Spring 2023

Regional Water Resources Plan – South West

Strategic Environmental Assessment

Appendix H: Study Area H – Environmental Review

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

Baseline data included in the RWRP-SW 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-SW. 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 South West Region (referred to as the Regional Plan). The Regional Plan includes three individual study area reviews (SAH-J) as appendices.

This Study Area H 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 H within the South West Region for the options and approaches considered and as outlined in the Study Area H Technical Report (RWRP-SW Appendix 1). 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/.

Phase 2 of the NWRP comprises development of the four RWRPs. The RWRP for the South West Region (RWRP-SW) was published for consultation in June 2022 with the timeframe for submissions closing on 24th August 2022. Where relevant, submissions received on the RWRP-SW have also informed the development of this Regional Plan, to the extent they had general application. Further, the cumulative impacts of the RWRP-SW along with this Regional Plan have been assessed, and are considered in section 9 of the SEA Environmental report for the RWRP-SW.

1.1 Options Assessment Methodology

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

1) Identifying need – based on SDB and/or Drinking Water Safety Plan Barrier Assessment;
2) Scoping of the study area (Water Resource Zones (WRZs)) – understanding the study area and the existing conditions of assets, supply and demand issues; as well as environmental constraints and opportunities;
3) Identifying potential options for consideration relevant to the study area;
4) Coarse screening – assessing the unconstrained options and eliminating any that will not be viable;
5) Further option definition, information collection and preliminary costing;

6) Fine screening – options assessment and scoring against the key criteria with further removal of options identified as unviable and development of feasible options for costing and scoring assessment update;
7) Approach appraisal – comparison and assessment of combinations of options identified to meet the predicted supply demand deficit to determine the Preferred Approach; and
8) Monitoring and Feedback – a process for monitoring the implementation of the plan and responding to changes to policy and guidelines and to information changes which will feed into the 5 year plan cycle and includes an annual review to identify actions required within the plan cycle.

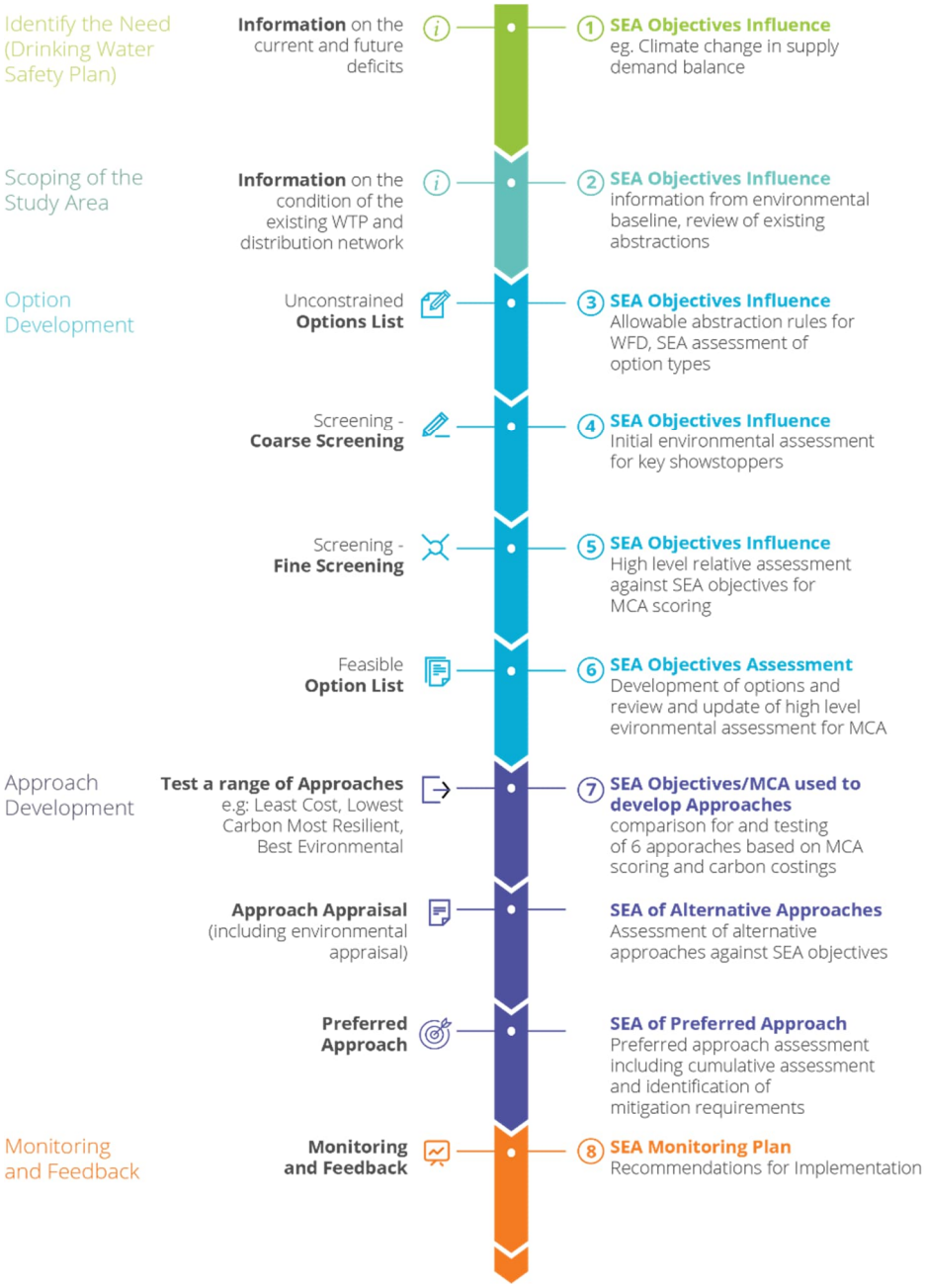

Figure 1.1 Option and Approach Development Process

1.2 Regional Plan Strategic Environmental Assessment

The four RWRPs, implementing Phase 2 of the NWRP, are each subject to a separate SEA process. The study area assessments will follow the outline methodology established by the Framework Plan. The

SEA Environmental Reports are being published for consultation alongside the draft Regional Plans for each of the four regions.

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

- Introduction for SEA, Water Framework Directive (Council Directive 2000/60/EC) (WFD) and AA applied at the study area level;
- Environmental baseline context;
- Environmental assessment for the options screening process and feasible options;
- Assessment of the alternatives considered and the Preferred Approach;
- Cumulative effects assessment between options within each study area and with proposed developments in the study area; and
- Recommendations for implementation, including mitigation and monitoring.

1.3 Study Area: Strategic Environmental Assessment

The set of SEA objectives developed at the Phase 1 scoping stage have been refined and finalised following consultation (see Table 1.1). These objectives have been influenced by the plans, policies and programmes review, the baseline trends and pressures identified, and the scope of the assessment as defined and consulted on in the Regional Plan SEA scoping report.

Table 1.1 SEA Objectives

SEA Topic	SEA Objective
Population, economy, tourism and recreation, and human health	Protect and, where possible, contribute to enhancement of human health and wellbeing and to prevent restrictions to recreation and amenity facilities in providing water services.
Water environment	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 water services. Contribute towards the "no deterioration" WFD condition and, where possible, to the improvement of waterbodies, including rivers, lakes, transitional and coastal waters, and groundwater to meet WFD Objectives.
	Flood risk Protect and, where possible, reduce risk from ground water and surface water flooding as a result of Irish Water's provision of water services.
Biodiversity	Protect and, where possible, enhance terrestrial, aquatic and soil biodiversity; particularly regarding European sites and protected species in providing water services.
Material assets	Minimise resource use and waste generation from, new or upgraded, existing water services infrastructure and management of residuals from drinking water treatment - to protect human health and the ecological status of waterbodies. Minimise impacts on other material assets and existing water abstractions.

SEA Topic	SEA Objective
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'sprovision of water services
	Climate change adaptation Promote the resilience of the environment, water supply and treatment infrastructure to the effects of climate change.
Cultural heritage	Protect and, where possible, enhance cultural heritage resources 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 South West region were available. At that point, Irish Water conducted an exercise as part of the development of the overall relevant Regional Plan to assess the cumulative and in-combination impacts of the Preferred Approaches identified for each study area within the South West region. The conclusions of that cumulative assessment are presented in the SEA Environmental Report for the South West region.

If appropriate, the Preferred Approach identified for SAH 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).

An assessment of the cumulative effects of the Preferred Approaches identified in this Regional Plan is set out in section 9 of the RWRP-SW SEA. The assessment includes consideration of the cumulative effects along with the Preferred Approaches identified in the RWRP-SW.

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 SAH 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 SAH are provided in chapter 9 of this review.

1.6 Study Area H

The South West Region is subdivided into three 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 SAH, the location of SAH in relation to the South West Region is shown in Figure 1.2.

Study Area H lies within the counties of Limerick, Kerry and Cork and its total area is approximately 4,060 km^2. There are two principal settlements (with a population of over 10,000), namely Killarney and Tralee (CSO, 2016a), as shown in Figure 1.3.

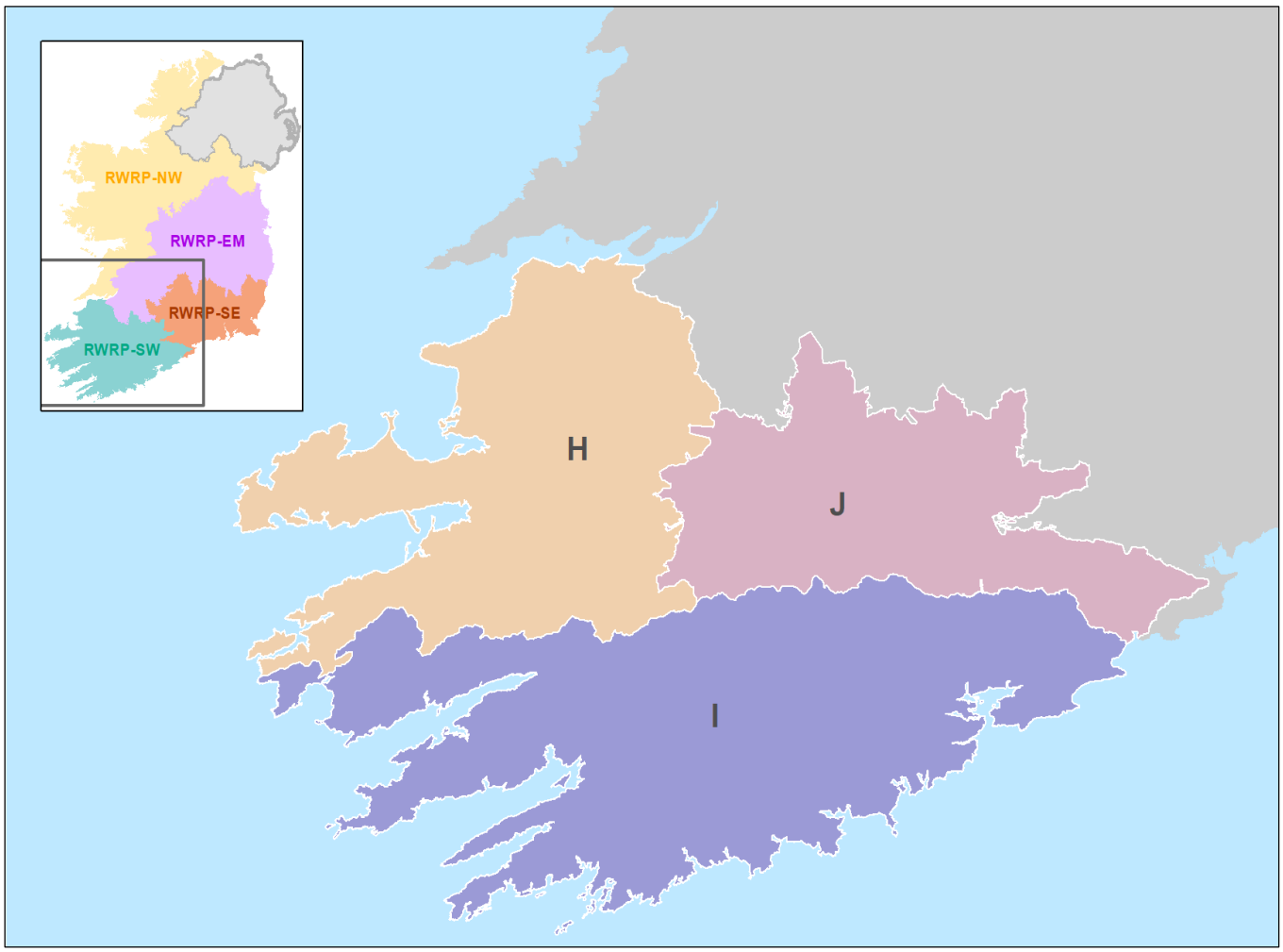

Figure 1.2 South West Region Study Areas

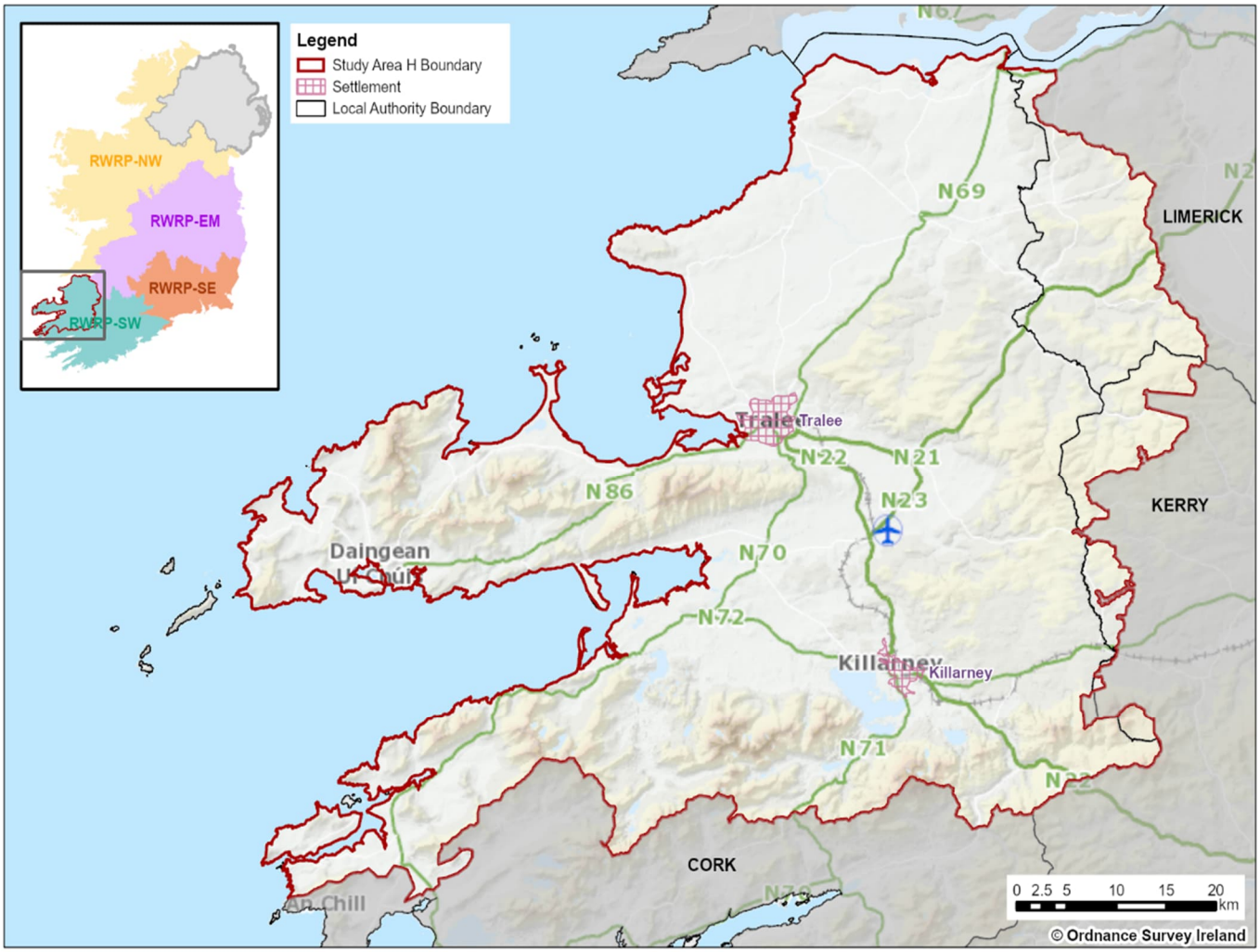

Figure 1.3 Study Area H

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Study Area H Environmental Baseline Context

2 Study Area H Environmental Baseline Context

This chapter provides environmental baseline information for SAH 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, 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 has 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 SAH

WRZ Reference Number and Name	Total Population Served (2019)*	% Population Change (2019-2044)*
1300SC0002: Annascaul/Ballintermon	706	+13%
1300SC0003: An Mhin Aird	990	+13%

WRZ Reference Number and Name	Total Population Served (2019)*	% Population Change (2019-2044)*
1300SC0004: An Baile Mor/An Daingean	2,596	+13%
1300SC0005: Baile An Fheirtearaigh/Tir Abhainn Thoir/Cill Maoilcheadair/An Ghraig/Cloichear	793	+13%
1300SC0006: Dun Chaoin PWS 034D	153	+13%
1300SC0007: An Fheothanach/An Mhuirioch/Baile Breach	751	+13%
1300SC0008: An Clochan	173	+13%
1300SC0009: Castlegregory PWSS 024D	1,158	+13%
1300SC0010: Ardfert North/Glenderry Ballyheigue WRZ	2,674	+13%
1300SC0011: Listowel Regional Public Water Supply	17,499	+13%
1300SC0012: Brosna/Knocknagoshel PWSS 016F	947	+13%
1300SC0013: Central Regional - Lough Guitane	73,201	+19%
1300SC0015: Mid Kerry	10,604	+13%
1300SC0016: Emlaghpeasta/Portmagee/Maulin	1,760	+13%
1300SC0022: Ceann Tra PWS 074D	438	+13%
1300SC0024: Lyranes 303A	91	+13%
1300SC0025: Mountain Stage PWS 062A	856	+13%
1300SC0026: Lios Cearnaigh PWS 052D	30	+13%
1300SC0028: Ce Bhreannain	147	+13%
1300SC0030: Aughacasla	348	+13%
1300SC0031: Rathmore	1,123	+13%
1300SC0032: Cahersiveen	1,396	+13%
1900SC0021: Abbeyfeale Water Supply	6,791	+13%

*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

SAH had a below average household disposable income per person in 2018 at a regional level, although, at a county level the counties of Cork and Limerick are above average (CSO, 2022a). The unemployment rate was 3.6% in the South West and 4.5% in the Mid West regions of the country for Q3 of 2022 (CSO, 2022b).

