as the Slaney River SAC. The River Slaney is a “high status” waterbody under WFD. This option was not considered feasible based on yield not being available at the current abstraction point on Mill Race channel adjacent to the River Dereen main channel. The existing abstraction experienced low flow interventions during the summer 2018 drought due to low flows diverted from the main channel into the Mill Race. The alternative surface water option to abstract from the main river channel was preferable as there is yield available and would be sustainable abstraction (5% Q95).
SA2-030	Increased abstraction from River Derreen and Hacketstown WTP expansion	
SA2-30c	Rationalise Hacketstown to Rathvilly	Rathvilly WTP is identified in the RWRP-EM as having a deficit in the DYCP, therefore, it cannot provide the required supply. Therefore, the option was considered unviable at coarse screening stage and not taken forward to fine screening.

3.4 Stage 5: Fine Screening

A total of 17 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 SA2.

3.5 Stage 6: Feasible Options List

A total of 17 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 SA2 Technical Report.

4

Environmental Assessment – Approach Development

4 Environmental Assessment – Approach Development

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

4.1 Introduction to Approach Development

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

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

Table 4.1 The Six SA Approaches

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

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

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

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

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

4.2 Stage 7: Approach Development Process

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

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

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

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

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

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

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

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

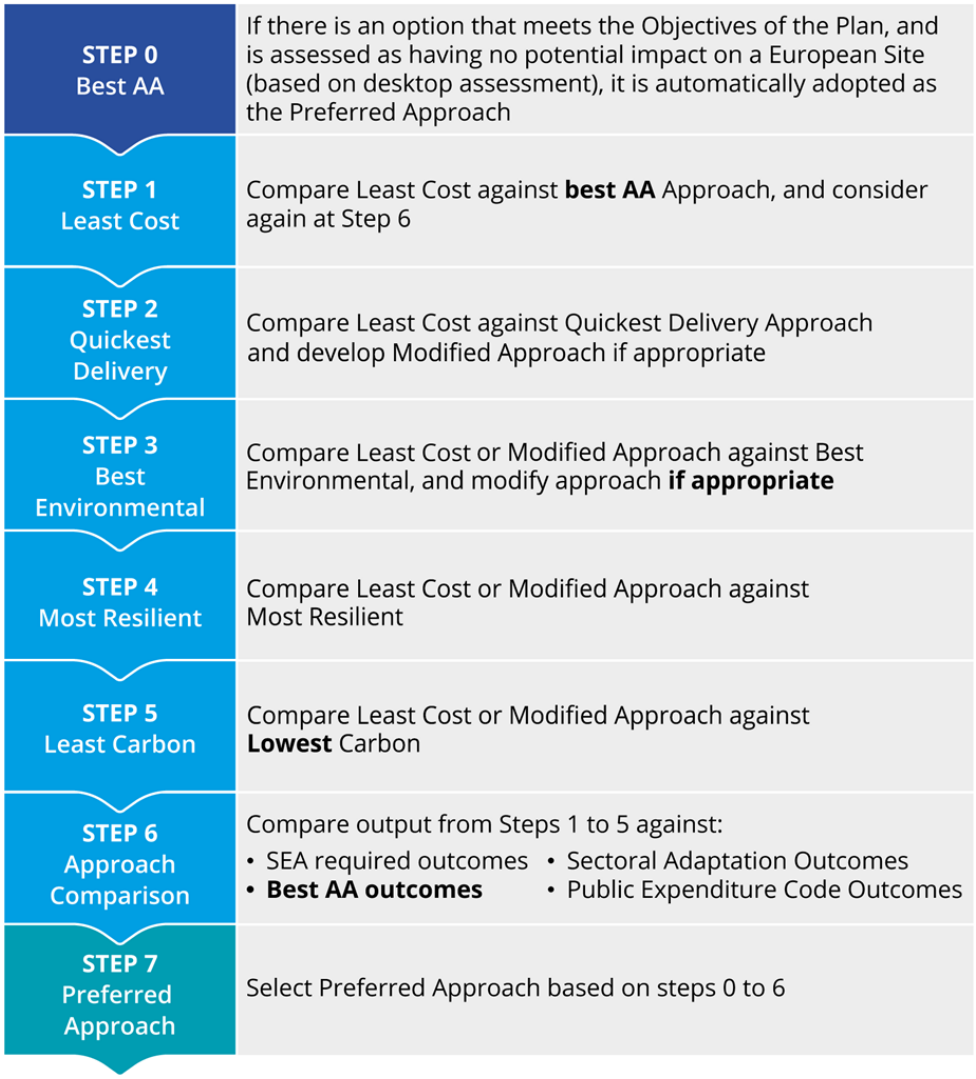

Figure 4.1 The 7 Step Process

4.2.1 Environmental Assessment in the Approach Development process

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

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

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

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

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

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

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

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

The general process is illustrated in Figure 4.2 below.