Population increase and expected economic growth has meant that housing and sustainable urban development have been made a priority for the National Development Programme; therefore, to supply the demand there is an aim to increase housing stock. The number of new dwellings completed in Q4 2022 was 1,045 for the South West region and 503 for the Mid West region (CSO, 2022c).

2.1.3 Tourism and Recreation

Tourism in SAH 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 Kerry has been described as having *"rich history, delicious food, and unique wildlife"* also placing emphasis on the county's natural assets including mountains, rivers and lakes (Discover Kerry, 2021). The county also contains one of Ireland's UNESCO World Heritage Sites, namely Killarney National Park Biosphere, the first national park in Ireland. There are also two sites in SAH on the UNESCO tentative list: Western Stone Forts: Benagh and Western Stone Forts: Caherconree.

Additionally, the study area is located along Ireland's Wild Atlantic Way, which is a tourism development strategy that aims to achieve greater visibility for the west coast of Ireland and is Ireland's first long-distance touring route (Fáilte Ireland, 2020).

Ireland's natural heritage is also recognised as an important tourism asset by the Department of Transport, Tourism and Sport (2019). For SAH, the national park of note in SAH is the Killarney 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 South West and Mid West regions within Ireland. Improvements in air quality, access to good quality drinking water and participation in recreational activities can all have a positive influence on human health and well-being.

Table 2.2 Well-Being Indicators for the South West and Mid West Regions within Ireland

Region	Life Expectancy (CSO, 2020a)	Participation in Sports, Fitness or Recreational Physical Activities (% of Persons Aged 15+) (CSO, 2020b)	Air Quality (EPA, 2020a)
South West	Male: 79.2 Female: 83.2	47%	Good
Mid West	Male: 79.0 Female: 82.5	52%	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 SAH.

Table 2.3 Areas Supplied by the WTPs in SAH

Water Treatment Plants	Water Resource Zone	Local Authority Supplied
Annascaul WTP and Ballintermon WTP	1300SC0002: Annascaul/Ballintermon	Kerry
An Mhin Aird Gualainn WTP and An Mhin Aird Puc (Banoge) WTP	1300SC0003: An Mhin Aird	Kerry
An Baile Mor WTP and An Daingean (Dingle) WTP	1300SC0004: An Baile Mor/An Daingean	Kerry
An Ghraigh Cloichear WTP, An Riasc (Baile An Fheirtearaigh) WTP, Balie Ui Bhaoithin WTP, Cill Maoilcheadair (Caherdorgan) WTP, Leataoibh WTP, Tir Abhainn Thoir WTP and Tobar Bhreandain (Baile An Fheirtearaigh) WTP	1300SC0005: Baile An Fheirtearaigh/Tir Abhainn Thoir/Cill Maoilcheadair/An Ghraig/Cloichear	Kerry
Dun Chaoin WTP	1300SC0006: Dun Chaoin PWS 034D	Kerry
An Fheothanach WTP and An Mhuirioch/ Baile Breac WTP	1300SC0007: An Fheothanach/An Mhuirioch/Baile Breach	Kerry
An Clochan WTP	1300SC0008: An Clochan	Kerry
Castlegregory WTP	1300SC0009: Castlegregory PWSS 024D	Kerry
Ballyheigue (Ardfert) WTP and Glenderry WTP	1300SC0010: Ardfert North/Glenderry Ballyheigue WRZ	Kerry
Listowel (Dromin) WTP, Lyracrompane WTP and Tarbert (Tieraclea) WTP	1300SC0011: Listowel Regional Public Water Supply	Kerry
Brosna/Knocknagoshel WTP	1300SC0012: Brosna/Knocknagoshel PWSS 016F	Kerry
Ardfert (Skrillagh) WTP, Camp (Knockglassmore) WTP, Central Regional (Lough Guitane) WTP, Fenit WTP and Inch WTP	1300SC0013: Central Regional - Lough Guitane	Kerry
Breanlee WTP, Caragh Lake, Oolagh) WTP, Miltown WTP and Mid-Kerry (Gearha) WTP	1300SC0015: Mid Kerry	Kerry
Emlaghpeasta (Gurrane) WTP, Malainn WTP and Portmagee (Lateeve) WTP	1300SC0016: Emlaghpeasta/Portmagee/Maulin	Kerry

Water Treatment Plants	Water Resource Zone	Local Authority Supplied
Ceann Tra (Cill Ruich) WTP	1300SC0022: Ceann Tra PWS 074D	Kerry
Lyranes WTP	1300SC0024: Lyranes 303A	Kerry
Mountain Stage (Droum) WTP and Mountain Stage (Kealduff) WTP	1300SC0025: Mountain Stage PWS 062A	Kerry
Lios Cearnaigh (Ballyduff) WTP	1300SC0026: Lios Cearnaigh PWS 052D	Kerry
Ce Bhreanainn (Slieveglass) WTP	1300SC0028: Ce Bhreannain	Kerry
Aughacasla (Kilballylahiff) WTP	1300SC0030: Aughacasla	Kerry
Rathmore WTP	1300SC0031: Rathmore	Kerry
Cahersiveen (Coulagh) WTP	1300SC0032: Cahersiveen	Kerry
Abbeyfeale WTP	1900SC0021: Abbeyfeale Water Supply	Limerick

Currently for day-to-day operations, nineteen out of twenty-three of the WRZs in the area have a current SDB deficit and twenty-one have a projected SDB deficit (based on a 'Do Minimum' approach). 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 thirty-four of the forty-six WTPs within the study area at high risk of failing to achieve Irish Water's conservative Barrier Assessment standards in relation to bacteria and viruses (Barrier 1) and maintaining chlorine residual in the network (Barrier 2.1) (see Table 2.1 in the SAH Technical Report - RWRP-SW Appendix 1).

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 five WRZs on the EPA Remedial Action List within SAH, namely, Cahersiveen, Aughaclasa, Mountain Stage, Mid Kerry and Ardfert North. Irish Water is currently progressing immediate corrective action in relation to a number of supplies within SAH in advance of the NWRP. Details of these are included in the SAH Technical Report (RWRP-SW Appendix 1).

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

Table 2.4 Catchments within SAH (EPA, 2020b)

WFD Catchments	Total Catchment Area (km^2)	Catchment Area within SAH (km^2)
Blackwater (Munster)	3,308	120
Dunmanus-Bantry-Kenmare	1,900	9

WFD Catchments	Total Catchment Area (km²)	Catchment Area within SAH (km²)
Laune-Maine-Dingle Bay	2,037	2,030
Shannon Estuary South	2,038	120
Tralee Bay-Feale	1,780	1,769

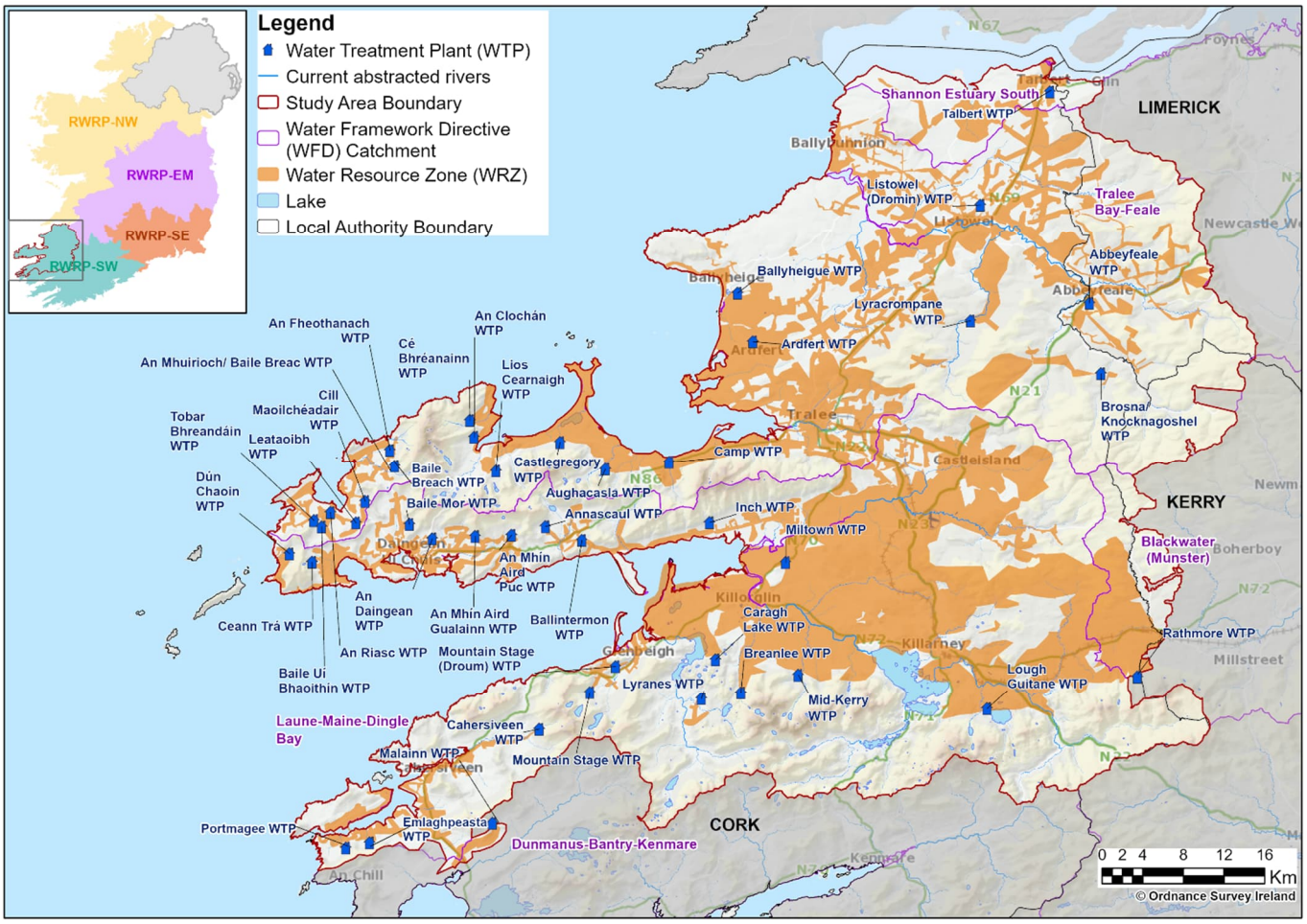

Figure 2.1 Water Environment of SAH

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.

At the end of 2022, the government passed the Water Environment (Abstractions and Impoundments) Act, 2022 (the Abstractions Act) which will ensure that national abstractions align with the requirements of the Water Framework Directive. The Abstractions Act has not yet commenced and the associated regulations and guidelines which will further detail the types of assessment and national methodology to be used are not yet in place.

Whilst the regulations and guidelines for the new abstraction regime are being developed, Irish Water are assessing existing abstractions to identify surface water sites that may exceed future abstraction thresholds. Irish Water have taken a precautionary approach based on their current understanding of how proposed abstraction legislation might be applied. This assessment suggests that certain schemes

may be subject to reductions in abstraction under the new legislation; however, this will ultimately determined by the EPA based on the project level information before them.

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 SAH Technical Report: RWRP-SW Appendix 1). 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 SAH supplies, Irish Water has assessed its surface water abstractions from River Feale (Abbeyfeale Water Supply), Garfinny River (An Baile Mor/An Daingean), Garfinny River (An Baile Mor/An Daingean), Puckisland (An Mhin Aird), Gowlane Stream (An Mhin Aird), Lough Acummeen (Aughacasla), Clydagh River (Knoppoge) (Brosna/Knocknagoshel PWS 016F), Coulagh River Intake (Cahersiveen), Stradbally Intake (Castlegregory), Mount Eagle Lake S50 (Ceann Tra PWS 074D), Lough Guitane (Central Regional - Lough Guitane), Curracullenagh Stream (Central Regional - Lough Guitane), Curracullenagh River (Central Regional - Lough Guitane), Ballyarkane River (Central Regional - Lough Guitane), Gurrane Stream (Emlaghpeasta/Portmagee/Maulin), Smearlagh River (Listowel Regional Public Water Supply), Feale (Listowel Regional Public Water Supply), Lough Cummernamuck (Mid Kerry), Gaddagh River (Mid Kerry), Lough Callee S76 (Mid Kerry), Cottoners River (Breanlee Stream from Lough Eighter) (Mid Kerry), Coomaglaslaw Lake S67 (Mountain Stage PWS 062A), and Maithegarbh River (Mountain Stage PWS 062A).

Based on this initial assessment, the volume abstracted at the Puckisland (An Mhin Aird), Gowlane Stream (An Mhin Aird), Lough Acummeen (Aughacasla), Coulagh River Intake (Cahersiveen), Stradbally Intake (Castlegregory), Mount Eagle Lake (Ceann Tra PWS), L Guitane (Central Regional), Curracullenagh Stream (Central Regional), Curracullenagh River (Central Regional), Ballyarkane River (Central Regional), Gurrane Stream (Emlaghpeasta / Portmagee / Maulin), Smearlagh River (Listowel Regional Public Water Supply), Feale (Listowel Regional Public Water Supply), Lough Cummernamuck (Mid Kerry), Gaddagh River (Mid Kerry), Lough Callee (Mid Kerry), Cottoners River (Breanlee Stream from Lough Eighter) (Mid Kerry), Coomaglaslaw Lake (Mountain Stage P and Maithegarbh River (Mountain Stage PWS) may not meet sustainability guidelines during dry weather flows. However, under the proposed regulatory regime, sustainable abstraction quantities will be adjudicated by the EPA who will have the benefit of detailed project level information.

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

Table 2.5 WFD Waterbodies within SAH (EPA, 2022a)

Waterbody Type	Water Catchments	Number of Waterbodies	Number of Waterbodies Rated Below Moderate
Rivers	Blackwater (Munster)	6	0
	Dunmanus-Bantry-Kenmare	1	0
	Laune-Maine-Dingle Bay	93	7
	Shannon Estuary South	7	0
	Tralee Bay-Feale	80	9
Lakes	Blackwater (Munster)	0	0
	Dunmanus-Bantry-Kenmare	0	0
	Laune-Maine-Dingle Bay	44	0
	Shannon Estuary South	0	0
	Tralee Bay-Feale	12	0
Transitional and Coastal	N/A	20	2
Groundwater	N/A	19	1

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

- Blackwater (Munster): Agriculture (53%), Other (including abstraction, historically polluted sites, windfarm construction and unknown anthropogenic) (32%) and Forestry (28%);
- Dunmanus-Bantry-Kenmare: Forestry (68%), Hydromorphology (45%) and Agriculture (32%);
- Laune-Maine-Dingle Bay: Agriculture (49%), Hydromorphology (34%) and Other (including abstractions, unknown anthropogenic, golf courses, tourism and windfarm construction) (22%);
- Shannon South Estuary: Agriculture (94%); and
- Tralee Bay-Feale: Agriculture (61%), Hydromorphology (35%) and Urban Wastewater (35%).

The Finow_020 waterbody is at particular risk of abstraction in SAH. Table 2.6 includes a summary of the ‘at risk’ waterbodies within SAH.

Table 2.6 Summary of ‘At Risk’ Waterbodies in SAH (EPA, 2022b)

Waterbody Type	Water Catchments	Number of Waterbodies Identified as ‘At Risk’	Surface Waterbodies Status ‘At Risk’ Due to Abstraction Pressure*
Rivers	Blackwater (Munster)	2	41
	Dunmanus-Bantry-Kenmare	1	
	Laune-Maine-Dingle Bay	35	
	Shannon Estuary South	0	

Waterbody Type	Water Catchments	Number of Waterbodies Identified as 'At Risk'	Surface Waterbodies Status 'At Risk' Due to Abstraction Pressure*
	Tralee Bay-Feale	17	
Lakes	Blackwater (Munster)	0	7
	Dunmanus-Bantry-Kenmare	0	
	Laune-Maine-Dingle Bay	3	
	Shannon Estuary South	0	
	Tralee Bay-Feale	2	
Transitional and Coastal	N/A	6	0
Groundwater	N/A	4	N/A
Total			

* Based on Irish Water assessment of their current abstractions

It is important to note that although Lough Leane is not 'At Risk' and has 'Good' status according to the WFD data, it does have an endemic species (Killarney Shad) which is sensitive to changes in water quality.

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 SAH are listed in Table 2.7.