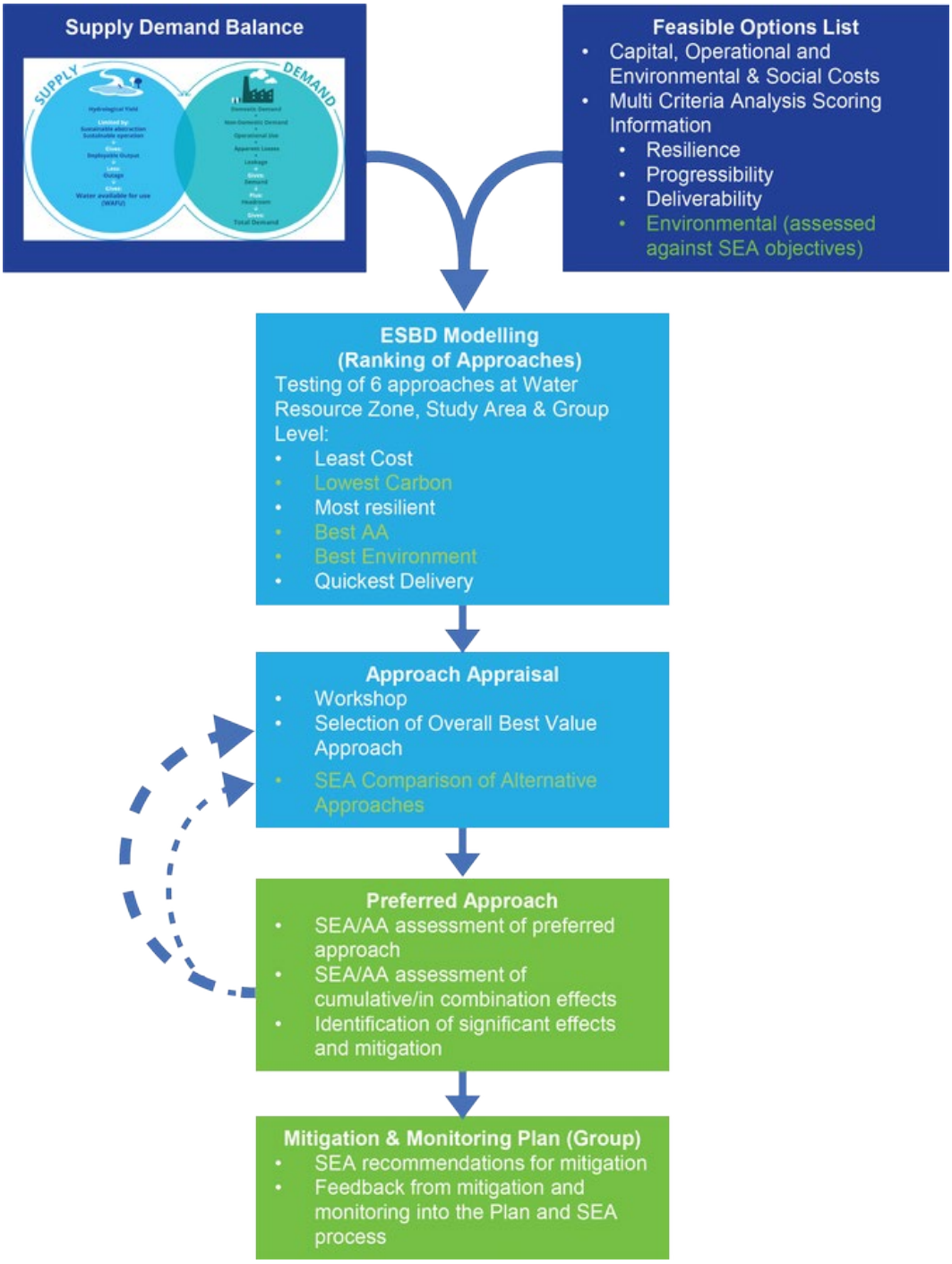

Figure 4.2 Approach Development Process

4.3 SA2 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 SA2 there are 15 WRZ options and these are listed in Table 5.2 in the SA2 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 SA2, a total of 2 combinations were compared including the WRZ Level Approach; these are presented in Table 4.2. Note that the Preferred Approach selected at the end of the process has been outlined in red throughout this section.

Table 4.2 SA2 Summary of SA Combination of Performance against Approach Category

Category	WRZ level approach	SA Combination 1 (SA Option 2)
Least Cost	Worst	Best
Quickest Delivery	Best	Worst
Number of -3 Biodiversity Scores	No -3 Scores	No -3 Scores
Lowest Carbon	Best	Worst
Most Resilient	Worst	Best
Best Environmental	Worst	Best

Key															
Ranked order (best to worst)	Best														Worst

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 two approaches (see Table 4.3).

Table 4.3 Study Area Approach Categories

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

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

Table 4.4 Study Area Approaches

Options included	Do Minimum	Least Cost Approach (SA combination 1)	Best Appropriate Assessment Approach (SA combination 1)	Quickest Delivery Approach (WRZ Approach)	Best Environmental Approach (SA combination 1)	Most Resilient Approach (SA combination 1)	Lowest Carbon Approach (WRZ Approach)
SA options (Group options)	No options	**SA option 2:** 07b, 11b	**SA option 2:** 07b, 11b	N/A	**SA option 2:** 07b, 11b	**SA option 2:** 07b, 11b	N/A
WRZ options	No options	001 013 017 20a 024 028 30d 035 038 040	001 013 017 20a 024 028 30d 035 038 040	001 008 010 013 017 20a 024 028 30d 035 038 040	001 013 017 20a 024 028 30d 035 038 040	001 013 017 20a 024 028 30d 035 038 040	001 008 010 013 017 20a 024 028 30d 035 038 040

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

* For the option references - all options are part of SA2 e.g. SA2-001 is shown as 001 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 SA2 Technical Report.

Within SA2, this resulted in two approaches being selected from the 2 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 in this circumstance when comparing the two identified approaches against each other (representing the Stage 3 analysis for the selection of the Preferred Approach used in the workshop - see Table 4.5), their relative performance against categories Table 4.2 is the same as identified in Table 4.5. This is because there are only 2 combinations considered, therefore, the 'best' and 'worst' scale is the equivalent of a first and second position.

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

The three stages identified above were applied through a final workshop with all of the background MCA and option costing information available for each option and the ranking from the Economic Balance of Supply and Demand (EBSD) tool. Table 4.5 suggests that both SA approach 1 and SA approach 2 are the best AA because they have the same number of -3 biodiversity scores (i.e. neither of these approaches had -3 scores). However, SA approach 1 was selected as the best AA approach in Table 4.3 after comparing the number of -2 and -1 biodiversity scores.

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

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

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

4.4 Comparison of SA2 Approaches

An overall summary of the infrastructure components and abstractions for each of the SA approaches identified for SA2 is provided below in Table 4.6 and has been used to inform the environmental assessment.

Table 4.6 Study Area Approach Components Summary

Infrastructure Summary	Do Minimum	SA Approach 1 (SA Combination 1) (LCo, BA, BE, MR)	SA Approach 2 (WRZ Approach) (QD, LC)
New pipeline network (km)	0	27	12
New WTPs	0	0	2
Upgrade WTPs	0	9	11
New / upgraded abstractions	0	7	6
WTPs decommissioned	0	3	1
Abstractions abandoned	0	3	1
Raw Water Storage	0	0	0
Treated Water Storage	0	3	2

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

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

Table 4.7 Study Area Approach Comparison Summary

Topic	Total No. of	SA Approach 1 (SA Combination 1) (LCo, BA, BE, MR)	SA Approach 2 (WRZ Approach) (QD, LC)	Range (Difference between Lowest and Highest Score)
Population, health, economy and recreation	-3 scores	No Difference		0
	MCA score	Best	Worst	1

Water Environment: quality and resources	-3 scores	No Difference		0
	MCA score	No Difference		0
Biodiversity, Flora and Fauna	-3 scores	No Difference		0
	MCA score	Best	Worst	5
Material Assets	-3 scores	No Difference		0
	MCA score	Best	Worst	4
Landscape and Visual	-3 scores	No Difference		0
	MCA score	Best	Worst	3
Climate Change	-3 scores	No Difference		0
	MCA Score	Best	Worst	1
Culture, Heritage and Archaeology	-3 scores	No Difference		0
	MCA Score	No Difference		0
Geology and Soils	-3 scores	No Difference		0
	MCA Score	No Difference		0

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

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

** approaches are showing similar level of risk on culture, heritage and archaeology. Routing and siting is only indicative at this stage. Most options involving new 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, BA, BE, MR)

SA approach 1, key comparison points:

- Identified as the best in the following categories: Least Cost, Best Environmental, Best AA and Most Resilient;
- Option types included:
    - SA option (group option): 1 rationalisation option;
    - WRZ options: 7 groundwater abstraction options, 1 surface water abstraction option and 2 WTP upgrade options;
- No -3 biodiversity scores (so no higher risk options that could impact on European sites); and
- SA approach 1 and SA approach 2 are similar in terms of infrastructure development. The difference being a result of the SA option used in SA Approach 1, which requires:
    - Twice the length of pipeline;
    - No new WTPs;
    - Fewer WTP upgrades;
    - More WTPs decommissioned, new/upgraded abstractions and abstractions abandoned; and
    - One additional treated water storage facility.

4.4.2 SA Approach 2 (WRZ Approach) (QD, LC)

SA approach 2, key comparison points:

- Identified as the best in the following categories: Quickest Delivery and Lowest Carbon;
- Option types included:
    - WRZ options: 9 groundwater abstraction options, 1 surface water abstraction option and 2 WTP upgrade options;
- No -3 biodiversity scores (so no higher risk options that could impact on European sites); and
- SA approach 2 is similar to SA approach 1 in terms of infrastructure development apart from the SA option differences explained above.

4.5 SA2 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 -1,278 m^3/d in 2019, to a projected maximum of -1,510 m^3/d in 2044 during dry conditions under a ‘Do Minimum’ scenario. As a result, public water supplies in this area are vulnerable, particularly under drought conditions. In addition, there may be ongoing reliability issues with the supplies and the situation is expected to further deteriorate due to climate change driven reductions in water resources and increased demand growth within the area. Table 4.8 shows the SDB for the WRZs in SA2.