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

Areas for Action	Key Reasons for Selection
Deenagh	• Of interest from a planning perspective • Build on work completed for the Lough Leane project • Headwaters to Lough Leane • One deteriorated waterbody • One waterbody (Deenagh_010) is failing to meet its protected area objectives for salmon
Fahaduff And Upper Maine	• Build on proposed improvements at Castleisland WwTP • Inland Fisheries Ireland reported two fish kills between 2013-2015 • Active community group • Ultimately discharges into Tralee shellfish area • Maine is an important salmonid river
Feale	• Would bring entire 23_4 sub catchment to 'Good' status • Potential to work with local community groups that received LEADER Group funding

Areas for Action	Key Reasons for Selection
	• Building on proposed improvements at Listowel WwTP • One river waterbody is failing to meet protected area objectives for salmon • One river waterbody is failing to meet protected area objectives for drinking water • One transitional water body is failing to meet protected area objectives for Nutrient Sensitive Areas • Headwaters to Upper Feale estuary • Four deteriorated waterbodies • One At Risk High Ecological Status Objective waterbody
Finow	• Project to examine impact from abstraction • One deteriorated High Ecological Status objective waterbody • Two waterbodies failing to meet protected area objectives for salmon • One potential 'quick win' • Headwaters to Lough Leane • High interest from Kerry County Council
Inny	• Discharges into designated bathing area (Trá na hUíne (Inny Strand), Waterville) • Opportunity to work with Waterville rivers trust and interested local community • Four deteriorated waterbodies • Two waterbodies are failing to meet their protected area objectives for salmon
Lee (Tralee) & Estuary	• Headwaters to the Lee K and Tralee estuaries • Tralee estuary is an important designated Shellfish area • Potential project to address urban diffuse pressures and suitable measures • Important for tourism - the possibility of opening a blueway is being examined • Tralee Wetlands are an important tourism and environmental amenity • Building on improvements at Tralee WwTP • Lee K Estuary is failing to meet protected area objectives for Nutrient Sensitive Areas • Two deteriorated waterbodies
Milltown (Kerry)	• Headwaters discharging into Dingle Harbour • Important for tourism • Small area is easier to manage

Areas for Action	Key Reasons for Selection
	• Two potential 'quick wins' • One deteriorated waterbody.
Owenmore	• Failing protected area objectives for Freshwater Pearl Mussels (populations listed in S.I. 296 of 2009) • Inland Fisheries Ireland reported that this is an important salmonid fishery • Important for tourism • Active community group • One deteriorated waterbody
Tyshe	• Discharges into designated bathing waters (Banna strand) • Building on improvements from upgrade to Ardfert WwTP • Headwaters to At Risk High Ecological Status objective coastal waterbody
Upper Caragh	• Failing to meet protected area objectives for Priority 8 Freshwater Pearl Mussels • Opportunity to work with KerryLIFE • Important fishery - Arctic char are unusual genetically here • High scenic value • Headwaters to river Caragh • Three At Risk High Ecological Status objective waterbodies • One potential 'quick win'

2.2.2 Flood Risk

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

The Office of Public Works (OPW) has been implementing the European Communities (Assessment and Management of Flood Risks) Regulations 2010 mainly through the Catchment Flood Risk Assessment and Management (CFRAM) Programme, through which draft Flood Risk Management Plans have been developed. Approximately 300 ‘Areas for Further Assessment’ have been established along with a range of measures to reduce or manage the flood risk within each catchment. 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 SAH.

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 greenhouse gas emissions 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*".

Section 1 of the 2015 Act in turn defines 'climate neutral economy' as "*a sustainable economy and society where greenhouse gas emissions are balanced or exceeded by the removal of greenhouse gases*".

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

The Department of the Environment, Climate and Communications' Climate Action Plan (CAP) 2023 published December 2022, replacing CAP 2021, 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 2023 to 2030. CAP 2023 updates existing targets with renewable energy to provide 80% of electricity by 2030 and sets targets for sectors, including a target of 9 GW from onshore wind, 8 GW from solar, and at least 5 GW of offshore wind energy by 2030 (Department of the Environment, Climate and Communications, 2023).

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 SAH

County	Key Risk Areas
Cork (Cork County Council, 2019)	• Flooding (Pluvial, Fluvial, Groundwater or Coastal or Marine) • Extreme Rainfall • Rising Sea Levels and Storm Surges • Storm Frequency and Intensity • Extreme Heat/Drought Conditions • Coastal Erosion • Wind Speeds
Kerry (Kerry County Council, 2019)	• Flooding (Pluvial, Fluvial, Groundwater or Coastal or Marine) • Extreme Rainfall • Rising Sea Levels and Storm Surges • Storm Frequency and Intensity • Extreme Cold/Heavy Snowfall and Ice • Extreme Heat/Drought Conditions • Bog, Sand, Dune, Gorse or Forest Fires • Coastal Erosion • Wind Speeds
Limerick (Limerick City and County Council, 2019)	• Flooding (Pluvial, Fluvial, Groundwater or Coastal or Marine) • Storm Frequency and Intensity • Extreme Cold/Heavy Snowfall and Ice • Extreme Heat/Drought Conditions • Coastal Erosion • Wind Speeds

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 SAH, 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 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 SAH 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

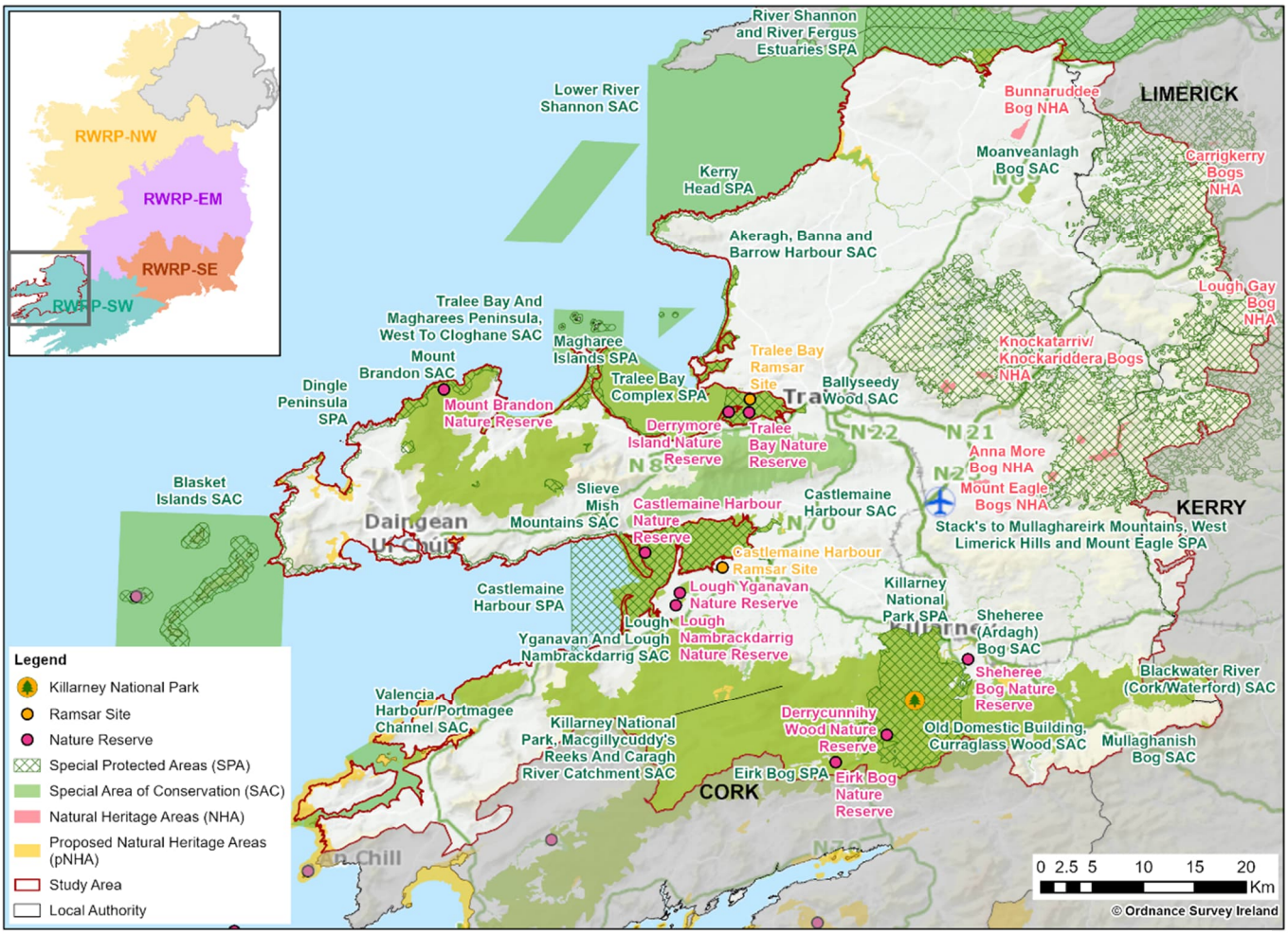

Figure 2.2 Designated Sites in SAH

Table 2.10 and Figure 2.2). Proposed Marine Conservation Zones (MCZs) are currently undergoing consultation. The European sites (SPAs and SACs), and the potential impacts on them, are discussed in more detail in the NIS.

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

Receptor	Name	Total Number
Special Protected Area (SPA)	Castlemaine Harbour SPA	10
	Dingle Peninsula SPA	
	Eirk Bog SPA	
	Iveragh Peninsula SPA	
	Kerry Head SPA	
	Killarney National Park SPA	
	River Shannon and River Fergus Estuaries SPA	
	Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA	
	Tralee Bay Complex SPA	
Special Area of Conservation (SAC)	Akeragh, Banna and Barrow Harbour SAC	16
	Ballyseedy Wood SAC	
	Blackwater River (Cork/Waterford) SAC	
	Blasket Islands SAC	
	Castlemaine Harbour SAC	
	Killarney National Park, Macgillycuddy's Reeks And Caragh River Catchment SAC	
	Lough Yganavan And Lough Nambrackdarrig SAC	
	Lower River Shannon SAC	
	Moanveanlagh Bog SAC	
	Mount Brandon SAC	
	Mullaghanish Bog SAC	
	Old Domestic Building, Curraglass Wood SAC	
	Sheheree (Ardagh) Bog SAC	
	Slieve Mish Mountains SAC	
	Tralee Bay And Magharees Peninsula, West To Cloghane SAC	
	Valencia Harbour/Portmagee Channel SAC	
Ramsar Sites	Castlemaine Harbour	2
	Tralee Bay	
Nature Reserves	Castlemaine Harbour	9
	Derrycunnihy Wood	

Receptor	Name	Total Number
	Derrymore Island	
	Eirk Bog	
	Lough Nambrackdarrig	
	Lough Yganavan	
	Mount Brandon	
	Sheheree Bog	
	Tralee Bay	
National Parks	Killarney National Park	1
Natural Heritage Areas (NHAs)	Anna More Bog NHA	6
	Bunnaruddee Bog NHA	
	Carrigkerry Bogs NHA	
	Knockatarriv/Knockariddera Bogs NHA	
	Lough Gay Bog NHA	
	Mount Eagle Bogs NHA	
Proposed Natural Heritage Areas (pNHAs)	See Figure 2.2	34

2.4.2 Habitats

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

Table 2.11 Habitat Areas for SAH (EPA, 2018)

Habitat	Ha	% of Study Area
Agricultural Land		
Complex cultivation patterns	429	0.11%
Land principally occupied by agriculture, with significant areas of natural vegetation	22,150	5.47%
Non-irrigated arable land	808	0.20%
Pastures	202,693	50.01%
Natural Habitats		
Bare rocks	1,060	0.26%
Beaches, dunes, sands	1,237	0.31%
Coastal lagoons	8	>0.01%

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

Habitat	Ha	% of Study Area
Estuaries	320	0.08%
Inland marshes	1,062	0.26%
Intertidal flats	328	0.08%
Moors and heathland	11,83	2.92%
Natural grasslands	7,057	1.74%
Peat bogs	89,067	21.98%
Salt marshes	356	0.09%
Sparsely vegetated areas	8,529	2.10%
Water courses	71	0.02%
Water bodies	3,887	0.96%
Forest		
Broad-leaved forest	3,101	0.77%
Coniferous forest	26,121	6.44%
Mixed forest	2,564	0.63%
Transitional woodland-shrub	17,042	4.20%
Urban		
Airports	127	0.03%
Continuous urban fabric	138	0.03%
Discontinuous urban fabric	3,261	0.80%
Sport and leisure facilities	900	0.22%
Industry		
Industrial or commercial units	213	0.05%
Mineral extraction sites	254	0.06%
Other		
Burnt areas	680	0.17%

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

- Oligotrophic waters containing very few minerals of sandy plains;
- Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea*;
- Bog habitats – *Rhynchosporion* depressions;
- Active raised bogs;
- Degraded raised bogs still capable of natural regeneration;
- Groundwater dependant terrestrial habitats, such as blanket bogs; and
- Northern Atlantic wet heaths with *Erica tetralix*.

2.4.3 Species

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

- Otter (*Lutra lutra*);
- Bat species – Lesser Horseshoe Bat (*Rhinolophus hipposideros*);
- Fish species - Atlantic Salmon (*Salmo salar*), Lamprey species;
- Fresh-water pearl mussel (*Margaritifera margaritifera*);
- Killarney Fern (*Trichomanes speciosum*);
- Kerry Slug (*Geomalacus maculosus*);
- White-clawed Crayfish (*Austropotamobius pallipes*);
- Marsh Fritillary (*Euphydryas aurinia*);
- Slender Naiad (*Najas flexilis*);
- Killarney Shad (*Alosa fallax killarnensis*);
- 'Qualifying interest' (QI) bird species e.g. peregrine falcon (*Falco peregrinus*), merlin (*Falco columbarius*); and hen harrier (*Circus cyaneus*); and
- Waterbirds of 'qualifying interest' e.g. Brent goose (*Branta bernicla*), whooper swan (*Cygnus cygnus*), Greenland white-fronted goose (*Anser albifrons flavirostris*), Little Tern (*Sterna albifrons*) and winter migratory waders.

The key invasive species (National Biodiversity Data Centre, 2021) to consider for developing options within SAH include the animals and plants stated below.

Animals:

- American mink (*Neovison vison*);
- Common carp (*Cyprinus carpio*);
- Coypu (*Myocastor coypus*);
- Harlequin ladybird (*Harmonia axyridis*);
- Ruddy duck (*Oxyura jamaicensis*); and
- Wild boar (*Sus scrofa*).

Plants:

- American skunk-cabbage (*Lysichiton americanus*);
- Brazilian giant-rhubarb (*Gunnera manicata*);
- Giant hogweed (*Heracleum mantegazzianum*);
- Giant-rhubarb (*Gunnera tinctoria*);
- Himalayan/Indian balsam (*Impatiens glandulifera*);
- Himalayan knotweed (*Persicaria wallichii*);
- Japanese knotweed (*Fallopia japonica*);
- New Zealand pigmyweed (*Crassula helmsii*);
- Parrot's feather (*Myriophyllum aquaticum*);
- Rhododendron (*Rhododendron ponticum*);
- Salmonberry (*Rubus spectabilis*);
- Spanish bluebell (*Hyacinthoides hispanica*);
- Three-cornered leek (*Allium triquetrum*); and
- Waterweeds (*Elodea spp*.).

2.5 Material Assets

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

Some of the natural assets within SAH are listed in , 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 forty-six WTPs in SAH, meeting the demand of 81.9 Ml/d in 2019.

There are no canals or ports of national or regional significance in SAH. There is one airport of national/regional significance, namely Kerry Airport and one of local significance (Abbeyfeale Airfield). Other significant transport infrastructure includes the main road network (particularly the N22, N21 and N86).

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

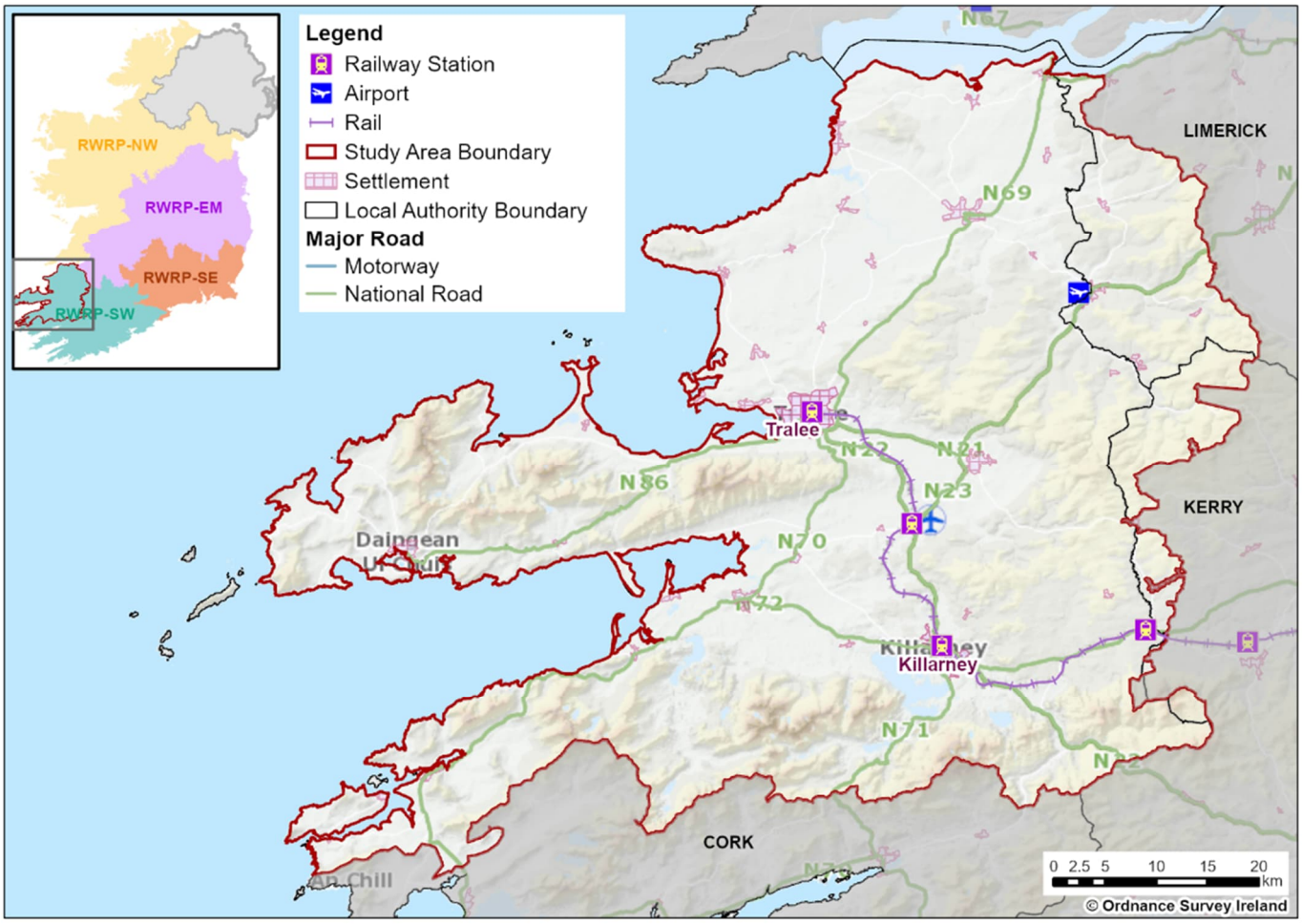

Figure 2.3 Transport Infrastructure in SAH

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

Land use	Ha	% of Study Area	Comparison to Overall South West Region %
Agriculture	226,081	55.78%	66.37
Urban	4,426	1.09%	1.57
Natural Habitats	124,811	30.80%	20.73
Forest	48,828	12.05%	10.97
Industry	467	0.12%	0.29
Other	0	0.17%	0.08%

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

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

Table 2.13 gives an overview of the project developments which are available from myProjectIreland (2021) for SAH[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		
Baile na Fheirtéaraigh Development	N70 Milltown Bypass Project	South Kerry Greenway
Cahersiveen Town Centre Regeneration Project	N86 Tralee to An Daingean	Tralee Flood Relief Scheme
Destination Killarney	Phase 1 Tralee Town Centre - Rock Street, Russell Street and Bridge Street	Tralee Northern Relief Road
Great Southern Greenway Limerick	Positioning Tralee as an Economic Driver	Tralee Wastewater Network
N69 Listowel Bypass	Shannon Foynes Port Company - Vision 2041	Valentia Trans-Atlantic Cable Station
N22 Road Improvement Scheme	Shannon Integrated Framework Plan	
N70 Glanbehy Bridge Road Project	Smarter Travel Killarney	

2.6 Landscape and Visual Amenity

2.6.1 Landscape and Visual

The National Landscape Strategy 2015-2025 is in the process of being implemented and will be Ireland's vehicle for complying with the EU Landscape Convention. Landscape assessment guidance is also available from the local authorities. This will be taken into account when identifying landscape character areas and protected areas at the project level in the future. Table 2.14 shows the sensitivity and value of the Landscape Character Areas (LCAs) within each of the counties listed within the study area[4].

The value of the landscape in SAH 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.

[3] Note that the myProjectIreland dataset was taken at a fixed point in time to allow for assessment of cumulative effects. The date for SAH being the 17//01/22.
[4] As with all the baseline information, the LCA information will be updated as part of regular reviews

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

Landscape Character Area	Value	Sensitivity
County: Limerick City and County (Limerick County Council, 2010)		
No values or sensitivity information available		
County: Cork (Cork County Council, 2007)		
City Harbour and Estuary	Very High	Very High
Broad Bay Coast	Very High	Very High
Indented Estuarine Coast	Very High	Very High
Rugged Ridge Peninsula	Very High	Very High
Fertile Plain with Moorland Ridge	Very High	Very High
Broad Fertile Lowland Valleys (Blarney-Ballincollig-Carrigaline-West to Dunmanway)	High	High
Broad Fertile Lowland Valleys (Cloyne, Castlemartyr, Killeagh and Environs)	Medium	Medium
Broad Fertile Lowland Valleys (Castlelyons-Rathcormack)	Medium	Medium
Rolling Patchwork Farmland (Bandon-Clonakilty-Leap Environs)	Medium	Medium
Rolling Patchwork Farmland (Dunderrow-Belgooly and Environs)	Medium	Medium
Hilly River and Reservoir Valleys	High	High
Broad Marginal Middleground and Lowland Basin	Low	Medium
Fissured Fertile Middleground (South of the Gearagh)	Low	Low
Fissured Fertile Middleground (Rylane east to Waterford)	Medium	High
Broad Marginal Middleground Valley	High	High
Rolling Marginal and Forested Middleground (BallyvourneyGaeltacht)	High	High
Rolling Marginal and Forested Middleground (South)	Medium	Medium
Valleyed Marginal Middleground (Macroom and Environs)	High	High
Valleyed Marginal Middleground (Glenville and Environs)	Medium	Medium
Fissured Marginal and Forested Rolling Upland (NorthwestRockchapel)	Medium	Medium

Landscape Character Area	Value	Sensitivity
Fissured Marginal and Forested Rolling Upland (Lyre and Nad)	Medium	Medium
Ridged and Peaked Upland (Mullaghanish to Millstreet)	High	High
Ridged and Peaked Upland (Millstreet)	Medium	Medium
Glaciated and Forested Cradle Valley (Gougane Barra)	High	High
Glaciated Cradle Valleys (Cullenagh Lake)	Low	Medium
Glaciated Cradle Valleys (Foilanumera)	Medium	Medium
County: Kerry (Kerry County Council, 2021)		
Beal Hill and Ballybunion	-	High
The Shannon Estuary	-	Medium / High
Bunnaruddee Bog and Galey River	-	Low / Medium
Kerry Head and Ballyduff	-	Medium / High
Listowel and The Cashen River	-	Medium
Banna and Ardfert	-	Medium / High
Smearlagh River Valley	-	Low / Medium
River Feale Valley	-	Medium
Stack's and Glanaruddery Mountains	-	Low / Medium
Mount Eagle and Owveg River Valley	-	Low / Medium
Tralee and Castleisland	-	Medium
Blasket Islands, Smerwick Harbour and Mount Brandon	-	High
Ventry and Dingle Harbours	-	High
Brandon Bay	-	High
Garfinny and Owenalondrig River Valleys	-	Medium / High
Tralee Bay, The Maharees and Northern Slieve Mish Mountains	-	High
Annascaul, Inch and Southern Slieve Mish Mountains	-	Medium / High
Milltown and Castlemaine	-	Medium
Gweestin River Valley	-	Medium
Deenagh and Glanoragh River Valleys	-	Medium
The Brown Flesk River Valley	-	Medium
Quagmire and Owneyskeagh Rivers	-	Medium
River Blackwater and Rathmore	-	Medium

Landscape Character Area	Value	Sensitivity
Rossbeigh and Cromane	-	Medium / High
Killorglin and Beaufort	-	Medium / High
Lough Leane and Killarney National Park	-	High
Clydagh River, The Paps and the Derrynasaggart Mountains	-	Medium / High
Coomasaharan Lake and Mountain Stage	-	Medium / High
Glencar, Caragh Lake and The Bridia Valley	-	High
MacGillycuddy Reeks and The Black Valley	-	High
Cahersiveen	-	Medium / High
Valentia Island and Saint Finan's Bay	-	High
Lough Currane and Mástir Gaoithe	-	Medium / High
Derrynane and Castlecove	-	High
Sneem and Ardsheelhane River Valley	-	Medium / High
Blackwater and Ballaghbeama	-	Medium / High
Kenmare	-	Medium / High
Kilgarvan and Roughty River Valley	-	Medium / High
Healy Pass, Kilmakilloge Harbour and Lough Inchiquin	-	High
Bonane and Sheen River Valley	-	Medium / High

2.6.2 Seascape

The Regional Seascape Character Assessment for Ireland (2020) presents the Regional Seascape Character Areas (SCAs) for the entire Republic of Ireland. An SCA is defined as "*an area of sea, coastline and land, as perceived by people, whose character results from the actions and interactions of land with sea, by natural and/or human factors*". The assessment identifies two SCAs in SAH; the Atlantic Southwest Rias, Bays & Islands, and Shannon Estuary & Tralee Bay.

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 SAH 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 Tralee, Killarney, Abbeyfeale, Listowel, N22, N21 and N86.

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 SAH, 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. Additionally there are potential marine archaeological interests which would need to be considered if any proposed options involve coastal or marine works.

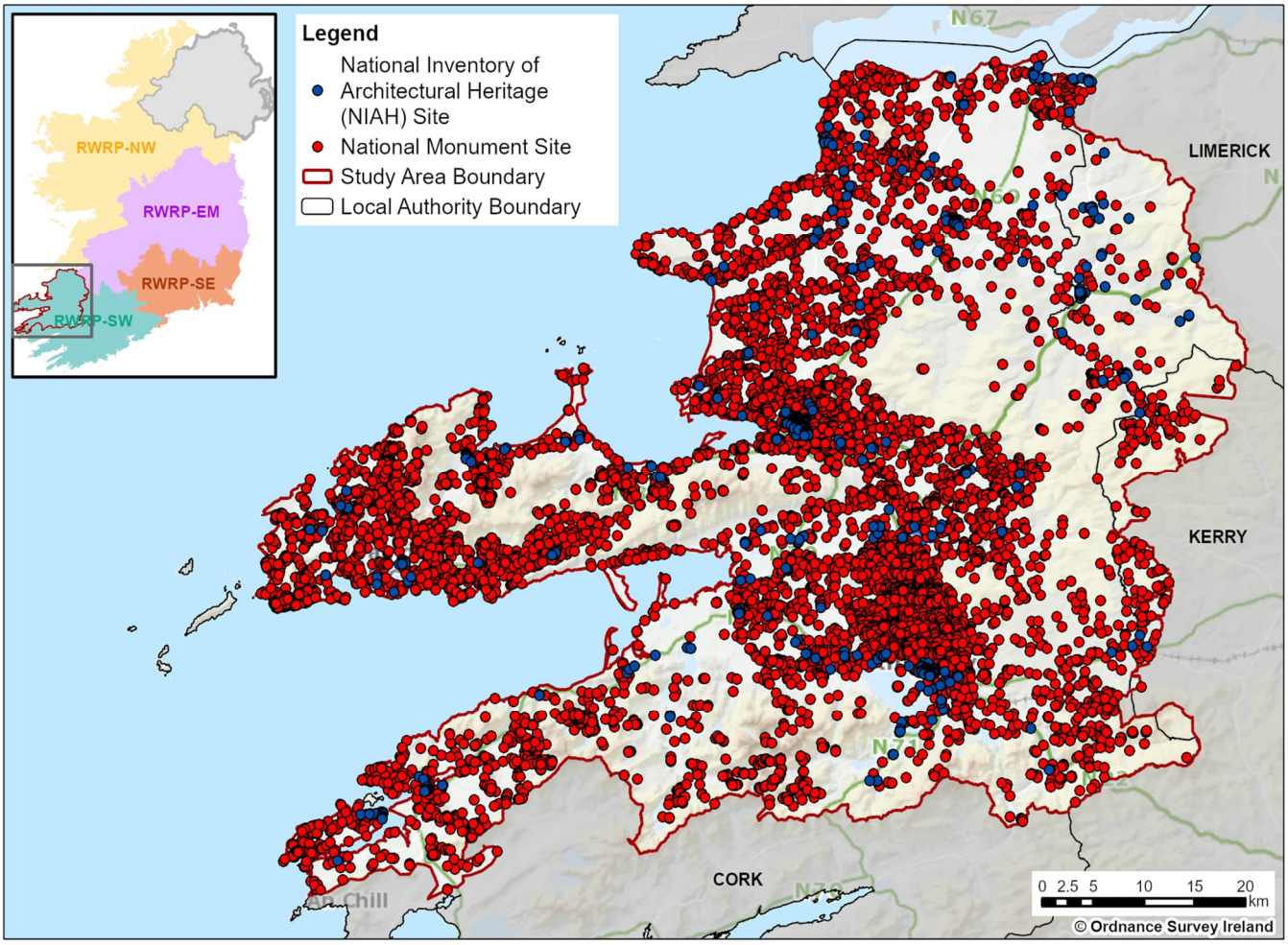

Figure 2.4 SAH Cultural Heritage Assets

Table 2.15 Cultural Heritage Assets within SAH

Assets	Total Number
National Monuments Service Sites	10,432
National Inventory of Architectural Heritage Sites	871
Sites and Monuments Record Zones	5,348

2.9 Geology and Soils

lists the land uses within SAH. SAH predominantly has a fine loamy soil type to the north east and peat soil types to the west of the study area (EPA, 2019a).

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

The topography of County Kerry, and associated geological deposits, can be broadly split into the topographic highs of the Macgillycuddy's Reeks just west of the Killarney National Park and the Slieve Mish Mountains north of Dingle Bay. The higher topographic features have the sedimentary rocks of the

Old Red Sandstones at or close to the surface in some parts. These sandstones also cover most of the southern half of the county. They are predominantly overlain by quaternary sediments of Till and raised Peat in the more upland areas. The most obvious lowland feature in the study area is the S-shaped "green belt" stretching from Ardfert to Killarney. Just south of the study area lies the broadly east-west trending syncline of Kenmare. The predominant bedrock in these areas are the Lower Carboniferous limestones (Dinantian Pure Unbedded Limestones) and generally have thick (5-10m) cover of Quaternary deposits. Finally, the centrally located uplands between Killarney and Farranfore, are underlain by Upper Carboniferous rocks dominated by shales and sandstones and these pose the least amount of potential from a groundwater resource perspective.

The karst forms a key regionally important aquifer in some areas, namely around Ardfert and Castlemaine. There are a number of sand and gravel aquifers throughout the study area; the Ardfert gravels from which the Ardfert South scheme currently abstracts, and the Killorglin gravels which currently has no abstractions taking place.

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, 107 of which have the potential to constrain water resource options in SAH.

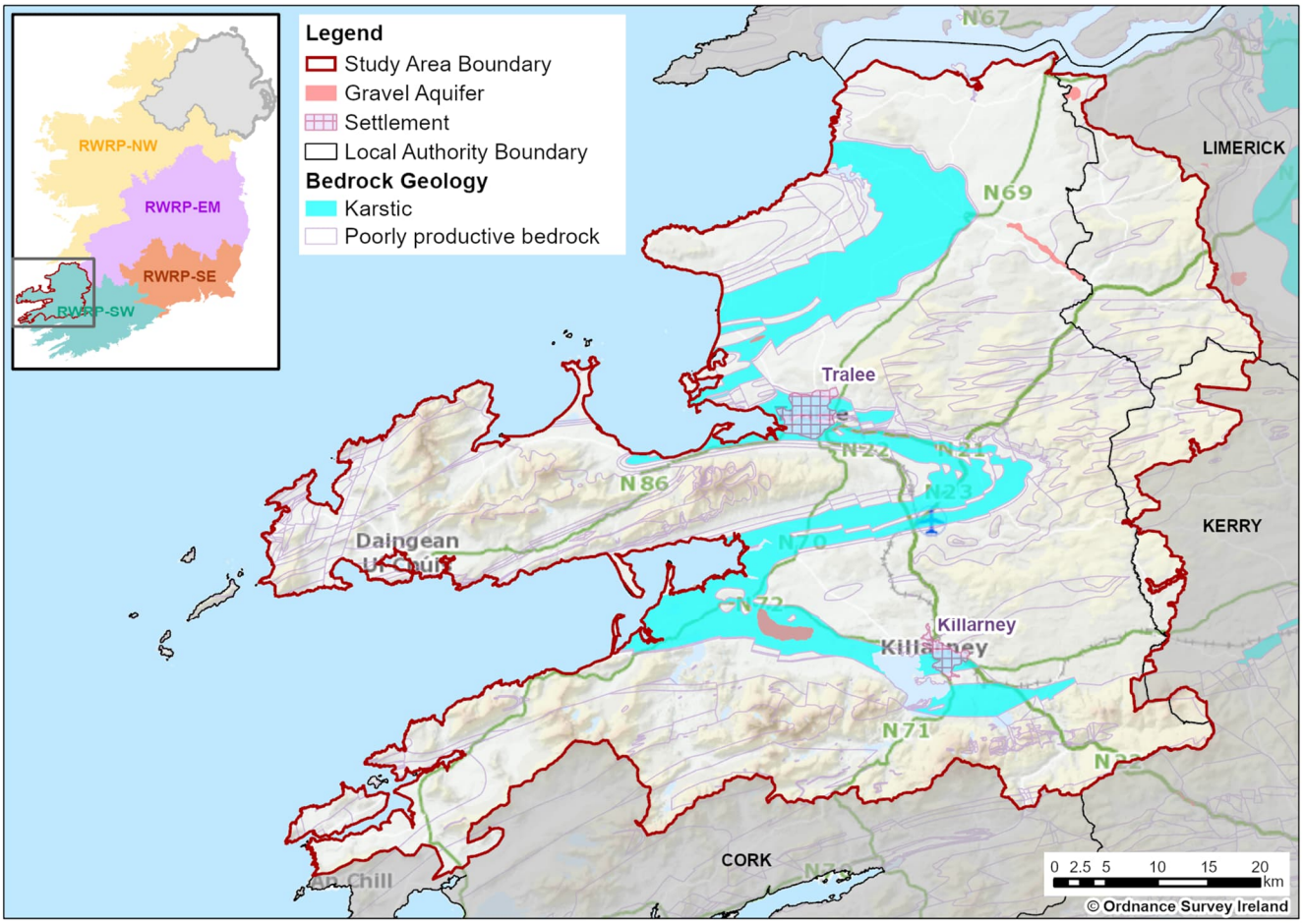

Figure 2.5 SAH Hydrogeology

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 SAH 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 SAH, 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 the importance of access to the 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 SAH, 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 SAH Technical Report). This has been used to inform options identification and appraisal. Irish Water will update its sustainability analysis and impact on its baseline Supply Demand Balance (SDB) calculations when regulatory assessment for the new legislation is undertaken. It is important to note that although Lough Leane is not 'At Risk' and has 'Good' status according to the WFD data, it does have an endemic species (Killarney Shad) which is sensitive to changes in water quality. **Opportunities:** To take account of identified pressure on the water environment in the selection of solutions for SAH.	Biodiversity and climate change
Biodiversity, Flora and Fauna	**Issues:** For SAH, many of the surface waters are within designated areas. These include the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC, and Castlemaine Harbour SAC in the	Water resources, water quality and climate change

SEA Topic	Issues and Opportunities	Interrelated Topics
	south, and the Lower River Shannon SAC in the north of the study area. There are also three designated Freshwater Pearl Mussel sub-catchments. It is considered especially important to avoid the loss of irreplaceable or rare habitats and increasing pressure on vulnerable species; potentially through direct land take or indirect such as through increased abstraction pressure	
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 SAH.	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 SAH 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 SAH are Stages 3-6:

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

3.2 Stage 3: Unconstrained Options

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

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

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

As mentioned previously, these are estimates applied for the purpose of strategic planning and are based on a conservative approach to what the new regulatory regime might require. The EPA will be the authority adjudicating the sustainability or otherwise of abstractions, once the regulations and guidelines for the new abstraction regime have being developed there will be 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 >20% 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

At the end of 2022, the government passed the Water Environment (Abstractions and Impoundments) Act, 2022 (the Abstractions Act) which will ensure that national abstractions align with the requirements of the Water Framework Directive. The Abstractions Act has not yet commenced and the associated regulations and guidelines which will further detail the types of assessment and national methodology to be used are not yet in place. Therefore, 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 227 unconstrained options were identified for SAH 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 227 unconstrained options, 98 were rejected after being analysed against the coarse screening criteria of resilience, deliverability and environment.

Sustainability reasons for rejecting options were identified for 74 options. Table 3.2 provides the options that were rejected on a sustainability basis and not considered suitable to address the deficit for the WRZs located in SAH. The full rejection register, including both the coarse and fine screening (where applicable) is provided in the SAH Technical Report (RWRP-SW Technical Appendix 1).