Table 4.8 Supply Demand Balance for SA2

WRZ Name	WRZ Code	Population	Maximum Deficit m^3/day*	
			2019	2044
Baltinglass Public Supply	3400SC0003	2,470	-801	-885
Dunlavin Public Supply	3400SC0004	975	-160	-187
Hollywood Donard Public Supply	3400SC0005	907	-145	-191
Hacketstown	0100SC0005	610	-90	-112
Stratford Public Supply	3400SC0009	582	-21	-47
Ballyknockan Valleymount Public Supply	3400SC0008	392	-34	-53
Kiltegan Public Supply	3400SC0011	286	No Deficit	No Deficit
Knockanarrigan Davidstown Public Supply	3400SC0023	225	-24	-29
Knockananna Public Supply	3400SC0015	211	No Deficit	-1
Rathdangan Public Supply	3400SC0014	130	No Deficit	No Deficit
Grangecon Public Supply	3400SC0019	51	-2	-4
Knocknagilky Public Supply	3400SC0052	1	-1	-1

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

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

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

SEA Objectives	Phase (Construction (C) / Operation (O))	Do Minimum	SA Approach 1 (SA Combination 1) (LCo, BA, BE, MR)	SA Approach 2 (WRZ Approach) (QD, LC)
1. Protect public health and promote wellbeing	C	0	--	-
	O	---	++	++
2. Protect and enhance biodiversity and contribute to resilient ecosystems	C	0	--	--
	O	--	0	0
3. To protect landscapes, townscapes and visual amenity	C	0	-	--
	O	0	+	-
	C	0	-	--

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

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

The overall assessment of the approaches against the SEA objectives indicates that SA approach 1 (identified as the Preferred Approach) is likely to have lower materials and waste impacts due to the rationalisation of assets involved. SA approach 1 is also likely to have a lower landscape impact as it requires less above ground infrastructure than SA approach 2. SA approach 1 also has some more resilience benefits due to the use of a more resilient source.

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

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

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

4.6 Without Regional Transfer Alternative

The approach development process at study area level identifies a number of locations where a supply from outside the study area is likely to represent a better solution than relying on local supply solutions only. The SA2 Preferred Approach includes options that are dependent on the development of the SA9 Preferred Approach. Alternatives for these options need to be considered in the event that the Preferred Approach for SA9 cannot advance, the alternative options are outlined in Table 4.10. Note that the options for the other WRZs that are not specified in Table 4.10 will remain the same as those in the current SA2 Preferred Approach.

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

WRZ	SA2 Preferred Approach Options	SA2 Alternative Options
Hacketstown	SA2-30d Rationalisation to Rathvilly	SA2-032 Maintain and upgrade existing WTP and abstractions and new GW abstraction local to the existing WTP
Dunlavin Public Supply	SA Option 2 Rationalise Hollywood - Donnard and Dulavin to Ballymore Eustace WTP	SA2-008 Maintain and upgrade existing WTP and new GW abstraction local to the existing WTP
Hollywood Donard Public Supply		SA2-010 Maintain and upgrade existing WTP and new GW abstraction local to the existing WTP

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

Table 4.11 Alternative and Preferred Approach Options Infrastructure Summary

Infrastructure Summary	Preferred Approach Options	Alternative Approach Options
New pipeline network (km)	26.5	1.1
New WTPs	0	3
Upgrade WTPs	0	3
New/upgraded abstractions	0	2
WTPs decommissioned	3	0

Infrastructure Summary	Preferred Approach Options	Alternative Approach Options
Abstractions abandoned	3	0
Raw water storage	0	0
Treated water storage	2	1

Table 4.12 provides an overall comparative assessment between the SA2 Preferred Approach options and the alternative options listed in Table 4.10 against the SEA objectives.

Table 4.12 Assessment of the Preferred Approach Options and the Alternatives

SEA Objectives	Phase (Construction (C) / Operation (O))	Preferred Approach Options (PA)	Alternative Approach Options (Alt)	Summary
1. Protect public health and promote wellbeing	C	--	--	The PA options have a significantly longer length of pipeline; however, the Alt options require three new WTPs. The PA options have the potential to cause disruption to urban and rural areas, whereas Alt options have the potential to cause disruption to rural areas.
	O	++	+	The PA options decommission failing WTPs whereas the Alt options upgrade these failing WTPs to provide benefits during operation.
2. Protect and enhance biodiversity and contribute to resilient ecosystems	C	--	--	The PA options have direct links to European sites, however it's a temporary impact for construction phase only.
	O	-	--	The Alt options have the potential to cause direct impacts within the Slaney River SAC that could impact qualifying interest species and Annex species as a result of abstraction pressures. There is also a loss of important habitat associated with required infrastructure. The PA options do require river crossing with direct hydrological links to the River Slaney SAC.
3. To protect landscapes, townscapes and visual amenity	C	-	-	The PA options require a significantly longer length of pipeline; however, the Alt options require three new WTPs. Both have the potential to cause visual impacts to urban and rural areas during construction.
	O	+	--	The PA options include decommissioning of three WTPs, whereas the Alt options require three new WTPs to be built which have the potential to cause moderate long term visual impacts.

SEA Objectives	Phase (Construction (C) / Operation (O))	Preferred Approach Options (PA)	Alternative Approach Options (Alt)	Summary
4. Protect and where appropriate enhance, built and natural assets and reduce waste	C	-	--	The PA options require approximately 26 km of new pipeline which could result in temporary loss of access to agricultural land. The Alt approach requires three new WTPs to make use of existing assets.
	O	0	-	The PA options require new network below ground network; however, land will be reinstated after construction and no long term impacts are predicted. The Alt options would result in the partial loss of agricultural land to cater for new WTPs.
5. Reduce greenhouse gas emissions	C	--	-	There is a is a moderate level or carbon emissions associated with the PA options and a low level of carbon emissions associated with the Alt options in relation to the Deployable Output created.
	O	--	-	
6. Contribute to environmental climate change resilience	C	0	0	No construction impacts are predicted.
	O	++	--	The PA options use a large resilient supply whereas the Alt options utilise several smaller supplies that are more vulnerable to climate change impacts. The PA options would also help to reduce pressure on existing environmental sources within these WRZs through rationalising the supply.
7. Protect and improve surface water and groundwater status	C	0	0	No construction impacts are predicted.
	O	0	-	The PA options do not include any new or increased abstractions and involve abandonment of three abstractions. The Alt options include one new groundwater water abstraction and two increased groundwater abstractions.
8. Avoid flood risk	C	0	0	No impediment to or increase of flood risk anticipated.
	O	0	0	
9. Protect and where appropriate, enhance cultural heritage assets	C	--	-	The PA options are located where there are a number of cultural heritage assets listed under the Record of Monuments/Record of Protected Structures and/or National Inventory of Architectural Heritage records and may be affected. The Alt options are not located where there are records of

SEA Objectives	Phase (Construction (C) / Operation (O))	Preferred Approach Options (PA)	Alternative Approach Options (Alt)	Summary
				cultural heritage assets, however due to new network required, risk of unknown archaeology is assessed as minor.
	O	0	0	No operational impacts are predicted.
10. Protect quality and function of soils	C	-	-	There are no geological features resources at risk as a result of both PA and Alt options, however there is a potential risk of minor damage to valuable soils with construction of the network.
	O	0	0	Soils will be reinstated after construction and no operation impacts are predicted.

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

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

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

5

SA2 Preferred Approach: Strategic Environmental Assessment

5 SA2 Preferred Approach Strategic Environmental Assessment

5.1 SA2 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 all but two 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 two WRZs, Hollywood - Donard Public Supply and Dunlavin Public Supply, SA option 2 (SA2-07b and SA2-11b) involves rationalising these two WRZs. The SA Preferred Approach for the remaining WRZs involves new and increased groundwater abstractions, upgrades to existing WTPs, and the decommissioning of Hacketstown WTP.

Table 5.1 gives a breakdown of the options in SA2 and the associated abstractions.