Table 3.2 Coarse Screening Rejection Register

Option Reference	Option Description	Rejection Reasoning
SAH-009	New connection New Shannon Source (NSS) via Newcastle West to supply deficit in Central Regional	Lough Derg NSS option not an infinite source. Yield is still limited and more suitable as solution for closer study area WRZs. Not as suitable for Kerry due to location so better alternatives.
SAH-015	New connection from NSS to feed WRZ in deficit in North of Kerry	

Option Reference	Option Description	Rejection Reasoning
SAH-010	Increase SW abstraction from Owgarriff River	Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving good WFD status. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.
SAH-012	Recommission old Torc source (previously used to feed Killarney)	
SAH-013	Recommission old Curraheen source - SW (previously used to feed Tralee)	
SAH-017	Increase SW abstraction from the Gaddagh River and Upgrade WTP	
SAH-018	Increase SW abstraction from Lough Callee and Upgrade Gearha WTP	
SAH-022	New SW abstraction from Lough Yganavan	
SAH-024a	Increase existing abstraction and supply Mid Kerry	
SAH-024	Increase existing abstractions and connect to Mountain Stage PWS WTP	
SAH-029	Increase SW abstraction from Garfinny River and upgrade An Daingean WTP	
SAH-033	New SW abstraction from Loch Ui Fhiannachta and upgrade An Daingean WTP	
SAH-035	New impoundment at Garfinny	
SAH-041	New GW abstraction from Causeway Well - disused source - and upgrade Ballyheigue WTP	
SAH-051	Supply deficit from Waterville WTP	
SAH-051a	Interconnect with Waterville PWS	
SAH-054	Increase abstraction from Coulough Stream	
SAH-055	Conjunctive use - Increase abstraction from Coulough Stream and increase abstraction from borehole - Conversion of existing trial to production wells	
SAH-056	New SW abstraction from Coomaglaslaw Lake	
SAH-057	New SW abstraction from Coomnacronia Lake	
SAH-058	New SW abstraction from Carhan River to partly supply deficit	

Option Reference	Option Description	Rejection Reasoning
SAH-063	Increase SW abstraction from Stradbally River and upgrade existing Castlegregory WTP to supply deficit	
SAH-066	Increase SW abstraction from Lateeve River and upgrade Portmagee WTP	
SAH-069	Increase SW abstraction from Maulin River and upgrade Málainn WTP	
SAH-080	Increase SW abstraction from Coomaglaslaw Lake and upgrade WTP	
SAH-081	Increase SW abstraction from Maithegarbh River and upgrade WTP	
SAH-082	New SW abstraction at Windy Gap Intake (Disused Source) and new WTP	
SAH-083	New SW abstraction from the Gowlane River (Disused Source) and new WTP	
SAH-093	Increase SW abstraction from Mount Eagle Lake and upgrade Ceann Tra PWSS WTP - Partly supply deficit	
SAH-096	New SW abstraction from Fahan Intake (Disused stream source) with New WTP	
SAH-098	Increase SW abstraction from Gowlane Stream and upgrade An Mhín Aird Gualainn WTP	
SAH-100	Increase SW abstraction from Puckisland Lake and upgrade An Mhin Aird Puc Banogue WTP	
SAH-101	New SW abstraction from Banoge River (disused source) and upgrade An Mhin Aird Puc Banogue WTP	
SAH-150	Increase SW abstraction from Feale and upgrade Listowel WTP	
SAH-152	Rationalise Tarbert and feed from Listowel. Increased abstraction from Smearlagh to offset	
SAH-157	Increase SW abstraction from River Feale and upgrade Abbeyfeale WTP. Known issues at critical periods - lower intake required potentially	

Option Reference	Option Description	Rejection Reasoning
SAH-159	New SW abstraction from River Allaghaun – abstraction point TBC and new WTP	
SAH-206	New SW abstraction from River Galey, connection to existing WTP	
SAH-207	New SW abstraction from River Brick, new WTP and connection to network	
SAH-226	New SW abstraction from Lough Cruite, including new WTP and network.	
SAH-040	New GW abstraction from Tiershanaghan Well (local important aquifer) - disused source - and new WTP	There is great uncertainty around available yield and as a result, this option is not considered feasible at coarse screening stage and would not be taken forward to the fine screening stage.
SAH-070	Increase GW abstraction from Emlaghpeasta borehole and upgrade Emlaghpeasta WTP	
SAH-079	Increase GW abstraction at Drom Well and upgrade WTP	
SAH-086	Increase GW at Tobar Tollta Leataoibh and upgrade Leatoibh WTP	
SAH-088	New GW from Kerry Spring Water borehole	
SAH-089	Increase GW abstraction from Caherdorgan (local important aquifer) – spring source – and upgrade Cill Maoilchéadair WTP	
SAH-095	New GW abstraction from Glenfahan Spring (Disused stream source) with New WTP	
SAH-097	Increase GW abstraction from Gowlane Springs and upgrade An Mhín Aird Gualainn WTP	
SAH-114	Increase GW abstraction from Baile Breac Springs and upgrade An Mhuirioch/ Baile Breach WTP	
SAH-115	Increase GW abstraction from Baile Breac Springs and upgrade An Mhuirioch/ Baile Breach WTP	
SAH-117	Increase GW abstraction from BH at reservoir site and upgrade An Mhuirioch/ Baile Breach WTP	

Option Reference	Option Description	Rejection Reasoning
SAH-119	New GW abstraction from Tobar Tollta Baile Reo (Disused borehole source) and upgrade An Fheothanach WTP	
SAH-124	Increase GW abstraction with 1 new borehole. (Currently 1 Spring source). Interconnect to Ballyferiter, Ceann tra/Ventry WTP	
SAH-124a	Connect to Dun Chaoin	
SAH-124b	Connect to Dun Chaoin	
SAH-144	Increase GW abstraction from Ballintermon borehole (local important aquifer) and upgrade Ballintermon WTP	
SAH-146	Rationalisation of Ballintermon WTP and feed from Inch	
SAH-146a	New GW close to Inch and supply Anascaul	
SAH-154	New GW abstraction at Inch WTP	
SAH-160	Supply deficit from neighbouring Brosna GWS (Kerry) (network upgrades required)	
SAH-163	Rationalise Abbeyfeale to Newcastle West WRZ (approx. distance 3.5km, new watermains and network upgrades required)	
SAH-163a	Supply Abbeyfeale	
SAH-164	Interconnect Abbeyfeale and Newcastle West WRZs (approx. distance 3.5km, new watermains and network upgrades required) for increased resilience and supply deficit	
SAH-164a	Supply Abbeyfeale	
SAH-030	Increase GW abstraction from Garfinny Springs and upgrade An Daingean WTP	A desktop assessment shows the required abstraction would not be suitable at this location. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.
SAH-031	New GW abstraction from Connor Hill Spring (Disused Source) and upgrade An Daingean WTP	
SAH-042	New SW abstraction from Lough Akeragh and upgrade Ballyheigue WTP	This option recommends a new SW abstraction from Lough Akeragh. Not a viable option as the lake no longer exists.

Option Reference	Option Description	Rejection Reasoning
SAH-087	Increase GW abstraction from An Riasc WTP (local important aquifer) and upgrade An Riasc WTP	This option recommends increasing the abstraction at An Riasc to supply deficit. There is a great uncertainty around available yield and as a result, this option is not considered feasible at coarse screening stage and would not be taken forward to the fine screening stage.
SAH-111	Supply Rathmore from Milstreet	Millstreet is in deficit, and it will be assessed as part of Study Area J. This option would involve in excess of 10km required for <1Ml/d deficit in Rathmore. Transferring small quantities of water over long distances can affect the quality of water. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.
SAH-149	Rationalise and connect to Breanlee - Mid Kerry	The option requires a significant length of pipeline for a relatively very small supply. Transferring small quantities of water over long distances can affect the quality of water. As There are other viable alternative option for this WRZ. this option was considered not feasible at coarse screening stage. This option did not meet the requirements of the Resilience, Deliverability and Environmental criteria at coarse screening stage.
SAH-149a	Increase SW abstraction at Breanlee and supply Lyranes	
SAH-165	Interconnect with NSS	
SAH-193	New SW abstraction from Coomnacronia Lake	It was determined that the sustainable allowable abstraction at this location is above the 5% allowable limit provided in the UKTAG guidance. Abstracting the volume of water required to make this a feasible option is considered likely to result in the waterbody not achieving good WFD status. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.
SAH-205	New 120 ML raw water bankside reservoir storage at existing River Feale abstraction site to provide up to 1 week supply for DYCP low flow periods when river abstraction rates reduced.	New 120 ML storage would only provide up to 1 week supply, and so it is not resilient long term for critical DYCP periods. For potential 3 month DYCP period when river abstraction limited the new storage volume required would be unfeasibly large. Therefore this option did not meet the requirements of the

Option Reference	Option Description	Rejection Reasoning
		Resilience, Deliverability or Environmental criteria.

3.4 Stage 5: Fine Screening

A total of 129 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 SAH.

3.5 Stage 6: Feasible Options List

A total of 129 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 SAH Technical Report (RWRP-SW Technical Appendix 1).

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-SW:

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.

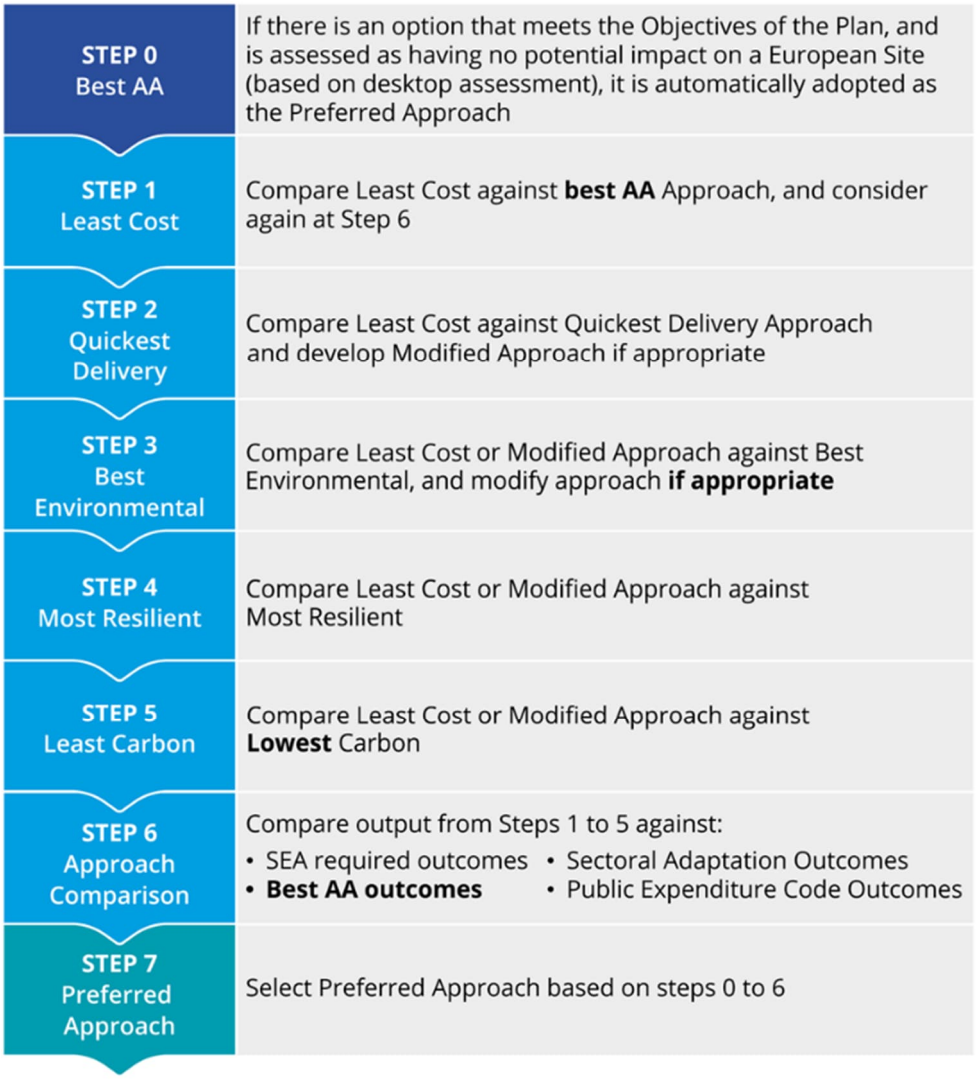

Figure 4.1 The 7 Step Process

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.

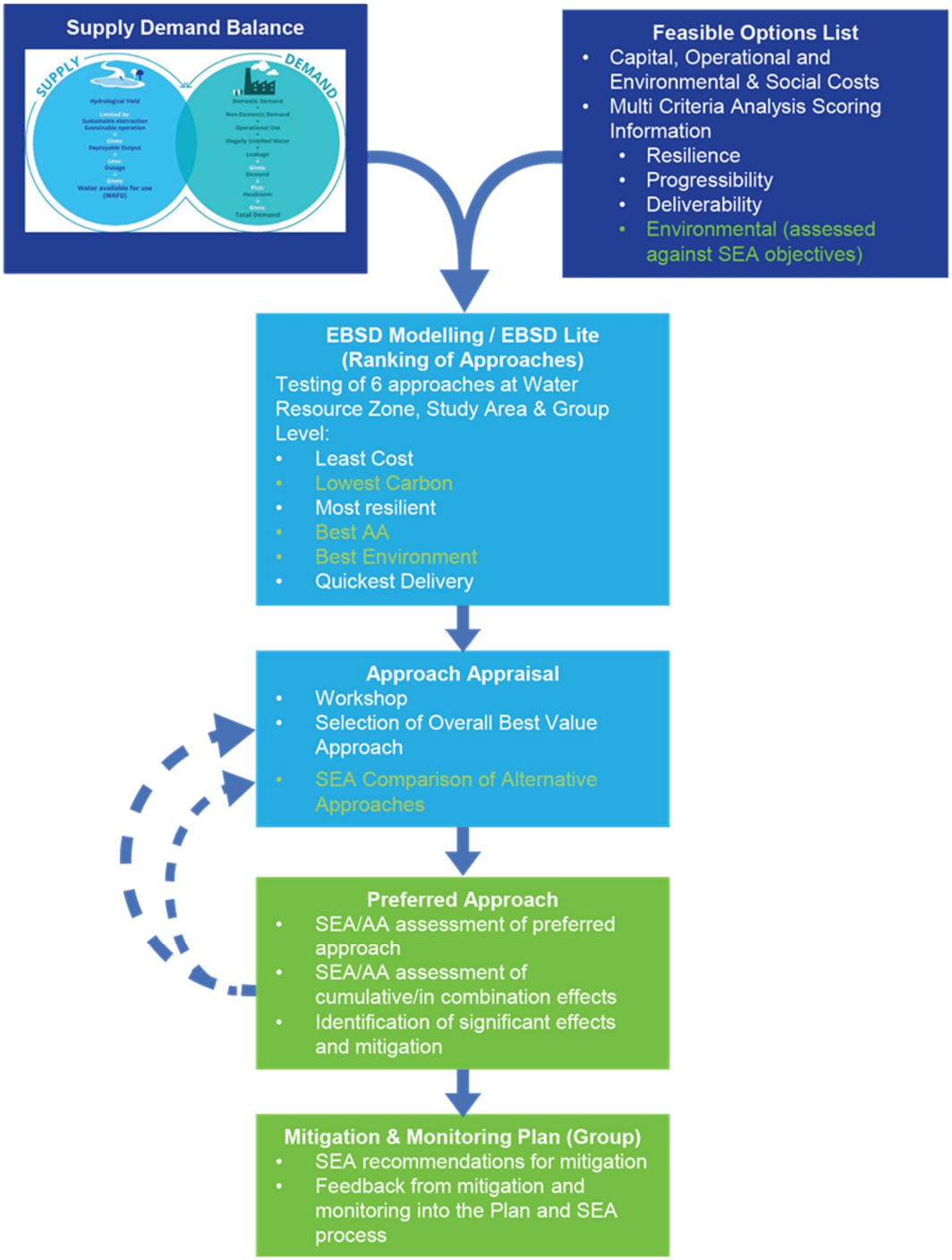

Figure 4.2 Approach Development Process

4.3 SAH 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 SAH there are 56 WRZ options and these are listed in Table 5.2 in the SAH Technical Report (RWRP-SW Technical Appendix 1), 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 SAH, a total of 11 combinations were compared and are presented in Table 4.2. The WRZ level preferred approach cannot meet the deficit for the study area as a whole, therefore, it has not been assessed and assigned a score in Table 4.2 for the purposes of determining the best performing alternative within each approach category. Note that the Preferred Approach selected at the end of the process has been outlined in red throughout this section.

It is important to note that where an option or combination provides similar NPV costs, Irish Water has considered that all options within a 5% NPV cost margin are in principle eligible to be identified as the "Least Cost" option (see section 7.2.1 of the RWRP-SW). In SAH, there were four combinations within 5% of one another in the least cost category. Overall combination 9 performs better against the SEA and Habitats Objectives of the plan and has been identified as the Least Cost option. See section 5 of the SAH Technical Report (RWRP-SW Technical Appendix 1), for further details.

For combination 9 and combination 8, there is an overlap of -3 AA impacts between SA option 40 for Rathmore and the proposed solution for Central Regional. Therefore, although combination 9 has three options and combination 8 has four options with a -3 biodiversity score, the SA option 40 AA impact is reported cumulatively as one -3 AA impact. This results in combination 8 having three -3 biodiversity scores and combination 9 having two -3 biodiversity scores at an approach level. Also note that to avoid double counting of infrastructure between SA option 40 and SA option 30 for the Central Regional WRZ, option SAH-216 has not been considered as part of SA option 40.

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

Category	WRZ Level Approach (Cannot meet the deficit)	SA Combination 1 (SA Option 24, 30, 31 and 32)	SA Combination 2 (SA Option 24, 30, 31 and 33)	SA Combination 3 (SA Option 24, 30 and 31)	SA Combination 4 (SA Option 24, 30 and 32)	SA Combination 5 (SA Option 24, 30, 31 and 39)	SA Combination 6 (SA Option 24, 30, 31, 32 and 39)	SA Combination 7 (SA Option 24, 30, 31, 33 and 40)	SA Combination 8 (SA Option 31, 33 and 40)	SA Combination 9 (SA Option 12, 24, 30, 31, 33 and 40)	SA Combination 10 (SA Option 24 and 36)	SA Combination 11 (SA Option 24)
Least Cost										Best**	Worst	
Quickest Delivery							Best					Worst
Number of -3 Biodiversity Scores		Three -3 Scores	Three -3 Scores	Three -3 Scores	Three -3 Scores	Four -3 Scores	Four -3 Scores	Three -3 Scores	Four -3 Scores	Two -3 Scores	Two -3 Scores	Four -3 Scores
Lowest Carbon			Best								Worst	
Most Resilient									Best		Worst	
Best Environmental											Best	Worst

Key															
Ranked order (best to worst)	Best														Worst

*SA options are also known as SA grouped options

**Overall combination 9 is within 5% of the other lowest cost combination and performs better against the SEA and Habitats Objectives of the plan. Hence, it has been identified as the least cost approach

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: RWRP-SW Technical Appendix 1); these aligned as five approaches (see Table 4.3).