Table 5.1 Preferred Approach Breakdown

WRZ Name and Option Reference*	Option Description	Abstraction / Demand
SA2-001 3400SC0003 Baltinglass Public Supply	New GW abstraction and upgrade of Baltinglass WTP • New GW abstraction amount to supply full future demand • Ballyglass groundwater body WFD status 2013-2018: Good	1,066 m^3/d
SA2-07b (SA option 2) 3400SC0004 Dunlavin Public Supply	Rationalisation to Ballymore Eustace (BME) WTP • SA option includes rationalisation of Hollywood-Donard WRZ and Dunlavin WRZ full demands to BME WTP (GDA). • BME source Poulaphouca lake waterbody WFD status 2013-2018 – Good	421 m^3/d
SA2-11b (SA option 2) 3400SC0005 Hollywood Donard Public Supply	Rationalisation to Ballymore BME WTP • SA option includes rationalisation of Hollywood-Donard WRZ and Dunlavin WRZ full demands to BME WTP (GDA). • BME source Poulaphouca lake waterbody WFD status 2013-2018 – Good.	529 m^3/d
SA2-013 3400SC0008 Ballyknockan Valleymount Public Supply	Increase groundwater abstraction • Increase GW abstraction to meet WRZ future deficit (DYCP 2044) • Kilcullen groundwater body WFD status 2013-2018 – Good	186 m^3/d
SA2-017	Increase groundwater abstraction	233 m^3/d

WRZ Name and Option Reference*	Option Description	Abstraction / Demand
3400SC0009 Stratford Public Supply	• Increase GW abstraction to meet WRZ future deficit (DYCP 2044) • Ballyglass groundwater body WFD status 2013-2018 – Good	
SA2-028 3400SC0023 Knockanarrigan Davidstown Public Supply	Increase groundwater abstraction • Increase GW abstraction to meet WRZ future deficit (DYCP 2044) • Ballyglass groundwater body WFD status 2013-2018 – Good	176 m^3/d
SA2-035 3400SC0014 Rathdangan Public Supply	Not in deficit. Treatment upgrade if required. • WRZ not in deficit, option to upgrade WTP for water quality purposes • Ballyglass groundwater body WFD status 2013-2018 – Good	N/A
SA2-038 3400SC0011 Kiltegan Public Supply	Not in deficit. Treatment upgrade if required. • WRZ not in deficit, option to upgrade WTP for water quality purposes • Ballyglass groundwater body WFD status 2013-2018 – Good	N/A
SA2-040 3400SC0052 Knocknagilky Public Supply	Increase GW abstraction • Increase GW abstraction to meet WRZ deficit (DYCP 2044) • Ballyglass GWB WFD status 2013-2018 – Good	1 m^3/d
SA2-30d 0100SC0005 Hacketstown	Rationalisation to Rathvilly (Dependant on New Shannon Source) • Includes rationalisation of WRZ to supply from Srowland WTP (New Shannon Source - SA9) via connection to Rathvilly WTP (Carlow). Dependent on new source supply to New Shannon Source to offset Srowland supply to Carlow. Decommissioning of existing surface water abstraction • Lough Derg highly modified waterbody WFD status 2013-2018 – Good	571 m^3/d
SA2-20a 3400SC0015 Knockananna Public Supply	Increase GW abstraction • Increase GW abstraction to meet WRZ deficit (DYCP 2044) • Ballyglass groundwater body WFD status 2013-2018 – Good	56 m^3/d
SA2-024 3400SC0019 Grangecon Public Supply	Increase GW abstraction • Increase GW abstraction to meet WRZ deficit (DYCP 2044) • New Ross groundwater body WFD status 2013-2018 – Good	19 m^3/d

* Note: SA Options are the same as Group Options

The SA Preferred Approach options are shown in Figure 5.1, in relation to key environmental designations. Note that SA option 2 is labelled as SA2-502.

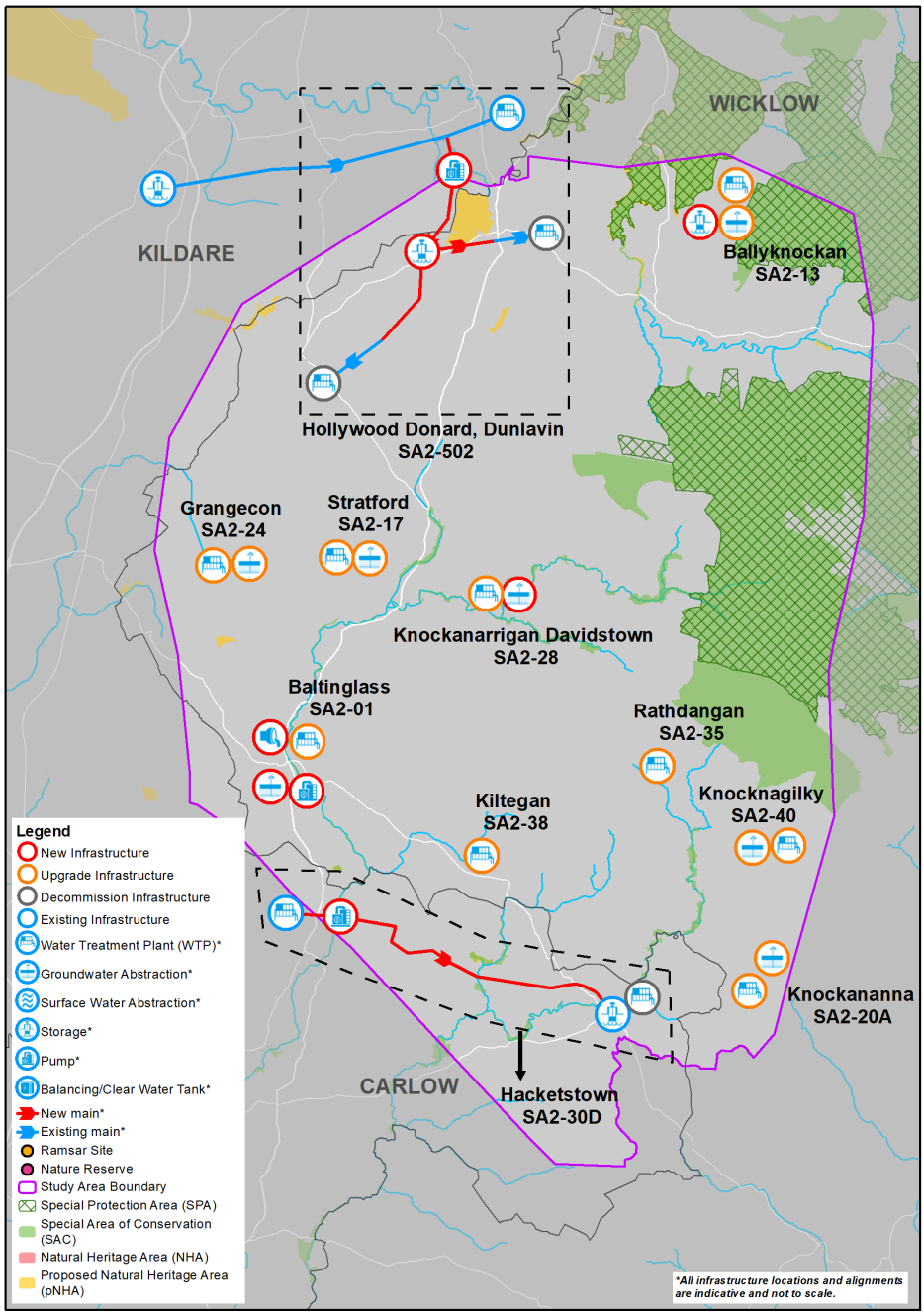

Figure 5.1 SA Preferred Approach and Key Environmental Designations

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
SA Option 2 (SA2-07b and SA2-11b)	✓	-	-	-	✓	✓	-	✓
SA2-001	✓	-	✓	✓	-	-	-	-
SA2-013	-	-	✓	✓	-	-	-	✓
SA2-017	-	-	✓	✓	-	-	-	-
SA2-20a	-	-	✓	✓	-	-	-	-
SA2-024	-	-	✓	✓	-	-	-	-
SA2-028	-	-	✓	✓	-	-	-	-
SA2-30d	✓	-	-	-	✓	✓	-	✓
SA2-035	-	-	✓	-	-	-	-	-
SA2-038	-	-	✓	-	-	-	-	-
SA2-040	-	-	✓	✓	-	-	-	-