Table 4.3 Study Area Approach Categories

Category	SA Approach 1 (SA Combination 2) (SA Option 24, 30, 31 and 33)	SA Approach 2 (SA Combination 6) (SA Option 24, 30, 31, 32 and 39)	SA Approach 3 (SA Combination 8) (SA Option 24, 31, 33 and 40)	SA Approach 4 (SA Combination 9) (SA Option 12, 24, 30, 31, 33 and 40)	SA Approach 5 (SA Combination 10) (SA Option 24 and 36)
Least cost (LCo)	-	-	-	✓	-
Quickest Delivery (QD)	-	✓	-	-	-
Best Environmental (BE)	-	-	-	-	✓
Most Resilient (MR)	-	-	✓	-	-
Lowest Carbon (LC)	✓	-	-	-	-
Best AA (BA)	-	-	-	-	✓

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

Table 4.4 Study Area Approaches

Options included	Do Minimum	Least Cost (SA Approach 4) (SA combination 9)	Best AA (SA Approach 5) (SA combination 10)	Quickest Delivery (SA Approach 2) (SA Combination 6)	Best Environmental (SA Approach 5) (SA combination 10)	Most Resilient (SA Approach 3) (SA combination 8)	Lowest Carbon (SA Approach 1) (SA Combination 2)
SA options (Group options)	No options	**SA option 12:** 108, 108a **SA option 24:** 162, 162a **SA option 30:** 177, 178 **SA option 31:**	**SA option 24:** 162, 162a **SA option 36:** 198, 199, 201, 202, 203	**SA option 24:** 162, 162a **SA option 30:** 177, 178 **SA option 31:** 181, 182, 204	**SA option 24:** 162, 162a **SA option 36:** 198, 199, 201, 202, 203	**SA option 24:** 162, 162a **SA option 31:** 181, 182, 204 **SA option 33:** 186, 187	**SA option 24:** 162, 162a **SA option 30:** 177, 178 **SA option 31:** 181, 182, 204

Options included	Do Minimum	Least Cost (SA Approach 4) (SA combination 9)	Best AA (SA Approach 5) (SA combination 10)	Quickest Delivery (SA Approach 2) (SA Combination 6)	Best Environmental (SA Approach 5) (SA combination 10)	Most Resilient (SA Approach 3) (SA combination 8)	Lowest Carbon (SA Approach 1) (SA Combination 2)
		181, 182, 204 **SA option 33:** 186, 187 **SA option 40:** 215		**SA option 32:** 184, 185 **SA option 39:** 212, 213, 214		**SA option 40:** 215	**SA option 33:** 186, 187
WRZ options	No options	038 065 094 099 122 138 148 169 170 173 179 225	038 062 065 068 085 094 107 109 122 123 138 140 148 169 225	038 085 099 107 109 122 140 148 169 170 173 179 225	038 062 065 068 085 094 107 109 122 123 138 140 148 169 225	002 021 038 065 094 099 107 109 122 138 140 145 148 169 170 179 225	038 065 094 099 107 109 122 138 140 148 169 170 173 179 225

* For the option references - all options are part of SAH e.g. SAH-038 is shown as 038 above

For the purposes of the Approach Development Process as set out in the SA Technical Report (RWRP-SW Technical Appendix 1), 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 SAH Technical Report (RWRP-SW Technical Appendix 1), .

Within SAH, this resulted in five approaches being selected from the ten SA combinations identified in Table 4.2, as they were identified as the best performing against the six approach categories - Least Cost, Best Environmental, Quickest Delivery, Most Resilient, Best AA and Lowest Carbon. This means that when comparing the five identified approaches against each other (representing the Stage 3 analysis for the selection of the Preferred Approach used in the workshop - see Table 4.5), their relative

performance against categories they were not identified as “best” in Table 4.2. This is because Table 4.2 compares all of the combinations to give a wider ranking, whereas Table 4.5 only compares the best performing combinations that have been selected as approaches. For example, an option identified as the "worst" performer against a particular approach category in Table 4.5 may not be the overall worst performing option when considered alongside all of the combinations in Table 4.2.

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

The three stages identified above were applied through a final workshop with all of the background MCA and option costing information available for each option and the ranking from the Economic Balance of Supply and Demand (EBSD) tool. Table 4.5 suggests that both SA approach 4 and SA approach 5 are the best AA because they have the same number of -3 biodiversity scores. However, SA approach 5 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 (LC) (SA Combination 2)	SA Approach 2 (QD) (SA Combination 6)	SA Approach 3 (MR) (SA Combination 8)	SA Approach 4 (LCo) (SA Combination 9)	SA Approach 5 (BE, BA) (SA Combination 10)
Least Cost Score				Best	Worst
Quickest Delivery Score		Best	Worst		
Best AA Score	Three -3 Biodiversity Scores	Four -3 Biodiversity Scores	Four -3 Biodiversity Scores	Two -3 Biodiversity Scores	Two -3 Biodiversity Scores
Lowest Carbon Score	Best				Worst
Most Resilient Score			Best		Worst
Best Environmental Score			Worst		Best

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

4.4 Comparison of SAH Approaches

An overall summary of the infrastructure components and abstractions for each of the SA approaches identified for SAH 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 (LC) (SA Combination 2)	SA Approach 2 (QD) (SA Combination 6)	SA Approach 3 (MR) (SA Combination 8)	SA Approach 4 (LCo) (SA Combination 9)	SA Approach 5 (BE, BA) (SA Combination 10)
New pipeline network (km)	0	114	152	122	123	190
New WTPs	0	4	4	4	4	2
Upgrade WTPs (Quality)	0	34	31	28	29	28
Upgrade WTPs (Quantity)	0	10	9	14	10	11
New abstractions	0	9	6	11	9	7
Increased abstractions	0	7	9	6	5	9
WTPs decommissioned	0	2	6	4	7	7
Abstractions abandoned	0	1	6	6	8	6
Raw Water Storage	0	1	1	1	0	1
Treated Water Storage	0	15	15	15	14	12

A comparative assessment of the five 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 (LC) (SA Combination 2)	SA Approach 2 (QD) (SA Combination 6)	SA Approach 3 (MR) (SA Combination 8)	SA Approach 4 (LCo) (SA Combination 9)	SA Approach 5 (BE, BA) (SA Combination 10)	Range (Difference between Lowest and Highest Score)
Population, health, economy and recreation	-3 scores	Worst	Best	Best	Worst	Worst	1
	MCA score			Worst		Best	14
Water Environment: quality and resources	-3 scores				Best	Worst	4
	MCA score			Worst	Best		9
Biodiversity, Flora and Fauna	-3 scores			Worst	Best	Best	3
	MCA score			Worst		Best	27
Material Assets	-3 scores		Best			Worst	2
	MCA score			Worst		Best	10
Landscape and Visual	-3 scores		Best	Worst			2
	MCA score		Best	Worst	Best	Best	4
Climate Change	-3 scores	Worst	Best	Worst	Worst	Worst	1
	MCA Score		Best	Worst		Best	6
Culture, Heritage and Archaeology	-3 scores	No Difference					0
	MCA Score	No Difference					0
Geology and Soils	-3 scores	No Difference					0

Topic	Total No. of	SA Approach 1 (LC) (SA Combination 2)	SA Approach 2 (QD) (SA Combination 6)	SA Approach 3 (MR) (SA Combination 8)	SA Approach 4 (LCo) (SA Combination 9)	SA Approach 5 (BE, BA) (SA Combination 10)	Range (Difference between Lowest and Highest Score)
	MCA Score	Worst	Best	Worst	Worst	Worst	1

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 2) (LC)

SA approach 1, key comparison points:

- Identified as the lowest carbon based on carbon cost:
- Option types included:
  - SA options (group options): 1 groundwater abstraction and interconnection option, 1 groundwater abstraction option and 2 surface water abstraction options;
  - WRZ options: 8 groundwater abstraction options, 2 rationalisation options, 3 surface water abstraction option and 2 WTP upgrade options;
- Three -3 biodiversity scores due to :
  - SAH-140: Further assessment required to rule out potential effects to the Mount Brandon SAC and the Dingle Peninsula SPA;
  - SAH-170: Further assessment required to rule out potential effects to the Killarney National Park SAC;
  - SA option 30: Potential direct impacts on the Killarney National Park, Macgillycuddy's Reek and Caragh River Catchment SAC as well as the Killarney National Park SPA, Lough Leane SAC and the Killarney National Park SAC;
- SA approach 1 and SA approach 4 are similar in terms of infrastructure development. The key differences compared with SA approach 4, is that SA approach 1 has:
  - The shortest length of pipeline of all the approaches;
  - Five more WTP quality upgrades;
  - Two more increased abstractions;
  - Five less WTPs decommissioned;

- Seven less abstractions abandoned;
- One more raw water storage; and
- One additional treated water storage facility.

4.4.2 SA Approach 2 (SA Combination 6) (QD)

SA approach 2, key comparison points:

- Identified as the quickest delivery approach overall;
- Option types included:
  - SA options (group options): 2 groundwater abstraction and interconnection options, 2 surface water abstraction options, and 1 interconnection option;
  - WRZ options: 7 groundwater abstraction options, 2 rationalisation options, 2 surface water abstraction options and 2 WTP upgrade options;
- Four -3 biodiversity scores due to:
  - SAH-140: Further assessment required to rule out potential effects to the Mount Brandon SAC and the Dingle Peninsula SPA;
  - SAH-170: Further assessment required to rule out potential effects to the Killarney National Park SAC;
  - SA option 30: Potential direct impacts on the Killarney National Park, Macgillycuddy's Reek and Caragh River Catchment SAC as well as the Killarney National Park SPA, Lough Leane SAC and the Killarney National Park SAC;
  - SA option 39: Potential direct impacts on the Killarney National Park, Macgillycuddy's Reek and Caragh River Catchment SAC as well as the Killarney National Park SPA, Lough Leane SAC and Killarney National Park SAC;
- SA approach 2 has the following key differences in terms on infrastructure development requirements:
  - Lowest number of WTP quantity upgrades;
  - Lowest number of new abstractions; and
  - Highest number of treated water storage facilities (same number as SA approach 1 and SA approach 3).

4.4.3 SA Approach 3 (SA Combination 8) (MR)

SA approach 3, key comparison points:

- Identified as the most resilient approach for supply overall;
- Option types included:
  - SA options (group options): 1 groundwater abstraction and interconnection option, 1 surface water abstraction option, 1 groundwater abstraction option, and 1 rationalisation option;
  - WRZ options: 7 groundwater abstraction options, 3 rationalisation options, 5 surface water abstraction options and 1 WTP upgrade option;
- Four -3 biodiversity scores due to:
  - SAH-021: Further assessment is required to rule out potential effects to the Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC;
  - SAH-140: Further assessment is required to rule out potential effects to the Mount Brandon SAC and the Dingle Peninsula SPA;

- SAH-170: Further assessment is required to rule out potential effects to the Killarney National Park SAC;
- For combination 8, there is an overlap of -3 AA impacts between SAH-002 and SA option 40. Therefore, although combination 8 has five options with a -3 biodiversity score, two of these are associated with the same abstraction from the Lower Leane catchment which could directly impact the Killarney National Park, Macgillycuddy's Reek and Caragh River Catchment SAC as well as the Killarney National Park SPA. Hence, this AA impact is reported cumulatively as one -3 AA impact at an approach level;

- SA approach 3 has the following key differences in terms on infrastructural development requirements:
  - Lowest number of WTP quality upgrades (same number as SA approach 5);
  - Highest number of WTP quantity upgrades;
  - Highest number of new abstractions; and
  - Highest number of treated water storage facilities (same number as SA approach 1 and SA approach 2).

4.4.4 SA Approach 4 (SA Combination 9) (LCo)

SA approach 4, key comparison points:

- Identified as the lowest cost approach;
- Option types included:
  - SA options (group options): 1 groundwater abstraction and interconnection option, 2 groundwater abstraction options, 2 surface water abstraction options, and 1 rationalisation option;
  - WRZ options: 5 groundwater abstraction options, 2 rationalisation options, 3 surface water abstraction options and 2 WTP upgrade options;
- Two -3 biodiversity scores due to:
  - SAH-170: Further assessment is required to rule out potential effects to the Killarney National Park SAC;
  - SA option 30/SA option 40: For combination 9, there is an overlap of -3 AA impacts between SA option 30 and SA option 40. Therefore, although combination 9 has three options with a -3 biodiversity score, two of these are associated with the same abstraction from the Lower Leane catchment which could directly impact the Killarney National Park, Macgillycuddy's Reek and Caragh River Catchment SAC as well as the Killarney National Park SPA, Lough Leane SAC and Killarney National Park SAC. Hence, this AA impact is reported cumulatively as one -3 AA impact at an approach level;
- SA approach 4 has the following key differences in terms on infrastructural development requirements:
  - Highest number of WTPs decommissioned (same numer as SA approach 5);
  - Highest number of abstractions abandoned;
  - Lowest number of increased abstractions; and
  - No raw water storage facilities.

4.4.5 SA Approach 5 (SA Combination 10) (BE, BA)

SA approach 5, key comparison points:

- Identified as the overall best environmental and best AA approach;
- Option types included:
    - SA options (group options): 1 groundwater abstraction and interconnection option, and 1surface water abstraction option;
    - WRZ options: 10 groundwater abstraction options, 2 rationalisation options, 2 surface water abstraction options and 1 WTP upgrade option;
- Two -3 biodiversity scores due to:
    - SAH-140: Further assessment required to rule out potential effects to the Mount Brandon SAC and the Dingle Peninsula SPA;
    - SA option 36: Potential impacts to the Killarney National Park, Macgillycuddy's Reek and Caragh River Catchment SAC as well as the Killarney National Park SPA;
- SA approach 5 has the following key differences in terms of infrastructure development requirements:
    - Longest length of pipeline;
    - Lowest number of new WTPs;
    - Highest number of increased abstractions (same number as SA approach 2);
    - Highest number of WTPs decommissioned (same number as SA approach 4); and
    - Lowest number of treated water storage facilities.

4.5 SAH 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 -32,740 m^3/d in 2019, to a projected maximum of -38,1930 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 SAH.

Table 4.8 Supply Demand Balance for SAH

WRZ Name	WRZ Code	Population	Maximum Deficit m^3/day*	
			2019	2044
Abbeyfeale Water Supply	1900SC0021	6,791	-715	-926
Cahersiveen	1300SC0032	1,396	-1,573	-1,664
Rathmore	1300SC0031	1,123	-48	-117
Aughacasla	1300SC0030	348	No Deficit	-4
Ce Bhreannain	1300SC0028	147	-26	-42
Lios Cearnaigh PWS 052D	1300SC0026	30	No Deficit	No Deficit

WRZ Name	WRZ Code	Population	Maximum Deficit m³/day*	
			2019	2044
Mountain Stage PWS 062A	1300SC0025	856	-458	-516
Lyranes 303A	1300SC0024	91	-15	-18
Ceann Tra PWS 074D	1300SC0022	438	-469	-514
Emlaghpeasta/Portmagee/ Maulin	1300SC0016	1,760	-987	-1,112
Mid Kerry	1300SC0015	10,604	-9,757	-10,218
Central Regional - Lough Guitane	1300SC0013	73,201	-12,219	-15,251
Brosna/Knocknagoshel PWS 016F	1300SC0012	947	-207	-253
Listowel Regional Public Water Supply	1300SC0011	17,499	-1,684	-2,389
Ardfert North/Glenderry	1300SC0010	2,674	-2,144	-2,333
Castlegregory	1300SC0009	1,158	-980	-1,059
An Clochan	1300SC0008	173	-237	-253
An Fheothanach/An Mhuirioch/Baile Breach	1300SC0007	751	No Deficit	-32
Dun Chaoin PWS 034D	1300SC0006	153	-156	-164
Baile An Fheirtearaigh/Tir Abhainn Thoir/Cill Maoilcheadair/An Ghraig/Cloichear	1300SC0005	793	-410	-467
An Baile Mor/An Daingean	1300SC0004	2,596	-309	-456
An Mhin Aird	1300SC0003	990	-342	-405
Annascaul/Ballintermon	1300SC0002	706	No Deficit	No Deficit

*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 (LC) (SA Combination 2)	SA Approach 2 (QD) (SA Combination 6)	SA Approach 3 (MR) (SA Combination 8)	SA Approach 4 (LCo) (SA Combination 9)	SA Approach 5 (BE, BA) (SA Combination 10)
1. Protect public health and promote wellbeing	C	0	-	-	-	-	-
	O	---	++	++	+	++	+
2. Protect and enhance biodiversity and contribute to resilient ecosystems	C	0	--	--	--	--	--
	O	--	-	--	--	-	-
3. To protect landscapes, townscapes and visual amenity	C	0	-	-	--	-	-
	O	0	-	+	+	++	++
4. Protect and where appropriate enhance, built and natural assets and reduce waste	C	0	--	-	--	--	--
	O	-	-	-	-	-	-
5. Reduce greenhouse gas emissions	C	0	-	-	--	-	-
	O	-	-	-	--	-	-
6. Contribute to environmental climate change resilience	C	0	--	-	--	-	-
	O	--	-	+	++	+	-
7. Protect and improve surface water and groundwater status	C	0	0	0	0	0	0
	O	--	--	--	--	-	---
	C	0	0	0	0	0	0

SEA Objectives	Phase (Construction (C)/ Operation (O))	Do Minimum	SA Approach 1 (LC) (SA Combination 2)	SA Approach 2 (QD) (SA Combination 6)	SA Approach 3 (MR) (SA Combination 8)	SA Approach 4 (LCo) (SA Combination 9)	SA Approach 5 (BE, BA) (SA Combination 10)
8. Avoid flood risk	O	0	0	0	0	0	0
9. Protect and where appropriate, enhance cultural heritage assets	C	0	-	-	-	-	-
	O	0	0	0	0	0	0
10. Protect quality and function of soils	C	0	-	-	-	-	-
	O	0	0	0	0	0	0

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

The overall assessment of the approaches against the SEA objectives indicates SA approach 4 (identified as the Preferred Approach) is likely to have significant benefits in terms of improved reliable water supply with upgrade of failing WTPs compared to the 'do minimum' approach and overall reduced or similar landscape longterm impacts due to the decommissioning of WTPs compared to other approaches. SA approach 4 is also likely to have a lower impact on the water environment as the proposed new and increased sources have more capacity to support abstractions sustainably and the approach includes the decommissioning of two abstractions. Construction impacts associated with pipeline are also expected to be signicantly lower compared to two of the approaches and similar to the other two options.