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)
SA2-30d	Rationalisation to Rathvilly (Dependent on New Shannon Source)	Construction	-	--	-	-	0	0	0	0	-	-
		Operation	0	-	+	0	0	++	0	0	0	0
SA2-001	New GW - deeper BH in gravel aquifer approx. 3 km from Baltinglass	Construction	-	--	--	-	0	--	0	0	-	-
		Operation	0	-	0	0	0	--	-	0	0	0
SA2-013	Increase GW abstraction	Construction	-	-	0	-	-	-	0	0	0	0
		Operation	++	0	0	0	-	-	-	0	0	0
SA2-017	Increase GW abstraction	Construction	-	-	0	0	0	-	0	0	0	0
		Operation	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 (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)
SA2-038	Not in deficit. Treatment upgrade if required	Construction	-	-	0	0	0	0	0	0	0	0
		Operation	+	0	0	0	0	0	0	0	0	0
SA2-035	Not in deficit. Possible WQ issues will be looked at FOA stage	Construction	-	-	0	0	0	0	0	0	0	0
		Operation	++	0	0	0	0	0	0	0	0	0
SA2-20a	Increase GW abstraction	Construction	-	-	0	0	0	-	0	0	0	0
		Operation	0	0	0	0	0	-	-	0	0	0
SA2-024	Increase GW abstraction	Construction	-	-	0	0	0	-	0	0	0	0
		Operation	0	0	0	0	0	-	-	0	0	0
SA2-028	Increase GW abstraction	Construction	-	--	0	0	-	--	0	0	0	0
		Operation	0	-	0	0	-	--	-	0	0	0
SA2-040		Construction	-	-	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 (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)
	Increase GW abstraction	Operation	0	0	0	0	0	-	-	0	0	0
SA Option 2 (SA2-07b and SA2-11b)	Rationalisation to BME WTP	Construction	--	-	-	-	--	0	0	0	-	-
		Operation	++	0	+	0	--	++	0	0	0	0

* Note SA Option is the same as Group Option

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

5.2 Additional Measures

In addition to the SA Preferred Approach supply options, Irish Water is already implementing measures across the three pillars of Lose Less, Use Less and Supply Smarter to improve the level of service to their customers in this study area. These are described in the SA2 Technical Report and include leakage reduction and water conservation.

5.2.1 Leakage Reduction

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

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

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 SA2 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 SA2 Preferred Approach is provided in the SA2 Technical report. A high-level assessment of what this could mean for the SEA is shown in Table 5.4.

Table 5.4 SA2 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	The impact of sustainability reductions would reduce the volumes that can be abstracted from our existing sources therefore increasing the SDB deficit. The likelihood of this scenario appears to be low for the surface water abstraction at Hacketstown WTP based on outline sustainability assessments. Moreover, this source is to be decommissioned as part of the Preferred Approach. Groundwater sustainability is more difficult to assess at desktop level, however, as the abstractions in SA2 are small in scale they do not appear to be problematic.
			The Preferred Approach allows for the decommissioning of Hacketstown WTP so could contribute to sustainability improvements.
Climate Change	High (international climate change targets have not been met)	+100 m^3/d	Higher climate change scenarios would impact Irish Water's existing supplies and result in decreased water availability at certain times of year. 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. Within SA2, the single river abstraction at Hacketstown would be vulnerable to increased climate change impacts scenarios. However, this source is to be decommissioned as part of the Preferred Approach. 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.
			Could mean more pressure on sources although the Preferred Approach provides more operational flexibility to use less sensitive water sources.
Demand Growth	Low/Moderate (growth has been based on policy)	-283 m^3/d	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 twelve WRZs in the area and is projected to spread across ten. This is

Uncertainty	Likelihood	Increase/ Decrease in Deficit	Environmental Impacts Relative to Assessment of Preferred Approach Key: Green - Positive Amber - Negative
			driven by quality as well as quantity issues. In this rural area, growth is relatively low.
			This could allow lower than expected energy and carbon costs and lower increased abstraction requirements
Leakage Targets	Moderate/High (Irish Water is focused on sustainability and aggressive leakage reduction)	-33 m^3/d	Increased leakage savings beyond SELL would reduce the SDB deficit and the overall need requirement. The need drivers span across the WRZs in SA2 and are driven by quality as well as availability issues.
			This could allow lower than expected energy and carbon emissions and lower increased abstraction requirements.

6 SEA Cumulative Effects for SA2 Preferred Approach

6 SEA Cumulative Effects for SA2 Preferred Approach

Secondary, cumulative and the synergistic nature of the effects of the SA2 Preferred Approach proposals are required to be considered as part of SEA. These include:

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

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

6.1 Cumulative Effects 'Within Plan' for SA2

The potential 'within plan' cumulative effects for SA2 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 Eastern and Midlands Region level: Considering combined effects from proposals in the nine study areas (see the SEA Environmental Report of the Regional Plan).

For cumulative effects to occur, there needs to be an overlap of temporal periods in some way for the impact and/or the effect. For example, two schemes being constructed at the same time could result in cumulative traffic movements, while two schemes being operated together could result in additional drawdown of groundwater levels. A precautionary approach has been taken for the cumulative 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 SA2

Preferred Approach option references	SA2-30d	SA2-001	SA2-013	SA2-017	SA2-038	SA2-035	SA2-20a	SA2-024	SA2-028	SA2-040
SA option 2 (Group option 2))		N81		N81						
SA2-040										
SA2-028	SRV	SRV								
SA2-20a										
SA2-024										
SA2-035										
SA2-038										
SA2-017	SRV	SRV N81								
SA2-013										
SA2-001	SRV									

Key	
Construction Phase	
Operation Phase	
Construction and Operation	
Slaney River Valley	SRV
N81 Road	N81

There could be cumulative effects associated with construction in terms of traffic, noise and dust for the options located along the N81 road (indicated by N81 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 could be cumulative effects during construction for the options located close to the Slaney River Valley SAC (indicated by SRV in Table 6.1 and is part of the Slaney and Wexford Harbour catchment). The Slaney River Valley is a SAC and is important for salmon and the freshwater pearl mussel, which rely on high quality water. Cumulative construction works within the river valley could cause impacts including habitat loss, habitat degradation, mortality of QI species, spread of invasive non-native species and disturbance impacts if construction phases 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. A number of the options involve new or further abstraction from the Ballyglass WFD waterbody, see Figure 6.1 for the Preferred Approach abstractions in SA2.

There is 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 two of the WFD groundwater bodies (Ballyglass and Kilcullen) 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 Slaney River Valley SAC has been considered in the NIS. The NIS concluded that there will be no operational cumulative effects to the site.

Option SA2-013 (an increase groundwater option) is part of the Preferred Approach for SA2 but lies close to the Poulaphouca Reservoir SPA (Figure 6.1). The majority of the Poulaphouca Reservoir SPA area falls within the SA9 boundary. Therefore, cumulative effects of SA2-013 and other SA9 options to Poulaphouca Reservoir SPA are assessed in SA9 and overall cumulative effects for the study areas combined will be considered in the SEA for the RWRP.

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 SA2 this averages as 2.50 tCO_2e/ML (lifetime sum). Mitigation for carbon emissions could include increased sourcing of energy from renewable sources and improving energy efficiency. This could be undertaken alongside leakage reduction and campaigns to raise awareness of measures to reduce water consumption (which in turn would reduce energy consumption). This could include the promotion of water efficient devices and working with planning authorities and developers to encourage new development to be water efficient.

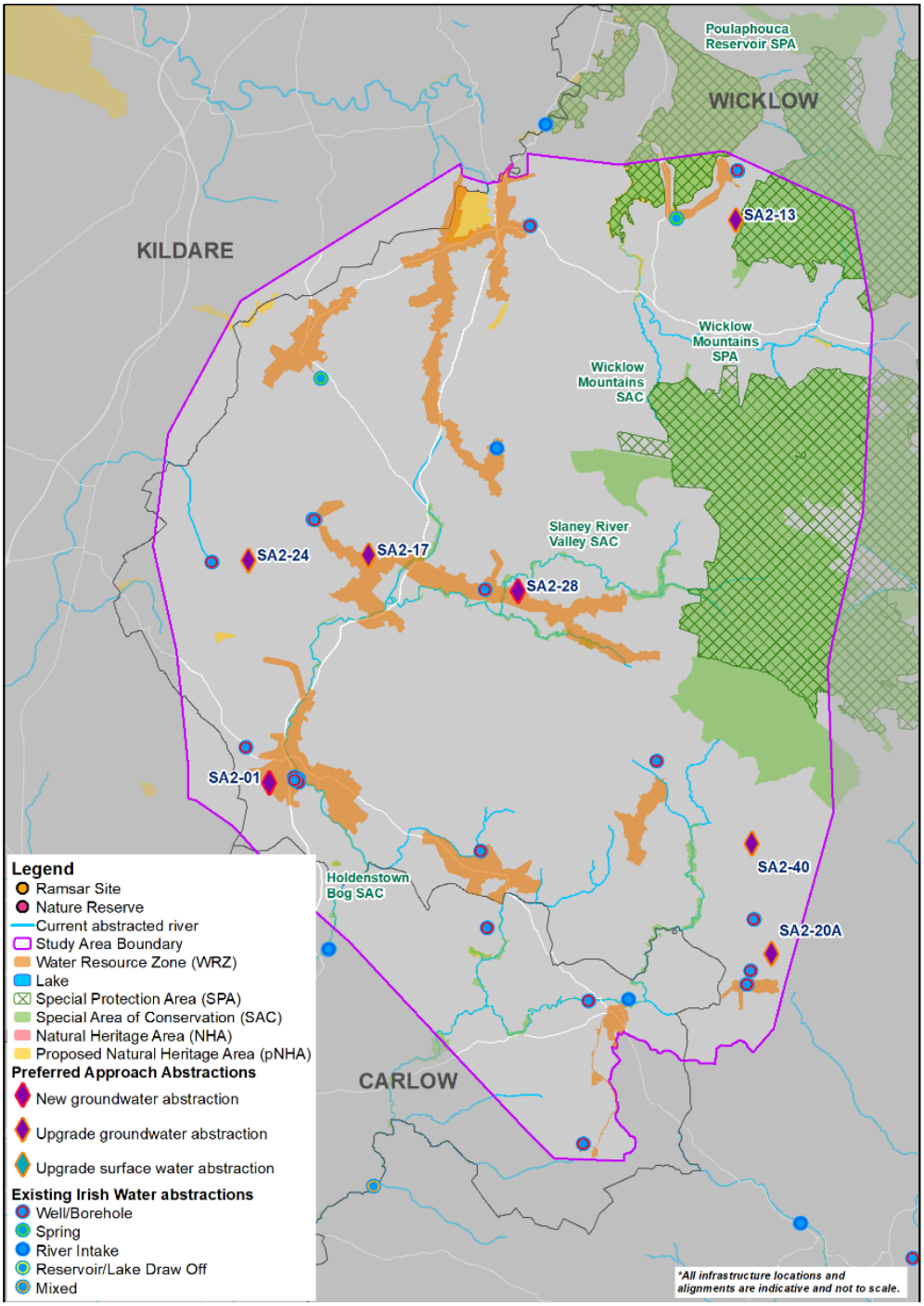

Figure 6.1 SA Preferred Approach Abstractions in SA2

6.2 Cumulative Effects with Other Developments

The SA2 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 SA2 there is only one development ‘Making Baltinglass the Hub for South West Wicklow’ that could cause cumulative effects with the SA Preferred Approach. Other developments that were not considered further due to the size and the distance of the developments from the SA

Preferred Approach are the Arklow to Shillelagh Recreational Trail and the N11/M11 Junction 4 to Junction 14 Improvement Scheme.

6.2.1 Cumulative Effects during Construction

The 'Making Baltinglass the Hub for South West Wicklow' covers a number of improvement projects within the town such as upgrading parking and footpaths, as well as supporting a number of town developments. The plan level assessment indicates that there could be potential for cumulative effects from construction disturbance between the Hub project and the SA Preferred Approach (Table 6.2). Potential effects could include increased traffic and potential for pollution or run off into the Slaney River Valley. These could be mitigated by standard mitigation measures such as planning of construction traffic routes and movements with the developer and producing a plan for maintaining water quality during construction. 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 SA2

Preferred Approach Options											
Project Developments	SA2-30d	SA2-001	SA2-013	SA2-017	SA2-038	SA2-035	SA2-20a	SA2-024	SA2-028	SA2-040	SA option 2 (Group option 2))
Making Baltinglass the Hub for South West Wicklow	SRV	SRV							SRV		

Key	
Construction Phase	
Operation Phase	
Construction and Operation	
Slaney River Valley	SRV

6.2.2 Cumulative Effects during Operation

The plan level assessment indicates that there are unlikely to be significant cumulative effects during the operation phase between the hub development and the options identified in the SA Preferred Approach individually.

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 SA2 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 SA2 and a range of options and SA approaches have been considered and assessed, including a 'Do Minimum' approach.

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

Key potential adverse impacts identified at plan level include:

- Moderate adverse effects during construction and minor adverse effect during operation for options SA2-30d, 001 and 028 which involve pipeline crossings of the Derreen River (hydrologically linked to the River Slaney SAC) and River Slaney SAC;
- Moderate adverse effects during construction of option SA2-001 associated with the visual impact to rural and urban areas of Baltinglass;
- Moderate adverse effects to environmental climate change resilience with options SA2-001 and 028 due to the requirement of new groundwater abstractions.
- Minor adverse effects during operation for options SA2-001, 013, 017, 20a, 024, 028 and 040 as a result of potential risks to groundwater quality and quantity and WFD status of hydrologically linked groundwater waterbodies from new or increased environmental abstractions; and
- Minor adverse effects (with SA option 2 being moderate adverse) arising from noise and visual disturbance for residents (including within Baltinglass Park), temporary loss of agricultural land, disturbance or loss of potentially valuable soils and/or risks of loss or truncation of unknown archaeological remains during construction of options which include considerable lengths of new supply pipeline, including SA2-001, 30d, 013 and SA option 2.

Cumulative effects assessment has identified a potential beneficial impact on the Slaney River Valley and salmonid and freshwater mussel pearl habitats as a result of the rationalisation of water abstractions from this waterbody. Cumulative effects assessment identified potential significant adverse effects in relation to carbon emissions, although the individual options are assessed as only neutral to moderate in relation to this SEA objective. This is because potential increases in carbon emissions contribute to national emissions. The average carbon intensity from the individual options provides an indicator for the new options in SA2 but does provide a complete picture as it does not fully take account of efficiencies from replacement of failing infrastructure, treatment technology or potential for mitigation, such as use of renewable energy sources in relation to the whole network. Insufficient information is available for the cumulative effects assessment to consider how total study area carbon emissions will change overall and per ML of water.