Mitigation for the Preferred Approach is taken into account in the individual options assessments presented in chapter 5, identified in chapter 6 in terms of cumulative assessment and in chapter 7 for the SEA summary. 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 5 has been selected through the 7 step process as the best performing approach overall across the different categories.

The SA Preferred Approach includes two -3 Biodiversity score options. Therefore, there are higher risk options for effects on European Sites included in the Preferred Approach. For options identified as

having some level of risk for LSEs (section 6.2.1 of the NIS), mitigation measures to address these are set out (section 6.3.3 of the NIS). No AESI have been identified .

5

SAH Preferred Approach: Strategic Environmental Assessment

5 SAH Preferred Approach Strategic Environmental Assessment

5.1 SAH 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 fourteen of the twenty-three WRZs in the study area. This reflects the small scale of the supplies and difficulties in transporting small volumes of water over long distances. The other nine WRZs comprise six SA options that involved interconnecting supplies. These SA options also include increasing GW abstraction at An Clochan (SA option 12), new abstraction from the Lower Leane catchment (SA Option 30), increased abstraction from Lough Currane (SA option 31) and increased groundwater sbatrction from Tobar Bhreandáin WTP (SA option 33). The SA Preferred Approach for the remaining WRZs involves new and increased groundwater and surface water abstractions, upgrades to existing WTPs, and rationalisation of WTPs.

Note that SA option 31 includes option SAH-181 which applies to a WRZ located in SAI (Waterville).

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

Table 5.1 Preferred Approach Breakdown

WRZ Name and Option Reference*	Option Description	Demand (DYCP 2044)
SAH-179 1300SC0004 An Baile Mor/An Daingean	**New SW abstraction from Milltown River and WTP** • New SW abstraction to meet WRZ future deficit • New SW source (Milltown River Kerry). WFD status 2016-2021 – Moderate	3,338 m^3/d
SAH-122 1300SC0007 An Fheothanach / An Mhuirioch/ Baile Breach	**Amalgamate all sources in WRZ to one WTP and rationalise smaller WTP - Upgrade an Fheothanach WTP** • Increase GW abstraction to meet WRZ future deficit • Existing GW source (Brandon Head groundwater body (GWB)) WFD status 2016-2021 – Good	783 m^3/d
SAH-099 1300SC0003 An Mhin Aird	**New GW abstraction in Dingle area to serve the customers currently served by An Mhín Aird Gualainn WTP** • New GW abstraction to meet WRZ future deficit • New GW source (Dingle GWB) WFD status 2016-2021 – Good	1,450 m^3/d
SAH-173 1300SC0002	**WTP Upgrade - No deficit** • WRZ in surplus. Rationalise Ballintermon to Annascaul.	N/A

WRZ Name and Option Reference*	Option Description	Demand (DYCP 2044)
Annascaul/ Ballintermonb	• Exisiting GW source (Dingle GWB) WFD status 2016-2021 – Good	
SAH-038 1300SC0010 Ardfert North/ Glenderry Ballyheigue WRZ	**Increase Ballyheigue abstraction. Abandon existing borehole (BH) at Glenderry Well and rationalise WTP** • Increase GW abstraction to meet WRZ future deficit • Existing GW source (Ardfert GWB) WFD status 2016-2021 – Good	4,212 m^3/d
SAH-138 1300SC0030 Aughacasla	**New GW abstraction from Aughacasla BHs and upgrade existing Aughacasla WTP to supply deficit. Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones** • New GW abstraction to meet WRZ future deficit • New GW source (Brandon Head GWB) WFD status 2016-2021 – Good	528 m^3/d
SAH-225 1300SC0012 Brosna/Knocknagoshel PWSS 016F	• **Develop trial well at Brosna raw waer pump house, upgrade WTP and undertake source protection works** New GW abstraction to meet WRZ future deficit • New GW source (Abbeyfeale GWB) WFD status 2016-2021 – Good	1,793 m^3/d
SAH-065 1300SC0009 Castlegregory PWSS 024D	**New SW abstraction from Lough Gill and upgrade Castlegregory WTP** • New GW abstraction to meet WRZ future deficit • New SW source (Lough Gill surface waterbody (SWB)) WFD status 2016-2021 – Moderate	1,167 m^3/d
SAH-094 1300SC0022 Ceann Tra PWS 074D	**Increase GW abstraction from Ceann Trá WTP BHs (Local important aquifer) and upgrade Ceann Tra WTP** • Increase GW abstraction to meet WRZ future deficit • Exisiting GW source (Dingle GWB) WFD status 2016-2021 – Good	796 m^3/d
SAH-169 1300SC0026 Lios Cearnaigh PWS 052D	**WTP Upgrade - No deficit** • WRZ in projected surplus. • Exisiting GW source (Brandon Head GWB) WFD status 2016-2021 – Good	N/A
SAH-148 1300SC0024 Lyranes 303A	**Increase GW abstraction from source Lyranes BH (local important aquifer) and upgrade Lyranes WTP** • Increase GW abstraction to meet WRZ future deficit • Existing GW source (Cahersiveen GWB) WFD status 2016-2021 – Good	62 m^3/d

WRZ Name and Option Reference*	Option Description	Demand (DYCP 2044)
SAH-170 1300SC0025 Mountain Stage PWS 062A	**New abstraction from Coomassaharn Lake, upgrade Mountain Stage WTP to treat** • New SW abstraction to meet WRZ future deficit • New SW source (Coomassaharn SWB) WFD status 2016-2021 – High	1,372 m^3/d
SA Option 12	**Increase GW abstraction at An Clochan. Ce Brennan and Clochan are connected - Could feed from either depending on where yield is**	**Demand per WRZ provided below**
SAH-108 1300SC0008 An Clochlan	**SA Option 12** • Increase GW abstraction to meet WRZ future deficit • Existing GW source (Brandon Head GWB) WFD status 2016-2021 – Good	365 m^3/d
SAH-108a 1300SC0028 Ce Bhreannain	**SA Option 12** • Increase GW abstraction to meet WRZ future deficit • Existing GW source (Brandon Head GWB) WFD status 2016-2021 – Good	220 m^3/d
SA Option 24	**New GW abstraction and interconnect Abbeyfeale and Listowel**	**Demand per WRZ provided below**
SAH-162a 1300SC0011 Listowel Regional PWS	**SA Option 24** • New GW abstraction to meet WRZ future deficit • New GW source (Ballybunnion GWB) WFD status 2016-2021 – Good	16,427 m^3/d
SAH-162 1900SC0021 Abbeyfeale WS	**SA Option 24** • New GW abstraction to meet WRZ future deficit • New GW source (Ballybunnion GWB) WFD status 2016-2021 – Good	3,497 m^3/d
SA Option 30	**New abstraction from theLower Leane catchment and WTP at abstraction to feed deficit in Central Regional and Mid Kerry**	**Demand per WRZ provided below**
SAH-177 1300SC0013 Central Regional - Lough Guitane	**SA Option 30** • New SW abstraction to meet WRZ future deficit • New SW source (Leane LWB) WFD status 2016-2021 – Good	58,674 m^3/d
SAH-178 1300SC0015 Mid kerry	**SA Option 30** • New SW abstraction to meet WRZ future deficit • New SW source (Leane LWB) WFD status 2016-2021 – Good	13,799 m^3/d

WRZ Name and Option Reference*	Option Description	Demand (DYCP 2044)
SA Option 31	**Rationalise Cahersiveen and Emlaghpeasta to Waterville, with Lough Currane abstraction increased to meet deficit**	**Demand per WRZ provided below**
SAH-181 1300SC0023 Waterville (SAI WRZ)	**SA Option 31** • Increase SW abstraction to meet WRZ future deficit and allow schemes in SAH to be rationalised • Existing SW source (Currane SWB) WFD status 2016-2021 – Good	1,811 m^3/d
SAH-182 1300SC0032 Cahersiveen	**SA Option 31** • Increase SW abstraction to meet WRZ deficit • Existing SW source (Currane SWB) WFD status 2016-2021 – Good	1,815 m^3/d
SAH-204 1300SC0016 Emlaghpeasta/ Portmagee/Maulin	**SA Option 31** • Increase SW abstraction to meet WRZ deficit • Existing SW source (Currane SWB) WFD status 2016-2021 – Good	1,112 m^3/d
SA Option 33	**Increase GW abstraction from Tobar Bhreandáin WTP borehole and supply Dun Chaoin**	**Demand per WRZ provided below**
SAH-187 1300SC0005 Baile An Fheirtearaigh /Tir Abhainn Thoir/ Cill Maoilcheadair/An Ghraig/Cloichear	**SA Option 33** • Increase GW abstraction to meet WRZ deficit • Existing GW source (Brandon Head GWB) WFD status 2016-2021 – Good	1,640 m^3/d
SAH-186 1300SC0006 Dun Chaoin PWS 034D	**SA Option 33** • Increase GW abstraction to meet WRZ deficit • Existing GW source (Dingle GWB) WFD status 2016-2021 – Good	229 m^3/d
SA Option 40	**Rationalise Rathmore WTP and connect to Central Regional WRZ and new SW source for central Regional**	**Demand per WRZ provided below**
SAH-215 1300SC0031 Rathmore	**SA Option 40** • Dependent on SA option 30 (New source for Central and Mid Kerry). • New SW source (Leane SWB) WFD status 2016-2021 – Good	780 m^3/d

*SA Options are the same as Group Options

The SA Preferred Approach options are shown in Figure 5.1 and Figure 5.2, with the key environmental designations. Note that the SA options are labelled accordingly in Figure 5.1 and Figure 5.2: SAH-512 (SA option 12), SAH-524 (SA option 24), SAH-530 (SA option 30), SAH-531 (SA option 31), SAH-533 (SA option 33) and SAH-540 (SA option 40).

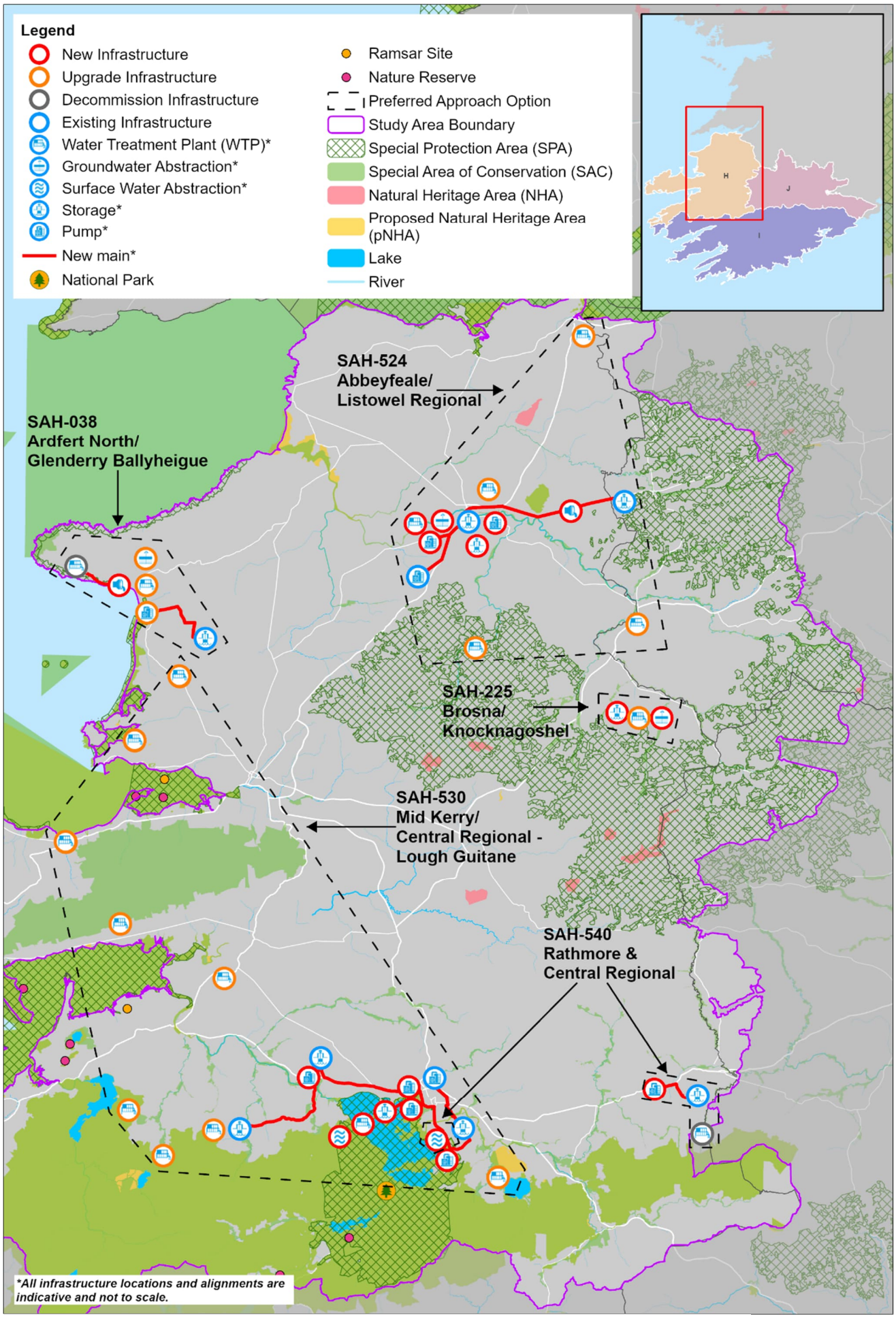

Figure 5.1 SA Preferred Approach East and Key Environmental Designations

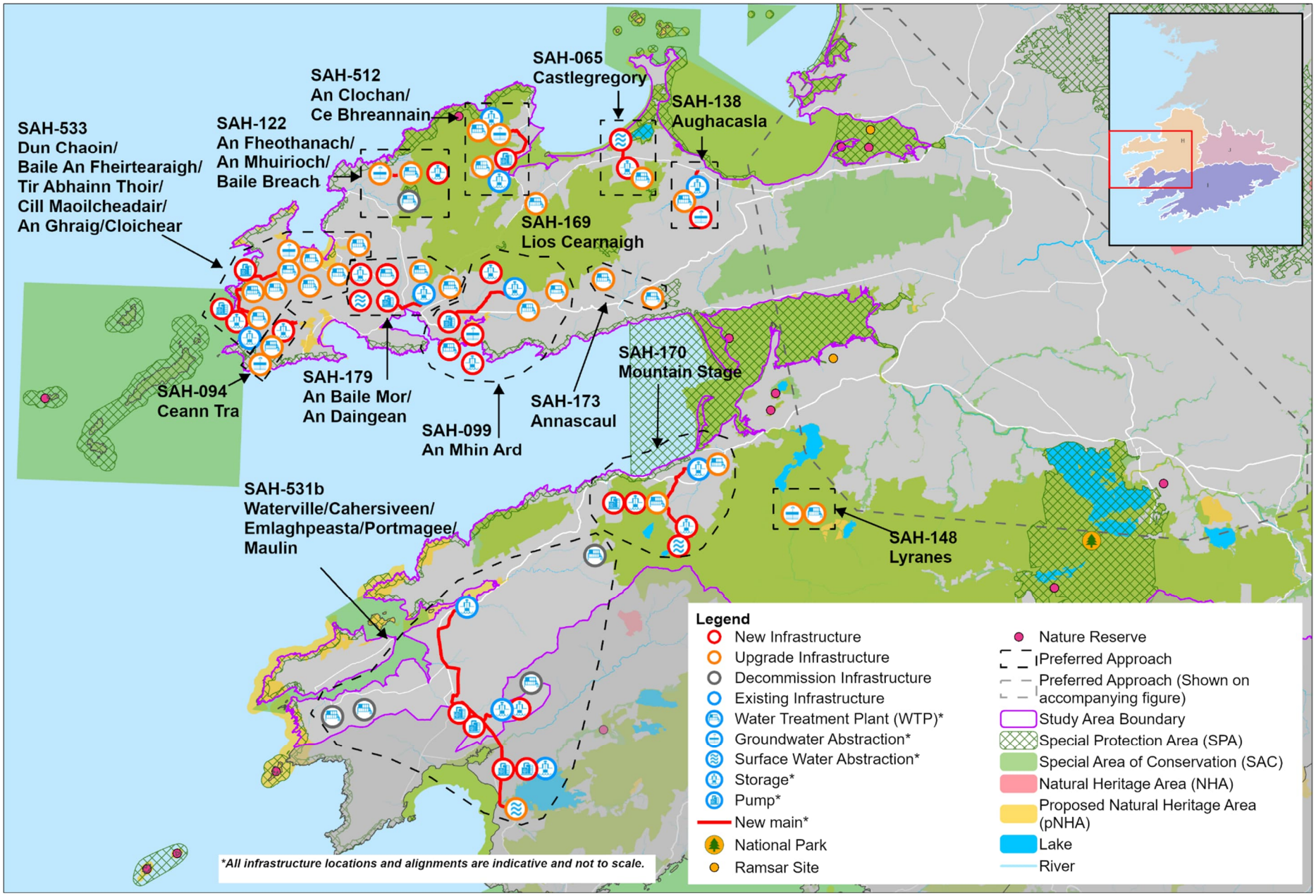

Figure 5.2 SA Preferred Approach West and Key Environmental Designations

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 (Quality)	Upgrade WTPs (Quantity)	WTPs Decommissioned	New Abstractions	Increased Abstractions	Abstractions Abandoned	Raw Water Storage	Treated Water Storage
SAH-179	✓	✓	✓	-	-	✓	-	-	-	✓
SAH-122	✓	-	-	✓	✓	-	✓	-	-	✓
SAH-099	✓	✓	✓	-	-	✓	-	-	-	✓
SAH-173	-	-	✓	-	-	-	-	-	-	-
SAH-038	✓	-	-	✓	✓	-	✓	✓	-	-
SAH-138	✓	-	-	✓	-	✓	-	-	-	-
SAH-225	-	-	-	✓	-	✓	-	-	-	✓
SAH-065	✓	-	-	✓	-	✓	-	-	-	✓
SAH-094	✓	-	-	✓	-	✓	-	-	-	✓
SAH-169	-	-	✓	-	-	-	-	-	-	-
SAH-148	-	-	-	✓	-	-	✓	-	-	-
SAH-170	✓	-	✓	✓	-	✓	-	-	-	✓
SA Option 12	✓	-	✓	✓	-	-	✓	-	-	-
SA Option 24	✓	✓	✓	-	-	✓	-	-	-	✓
SA Option 30	✓	✓	✓	-	-	✓	-	-	-	✓
SA Option 31	✓	-	-	-	✓	-	-	✓	-	✓
SA Option 33	✓	-	✓	✓	-	-	✓	-	-	✓