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 the River Slaney SAC and other 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 to Moderate Adverse O Neutral to Moderate Beneficial The PA is expected to improve overall drinking water quality reliability and sustainability through the decommissioning of failing WTPs and the replacement of abstractions vulnerable to drought conditions. The PA is expected to reduce risks to access of good quality water supply across different conditions and over the plan period.	Standard good construction practice and consultation Further assessment of risks to water quality and consideration of catchment management initiatives to improve water quality and reduce treatment cost. For example, working with landowners and managers on practices to reduce levels of sediment and pollution from entering water courses through run off.	• Level of service, and the frequency and duration of drought orders • Number of days/hours when water supply to people is disrupted due to drought, freeze-thaw or other service/infrastructure issues • Number of public rights of way closures/diversions and length of paths created compared to loss	• Duration of construction works, and number of complaints received regarding construction works • Duration of temporary closures of footpaths and other recreational assets • Number of days where recreational uses of Baltinglass park are impeded
2. Protect and enhance biodiversity and contribute to	C Minor Adverse to Moderate Adverse O Neutral to Minor Adverse Impacts from construction works for pipelines and service reservoirs	Routing/siting to avoid impacts. Standard good construction practice and specific measures as identified in the NIS of the Framework Plan.	• Temporary and permanent habitats lost vs habitats created/enhanced • Site condition and population data for QI of European and	• 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	on biodiversity. These can be minimised through careful routing and siting. Operational impacts on habitats of the River Slaney. Potential for construction and operational impacts on European and National designated sites, most notably the Slaney River Valley SAC.	Design to meet no net loss biodiversity or achieve enhancement, where possible, on or off site and in line with the Biodiversity Action Plan objectives. Further hydrological/hydrogeological assessments to determine impacts on designated sites. Operating rules to limit impacts on European and National sites.	National designated sites, including Slaney River Valley SAC.	
3. To protect landscapes, townscapes and visual amenity	C Neutral to Moderate Adverse O Neutral to Minor Beneficial Construction landscape impacts and long term impacts from above ground structures, such as new WTPs.	Routing and siting to reduce tree loss and appropriate location and design of above ground structures with landscape planting. Reinstatement of land use and vegetation.	• Total working area of pipelines non-designated landscapes • Land use/landscape features re-established for schemes over appropriate period – areas/km successfully restored to meet requirements	• Duration of construction works • Number of complaints received regarding visual impact of construction works
4. Protect and where appropriate enhance, built	C Neutral to Minor Adverse O Neutral New resources required for construction works, including	Materials management to be integrated into design to optimise use of existing resources and	• Loss of greenfield land, including agricultural, forestry or other land uses	• 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	extensive lengths of pipeline, service reservoirs and new/upgraded WTPs. Ongoing maintenance requirements.	minimise waste from construction and operation.	• Disruptions to strategic infrastructure/services • Use of waste management plans • Volume of drinking water treatment residuals sent to landfill	
5. Reduce greenhouse gas emissions	C Neutral to Moderate Adverse O Neutral to Moderate Adverse Embodied and operational carbon contribute to national level carbon emission targets. Leakage and water efficiency can contribute to reducing carbon.	Design to minimise embodied carbon emissions and optimise operational efficiency. Seek renewable energy supply sources and optimise use of leakage and water efficiency measures to reduce carbon. Consider offsetting approaches with multiple benefits for water quality, carbon sequestration and linking with other objectives.	• Percentage of energy supply from renewable sources or reduced energy use • Carbon footprint (total tonnes) per year, predicted over plan period, lifetime of schemes and carbon intensity of water resource options (tonnes/Ml/d)	• Carbon footprint (total tonnes) during construction • Operational Carbon Intensity kgsCO2equic/ML
6. Contribute to environmental climate	C Neutral to Moderate Adverse O Moderate Adverse to Moderate Beneficial	Consider how operation can further reduce climate change pressure on at risk sources and associated designations,	• WFD waterbody status objectives at risk and designated site condition status	• 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	Abstractions generally reduce environmental resilience but overall improved flexibility for operation using regional schemes has the potential to reduce pressure on at risk local resources. WRZ options SA2-001, SA2-013, SA2-017, SA2-20a, SA2-024, SA2-028 and SA2-040 require further assessment to understand their sustainability in the longer term.	particularly for SA2-001 and SA2-028. Sustainability review of sources taking account of groundwater and surface water interconnections for WRZ options SA2-001 and SA2-028.	• 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 Minor 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.	• WFD waterbody status objectives at risk	• Pollution incidents during construction
8.	Avoid flood risk	C Neutral O Neutral	Siting and design of schemes to take account of flood risk and design for flood risk resilience.	• Number of options at risk of flooding at each AEP level	• Lost time to flooding • Lost time to power supply interruptions

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
9. Protect and where appropriate, enhance cultural heritage assets	C Neutral to Minor Adverse O Neutral Potential construction impacts on unknown archaeological interest. Impacts on known interests are expected to be avoided.	Standard good practice approaches to minimise potential impacts.	• Number of archaeological assets adversely affected by water resource options • Number of options that are rerouted to avoid cultural heritage impacts • Number of schemes including improvements to access recording of archaeological assets or communication/ interpretation of interest features	• Number of archaeological finds recorded during construction
10. Protect quality and function of soils	C Neutral to Minor Adverse O Neutral Potential for loss and damage to valuable soils during construction but impacts to geological assets are expected to be avoided.	Standard good practice to conserve and reinstate soils.	• Soil Management Plans implemented • Volume of contaminated land restored, or soils removed	• Total volume of soil removed or reused on site

8

Water Framework Directive Summary

8 Water Framework Directive Summary

Through the options identification and assessment process new options considered have been restricted to those expected to meet estimated sustainability requirements and all options have been assessed based on conservative allowable abstraction constraints. The options identified in SA2 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 SA2 abstractions have good quantitative status (Irish Water, 2022). The abstractions are not located in close proximity and the risk of combined effects on groundwater body WFD objectives, or on existing abstractions, are considered low. However, impacts, including cumulative effects with non Irish Water abstractions, will need to be considered in further detail as part of project level consenting to demonstrate both sustainability for any connected surface waterbodies and groundwater dependent habitats and protected areas.

9 Appropriate Assessment Summary

9 Appropriate Assessment Summary

The NIS of the Regional Plan's conclusions for SA2, 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 Slaney River Valley SAC. The potential effects include disturbance, habitat degradation, habitat loss, mortality of Qualifying Interest (QI) species and spread of invasive non-native species. However, the assessment concluded that with the mitigation identified there will be no adverse effects on the integrity of the European site in-combination with other plans or projects.

Potential in-combination effects between preferred options were identified for Slaney River Valley SAC if construction of options is concurrent. The potential impacts include habitat loss, habitat degradation, mortality of QI species, spread of invasive non-native species and 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 Eastern and Midlands Region options and cumulative effects.

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Appendix A Fine Screening Summaries

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

Table A.1 Fine Screening Summary of WTP Upgrade Options in SA2

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
SA2-035	WTP Upgrade									0	0	-1
SA2-038	Upgrade Kiltegan Public Supply WTP for Water Quality Purposes									0	0	-4

Table A.2 Fine Screening Summary of Rationalisation Options in SA2

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
SA2-07b	Rationalisation Ballymore Eustace - Hollywood									0	0	-10
SA2-11b	Rationalisation Ballymore Eustace - Hollywood									0	0	-11

Table A.3 Fine Screening Summary of Surface Water Options in SA2

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
SA2-012	New SW Abstraction									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
SA2-041	Conjunctive supply from GW in summer and SW in the Winter									1	0	-14
SA2-30d	Supply from Rathvilly (New Shannon Source dependent via Carlow Town)									0	1	-10

Table A.4 Fine Screening Summary of Groundwater Options in SA2

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
SA2-001	New GW Abstraction									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
SA2-008	New GW Abstraction									0	0	-12
SA2-010	New GW Abstraction									0	0	-13
SA2-013	Increase GW Abstraction									0	0	-7
SA2-017	Increase GW Abstraction									0	0	-8
SA2-20a	Increase GW Abstraction									0	0	-3
SA2-024	Increase GW Abstraction									0	0	-4
SA2-028	New GW Abstraction									0	0	-6
SA2-032	New GW Abstraction									1	0	-16
SA2-040	Increase GW Abstraction									0	0	-2

Appendix B SA Approaches for SA2

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 1	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
0100SC0005: Hacketstown	SA2-30d Supply from Rathvilly (New Shannon Source dependent via Carlow Town)	-	SA2-30d Supply from Rathvilly (New Shannon Source dependent via Carlow Town)	-	SA2-30d Supply from Rathvilly (New Shannon Source dependent via Carlow Town)	-
3400SC0003: Baltinglass Public Supply	SA2-001 New GW Abstraction	-	SA2-001 New GW Abstraction	-	SA2-001 New GW Abstraction	-
3400SC0004: Dunlavin Public Supply	SA2-07b Rationalisation Ballymore Eustace - Hollywood	2	SA2-07b Rationalisation Ballymore Eustace - Hollywood	2	SA2-07b Rationalisation Ballymore Eustace - Hollywood	2
3400SC0005: Hollywood Donard Public Supply	SA2-11b Rationalisation Ballymore Eustace - Hollywood	2	SA2-11b Rationalisation Ballymore Eustace - Hollywood	2	SA2-11b Rationalisation Ballymore Eustace - Hollywood	2
3400SC0008: Ballyknockan Valleymount Public Supply	SA2-013 Increase GW abstraction	-	SA2-013 Increase GW abstraction	-	SA2-013 Increase GW abstraction	-
3400SC0009: Stratford Public Supply	SA2-017 Increase GW abstraction	-	SA2-017 Increase GW abstraction	-	SA2-017 Increase GW abstraction	-

WRZ	Preferred Approach - SA Approach 1		Least Cost - SA Approach 1		Best Environmental - SA Approach 1	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
3400SC0011: Kiltegan Public Supply	SA2-038 Upgrade Kiltegan Public Supply WTP for Water Quality Purposes	-	SA2-038 Upgrade Kiltegan Public Supply WTP for Water Quality Purposes	-	SA2-038 Upgrade Kiltegan Public Supply WTP for Water Quality Purposes	-
3400SC0014: Rathdangan	SA2-035 WTP Upgrade	-	SA2-035 WTP Upgrade	-	SA2-035 WTP Upgrade	-
3400SC0015: Knockananna Public Supply	SA2-20a Increase GW abstraction	-	SA2-20a Increase GW abstraction	-	SA2-20a Increase GW abstraction	-
3400SC0019: Grangecon Public Supply	SA2-024 Increase GW abstraction	-	SA2-024 Increase GW abstraction	-	SA2-024 Increase GW abstraction	-
3400SC0023: Knockanarrigan Davidstown Public Supply	SA2-028 New GW abstraction	-	SA2-028 New GW abstraction	-	SA2-028 New GW abstraction	-
3400SC0052: Knocknagilky Public Supply	SA2-040 Increase GW Abstraction	-	SA2-040 Increase GW Abstraction	-	SA2-040 Increase GW Abstraction	-

WRZ	Quickest Delivery - SA Approach 2		Most Resilient - SA Approach 1		Lowest Carbon - SA Approach 2	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
0100SC0005: Hacketstown	SA2-30d Supply from Rathvilly (New Shannon Source dependent via Carlow Town)	-	SA2-30d Supply from Rathvilly (New Shannon Source dependent via Carlow Town)	-	SA2-30d Supply from Rathvilly (New Shannon Source dependent via Carlow Town)	-
3400SC0003: Baltinglass Public Supply	SA2-001 New GW Abstraction	-	SA2-001 New GW Abstraction	-	SA2-001 New GW Abstraction	-
3400SC0004: Dunlavin Public Supply	SA2-008 New GW Abstraction	-	SA2-07b Rationalisation Ballymore Eustace - Hollywood	2	SA2-008 New GW Abstraction	-
3400SC0005: Hollywood Donard Public Supply	SA2-010 New GW Abstraction	-	SA2-11b Rationalisation Ballymore Eustace - Hollywood	2	SA2-010 New GW Abstraction	-
3400SC0008: Ballyknockan Valleymount Public Supply	SA2-013 Increase GW abstraction	-	SA2-013 Increase GW abstraction	-	SA2-013 Increase GW abstraction	-
3400SC0009: Stratford Public Supply	SA2-017 Increase GW abstraction	-	SA2-017 Increase GW abstraction	-	SA2-017 Increase GW abstraction	-
3400SC0011: Kiltegan Public Supply	SA2-038 Upgrade Kiltegan Public Supply WTP for Water Quality Purposes	-	SA2-038 Upgrade Kiltegan Public Supply WTP for Water Quality Purposes	-	SA2-038 Upgrade Kiltegan Public Supply WTP for Water Quality Purposes	-

WRZ	Quickest Delivery - SA Approach 2		Most Resilient - SA Approach 1		Lowest Carbon - SA Approach 2	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
3400SC0014: Rathdangan	SA2-035 WTP Upgrade	-	SA2-035 WTP Upgrade	-	SA2-035 WTP Upgrade	-
3400SC0015: Knockananna Public Supply	SA2-20a Increase GW abstraction	-	SA2-20a Increase GW abstraction	-	SA2-20a Increase GW abstraction	-
3400SC0019: Grangecon Public Supply	SA2-024 Increase GW abstraction	-	SA2-024 Increase GW abstraction	-	SA2-024 Increase GW abstraction	-
3400SC0023: Knockanarrigan Davidstown Public Supply	SA2-028 Increase GW abstraction	-	SA2-028 New GW abstraction	-	SA2-028 New GW abstraction	-
3400SC0052: Knocknagilky Public Supply	SA2-040 Increase GW Abstraction	-	SA2-040 Increase GW Abstraction	-	SA2-040 Increase GW Abstraction	-

WRZ	Best Appropriate Assessment - SA Approach 1	
	Option Description	SA Option
0100SC0005: Hacketstown	SA2-30d Supply from Rathvilly (New Shannon Source dependent via Carlow Town)	-
3400SC0003: Baltinglass Public Supply	SA2-001 New GW Abstraction	-
3400SC0004: Dunlavin Public Supply	SA2-07b Rationalisation Ballymore Eustace - Hollywood	2
3400SC0005: Hollywood Donard Public Supply	SA2-11b Rationalisation Ballymore Eustace - Hollywood	2
3400SC0008: Ballyknockan Valleymount Public Supply	SA2-013 Increase GW abstraction	-
3400SC0009: Stratford Public Supply	SA2-017 Increase GW abstraction	-
3400SC0011: Kiltegan Public Supply	SA2-038 Upgrade Kiltegan Public Supply WTP for Water Quality Purposes	-
3400SC0014: Rathdangan	SA2-035 WTP Upgrade	-
3400SC0015: Knockananna Public Supply	SA2-20a Increase GW abstraction	-

WRZ	Best Appropriate Assessment - SA Approach 1	
	Option Description	SA Option
3400SC0019: Grangecon Public Supply	SA2-024 Increase GW abstraction	-
3400SC0023: Knockanarrigan Davidstown Public Supply	SA2-028 New GW abstraction	-
3400SC0052: Knocknagilky Public Supply	SA2-040 Increase GW Abstraction	-