Option Reference*	New / Refurbished Pipeline	New WTP	Upgrade WTPs (Quality)	Upgrade WTPs (Quantity)	WTPs Decommissioned	New Abstractions	Increased Abstractions	Abstractions Abandoned	Raw Water Storage	Treated Water Storage
SA Option 40	✓	-	-	-	✓	-	-	✓	-	-

*SA Options are the same as Group Options

Table 5.3 Options Assessment Summary

Option Reference*	Option Description	Phase	Protect Public Health and Promote Wellbeing (P1, P2, P3)	Protect and Enhance Biodiversity and Contribute to Resilient Ecosystems (B1, B2, B3, B4, B5)	To Protect Landscapes, Townscapes and Visual Amenity (L1)	Protect and Where Appropriate Enhance, Built and Natural Assets and Reduce Waste (M1, M2)	Reduce Greenhouse Gas Emissions (C1)	Contribute to Environmental Climate Change Resilience (R1, R2, R5)	Protect and Improve Surface Water and Groundwater Status (W1, W2, W3)	Avoid Flood Risk (W5)	Protect and Where Appropriate, Enhance Cultural Heritage Assets (CH1)	Protect Quality and Function of Soils (G1)
SA Option 12 (SAH-108 and SAH-108a)	Increase GW abstraction at An Clochan. Ce Brennan and Clochan are connected - Could feed from either depending on where yield is	Construction	-	-	-	-	-	--	0	0	-	-
		Operation	+	--	0	0	-	--	---	0	0	0
SA Option 24 (SAH-162 and SAH-162a)	New GW abstraction and interconnect Abbeyfeale and Listowel	Construction	--	--	-	-	---	-	0	0	-	-
		Operation	++	-	-	-	---	-	-	0	0	0
SA Option 30 (SAH-	New abstraction from the Lower Leane	Construction	--	-	-	--	---	-	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)
177 and SAH-178)	catchment and WTP at abstraction to feed deficit in Central Regional and Mid Kerry	Operation	++	--	-	--	---	-	-	0	0	0
SA Option 31 (SAH-181, SAH-182 and SAH-204)	Rationalise Cahersiveen and Emlaghpeasta to Waterville, with Lough Currane abstraction increased to meet deficit	Construction	-	-	--	--	--	-	0	-	-	-
		Operation	+	--	++	0	--	-	-	0	0	0
SA Option 33 (SAH-	Increase GW abstraction from Tobar	Construction	-	--	-	-	---	--	0	0	-	-

Option Reference*	Option Description	Phase	Protect Public Health and Promote Wellbeing (P1, P2, P3)	Protect and Enhance Biodiversity and Contribute to Resilient Ecosystems (B1, B2, B3, B4, B5)	To Protect Landscapes, Townscapes and Visual Amenity (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)
186 and SAH-187)	Bhreandáin WTP BH (local important aquifer) and upgrade Tobar Bhreandáin WTP	Operation	++	-	0	0	---	--	---	0	0	0
SA Option 40 (SAH-215)	Rationalise Rathmore WTP and connect to Central Regional WRZ and new SW source for Central Regional	Construction	-	--	-	-	0	-	0	-	0	0
		Operation	-	-	+	-	0	-	-	0	0	0
SAH-179	New SW abstraction from Milltown River and WTP	Construction	--	-	-	-	--	--	0	-	-	-
		Operation	++	0	-	-	--	--	--	0	0	0
SAH-122	Amalgamate all sources in WRZ to one	Construction	-	-	-	-	-	--	0	0	-	-

Option Reference*	Option Description	Phase	Protect Public Health and Promote Wellbeing (P1, P2, P3)	Protect and Enhance Biodiversity and Contribute to Resilient Ecosystems (B1, B2, B3, B4, B5)	To Protect Landscapes, Townscapes and Visual Amenity (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)
	WTP and rationalise smaller WTP - Upgrade an Fheothanach WTP.	Operation	+	0	+	0	-	--	---	0	0	0
SAH-099	New GW abstraction in Dingle area to serve the customers currently served by An Mhín Aird Gualainn WTP.	Construction	-	-	-	-	--	-	0	0	-	-
		Operation	+	0	+	-	--	-	-	0	0	0
SAH-173	WTP Upgrade - No deficit	Construction	-	-	0	0	-	0	0	0	0	0
		Operation	++	0	0	0	-	0	0	0	0	0
SAH-038	Increase Ballyheigue abstraction. Abandon	Construction	-	-	-	-	-	--	0	0	-	-

Option Reference*	Option Description	Phase	Protect Public Health and Promote Wellbeing (P1, P2, P3)	Protect and Enhance Biodiversity and Contribute to Resilient Ecosystems (B1, B2, B3, B4, B5)	To Protect Landscapes, Townscapes and Visual Amenity (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)
	existing BH at Glenderry Well and rationalise WTP	Operation	+	--	+	0	-	--	---	0	0	0
SAH-138	New GW abstraction from Aughacasla BHs and upgrade existing Aughacasla WTP to supply deficit. Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones	Construction	-	-	-	-	-	-	0	0	-	-
		Operation	0	0	0	0	-	-	-	0	0	0
SAH-225	Develop TW at Brosna raw water pump house	Construction	-	-	-	-	--	--	0	0	0	0
		Operation	0	--	0	0	--	--	--	0	0	0

Option Reference*	Option Description	Phase	Protect Public Health and Promote Wellbeing (P1, P2, P3)	Protect and Enhance Biodiversity and Contribute to Resilient Ecosystems (B1, B2, B3, B4, B5)	To Protect Landscapes, Townscapes and Visual Amenity (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)
SAH-065	New SW abstraction from Lough Gill and upgrade Castlegregory WTP	Construction	-	-	-	-	-	-	0	0	-	-
		Operation	-	--	0	0	-	-	-	0	0	0
SAH-094	Increase GW abstraction from Ceann Trá WTP BHs (Local important aquifer) and upgrade Ceann Tra WTP	Construction	-	-	-	-	-	--	0	0	-	-
		Operation	0	0	0	0	-	--	--	0	0	0
SAH-169	No Deficit - WTP Upgrade	Construction	-	-	0	0	0	0	0	0	0	0
		Operation	+	0	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)
SAH-148	Increase GW abstraction from source Lyranes BH (local important aquifer) and upgrade Lyranes WTP	Construction	-	-	0	-	-	--	0	0	0	0
		Operation	0	--	0	0	-	--	---	0	0	0
SAH-170	New abstraction from Coomasaharn Lake, upgrade Mountain Stage WTP to treat	Construction	-	-	-	-	---	--	0	0	-	-
		Operation	+	--	0	0	---	--	--	0	0	0

*SA Options are the same as Group Options

**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 its customers in this study area. These are described in the SAH Technical Report (RWRP-SW Technical Appendix 1), 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 assesses 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; and
- Further net leakage reductions, to move towards achieving the national SELL target by 2034, in the WRZs: Listowel Regional Public Water Supply, Central Regional - Lough Guitane and Mid Kerry.

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 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 has not applied reductions to the SDB for unquantifiable water conservation gains. However, Irish Water does assume that any gain will offset consumer usage growth factors.

5.3 Interim Solutions

The SAH Technical Report (RWRP-SW Technical Appendix 1), 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 SAH Preferred Approach is provided in the SAH Technical Report (RWRP-SW Technical Appendix 1), . A high-level assessment of what this could mean for the SEA is shown in Table 5.4.

Table 5.4 SAH 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)	+47,000 m^3/d	The impact of sustainability reductions would reduce the volumes that can be abstracted from Irish Water's existing sources, therefore, increasing the SDB deficit. There are several surface water sources in SAH that would be impacted through sustainability reductions. However, the Preferred Approach is designed to relieve pressure on these sources by supplementing from more resilient surface water and groundwater sources. Regarding the abstraction from Lough Guitane (supplying Central Regional) it is assumed that the existing abstraction licence conditions can be maintained. However, Irish Water have identified an alternative source to supplement supply in order to provide long term resilience. Groundwater sustainability is more difficult to assess at desktop level, however, as the abstractions in SAH are small in scale they do not appear to be problematic.
			The SA Preferred Approach addresses reduction and Irish Water have identified alternative supplies to supplement the abstraction at Lough Guitane. However, additional sustainability reductions could increase pressure for additional supply from outside the study area.
Climate Change	High (international climate change targets have not been met)	+1,000 m^3/d	Higher climate change scenarios would impact Irish Water's existing supplies and result in decreased water availability at certain times of year. 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. 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.
			Although the Preferred Approach provides more operational flexibility to use less sensitive water sources, this could still result in more pressure on sources.

Uncertainty	Likelihood	Increase/ Decrease in Deficit	Environmental Impacts Relative to Assessment of Preferred Approach Key: Green - Positive Amber - Negative
Demand Growth	Low/Moderate (growth has been based on policy)	-33,867 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 nineteen out of twenty-three of the WRZs in the area and twenty-one have a projected SDB deficit. This is 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 (the distribution network in the region is extensive at nearly 234 kilometres)	+1,070 m^3/d	The impact of lower than expected leakage savings would increase the SDB deficit and the overall need requirement. Due to the length and condition of Irish Water's networks, Irish Water could potentially fail to achieve target leakage reductions within the timeframes set out. However, as Irish Water is committed to achieving leakage reductions, the likely scenario would be an extension in the period of time taken to achieve leakage targets as opposed to accepting lower targets.
			This could increase carbon and the effects of abstraction pressure on the environment.
	Moderate/High (Irish Water is focused on sustainability and aggressive leakage reduction)	-32,362 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 SAH 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 SAH Preferred Approach

6 SEA Cumulative Effects for SAH Preferred Approach

Secondary, cumulative and the synergistic nature of the effects of the SAH 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 three study areas within the South West Region and reported in the SEA Environmental Report of the Regional Plan. Further consideration of any inter regional cumulative effects will be addressed in each Regional Plan SEA sequentially.

6.1 Cumulative Effects 'Within Plan' for SAH

The potential 'within plan' cumulative effects for SAH 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 South West Region level: Considering combined effects from proposals in the three study areas (see the SEA Environmental Report of the Regional Plan).

For cumulative effects to occur, there needs to be an overlap of temporal periods in some way for the impact and/or the effect. For example, two schemes being constructed at the same time could result in cumulative traffic movements, while two schemes being operated together could result in additional drawdown of groundwater levels. A precautionary approach has been taken for the cumulative effects assessment, which assumes that all options could be constructed at the same time and then all options would be operated at the same time (Table 6.1). However, this is very unlikely to be the case for construction impacts due to budget resources and regulatory constraints.

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

- Biodiversity – for example, a cumulative loss of habitats or changes to a habitat's quality through changes in water quality or groundwater levels;
- Water environment (surface water and groundwater WFD status) – for example, changes to water flow due to combined abstraction pressure;
- People and health – for example, disruption due to multiple construction works taking place at the same time;
- Landscape and visual – for example, if there are a number of options located close together that could alter the landscape character or views;
- Cultural heritage – for example if the same cultural heritage features are affected by above ground infrastructure in close proximity or the combined effect of loss to undesignated archaeological assets or from combined impacts resulting in additional changes to water levels affecting archaeological resources; and
- Climate change – combined carbon emissions for the approach as a whole have been considered through the approach selection process and are also reported here to identify

potential requirements for mitigation. Combined effects on climate change adaptation are also considered.

6.1.1 Cumulative Effects during Construction

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

There is potential for cumulative effects associated with construction in terms of traffic, noise and dust for the options located along the N86 and N70 roads (indicated by 'N86' and 'N70', respectively in Table 6.1). These could be mitigated by standard mitigation measures such as planning of construction traffic routes and movements and engaging with local residents about the disruption. With these standard good practice measures in place, there are unlikely to be significant cumulative effects.

There is potential for cumulative effects from habitat loss, mortality, spread of invasive non-native species, disturbance and pollution on Lower River Shannon and to Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA from disturbance if construction of options SAH-225 and SA option 24 are concurrent (see 'LRS' in Table 6.1). The construction of the SA Preferred Approach could also cause cumulative effects from pollution on Akeragh, Banna and Barrow Harbour SAC (SAH-038 and SA option 30), Tralee Bay and Magharees Peninsula, West to Cloghane SAC (SAH-065, 138 and SA option 30) and Dingle Peninsula SPA (SAH-065, 173 and SA option 33). These are represented in Table 6.1 as 'ABB', 'TMW' and 'D', respectively. If construction of options SAH-038, 065 and SA option 30 are concurrent, there could be cumulative effects from disturbance and pollution to Tralee Bay Complex SPA (see 'T' in Table 6.1). There could be cumulative effects from habitat loss, mortality, spread of invasive non-native species, disturbance and pollution on Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC given that SAH-148, 170 and SA options 30, 31 and 40 all have potential for impacts to the site (see 'KMC' in Table 6.1). If construction of options SAH-170 and SA options 30 and 40, and options SAH-138, 170, 173 and SA option 30 are concurrent, there could be cumulative effects from pollution to Castlemaine Harbour SAC and SPA, respectively (see 'C1' and 'C2' in Table 6.1).

There is potential for cumulative effects from spread of invasive non-native species and pollution on Mount Brandon SAC and potential for cumulative effects from disturbance on Iveragh Peninsula SPA if construction of options SAH-122 and SA option 12, and SAH-170 and SA option 31 are concurrent, respectively. These are represented in Table 6.1 as 'M' and 'I', respectively. Cumulative effects to European designated sites during construction could be mitigated with good practice mitigations, such as having buffers along the edge of the river and having an emergency plan in place during construction. The impacts on the European designations are provided in the NIS and also summarised in chapter 9 of this review.

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

Preferred Approach	SAH-179	SAH-122	SAH-099	SAH-173	SAH-038	SAH-138	SAH-225	SAH-065	SAH-094	SAH-169	SAH-148	SAH-170	SA Option 24	SA Option 12	SA Option 33	SA Option 31	SA Option 30
SAH-122																	
SAH-099	N86																
SAH-173	N86		N86														
SAH-038																	
SAH-138																	
SAH-225																	
SAH-065				D	T	TMW											
SAH-094																	
SAH-169																	
SAH-148																	
SAH-170				C1 C2		C2					KMC						
SA Option 24							LRS/ SWM										
SA Option 12		M															
SA Option 33				D				D									
SA Option 31											KMC	KMC I N70					
SA Option 30	N86		N86	C1 C2 N86	ABB T	TMW C2		TMW T			KMC	KMC C1 C2					
SA Option 40				C1							KMC	KMC C1				KMC	KMC LL C1 K

Key	
	Construction Phase
	Operation Phase
	Construction and Operation
ABB	Akeragh, Banna and Barrow Harbour SAC
LRS	Lower River Shannon SAC
SWM	Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA
TMW	Tralee Bay and Magharees Peninsula, West to Cloghane SAC
T	Tralee Bay Complex SPA
D	Dingle Peninsula SPA
KMC	Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC
C1	Castlemaine Harbour SAC
C2	Castlemaine Harbour SPA
K	Killarney National Park SPA
M	Mount Brandon SAC
I	Iveragh Peninsula SPA
N86	N86
N70	N70
LL	Lough Leane
TMW	Tralee Bay and Magharees Peninsula, West to Cloghane SAC
T	Tralee Bay Complex SPA
D	Dingle Peninsula SPA
KMC	Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC

There is also potential for cumulative effects associated with the disruption to recreational amenity Lough Leane as both SA options 30 and 40 have the potential to impact the site during construction. With mitigation measures such as public consultation and development of construction environmental management plans, effects are considered unlikely to be significant.

6.1.2 Cumulative Effects during Operation

The SEA has identified that, at a plan level, there is potential for cumulative effects during the operational phase of the SA Preferred Approach on Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC given that SAH-148, 170 and SA options 30, 31 and 40 all have the potential for hydrological changes and water table impacts to the site. Option SAH-148 involves an

increase in groundwater abstraction from an aquifer that is within and hydrologically linked to the SAC. Options SAH-170 and SA options 30, 31 and 40 include an increased or new surface water abstraction from waterbodies within and hydrologically linked to the designated site. See Figure 6.1 for the Preferred Approach abstractions in SAH. All of these abstractions could potentially lead to changes in water table/availability and hydrological changes during operation that could impact QI species and habitats. The impacts on the European designations are provided in the NIS and also summarised in chapter 9 of this review. The NIS concuded that with general mitgation measures (section 6.3.3 of the NIS) and hydrogeological modelling, there will be no adverse cumulative effects on the integrity of Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC. Modelling of the impact of proposed abstractions would consider impact during drought conditions and will consider the potential increased frequency of the droughts due to the effects of climate change.

The potential for cumulative effects on groundwater bodies has been considered in a hydrogeological assessment of the groundwater abstractions commissioned by Irish Water (Irish Water, 2022). This hydrogeological assessment considers the abstraction quantities and proximities and concludes that all of the WFD groundwater bodies (Abbeyfeale, Ardfert, Brandon Head, Ballybunnion, Cahersiveen and Dingle) affected cumulatively by the proposed and existing 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 operational cumulative effects on European designated sites has been considered in the NIS. The NIS concluded that there will be no operational cumulative effects to the sites.

There could also be cumulative effects in terms of carbon emissions 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, increases in carbon emissions can be considered a significant effect, as these increases add cumulatively across all developments and contribute to carbon emissions at a national level. 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 SAH this averages as 126.7 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.

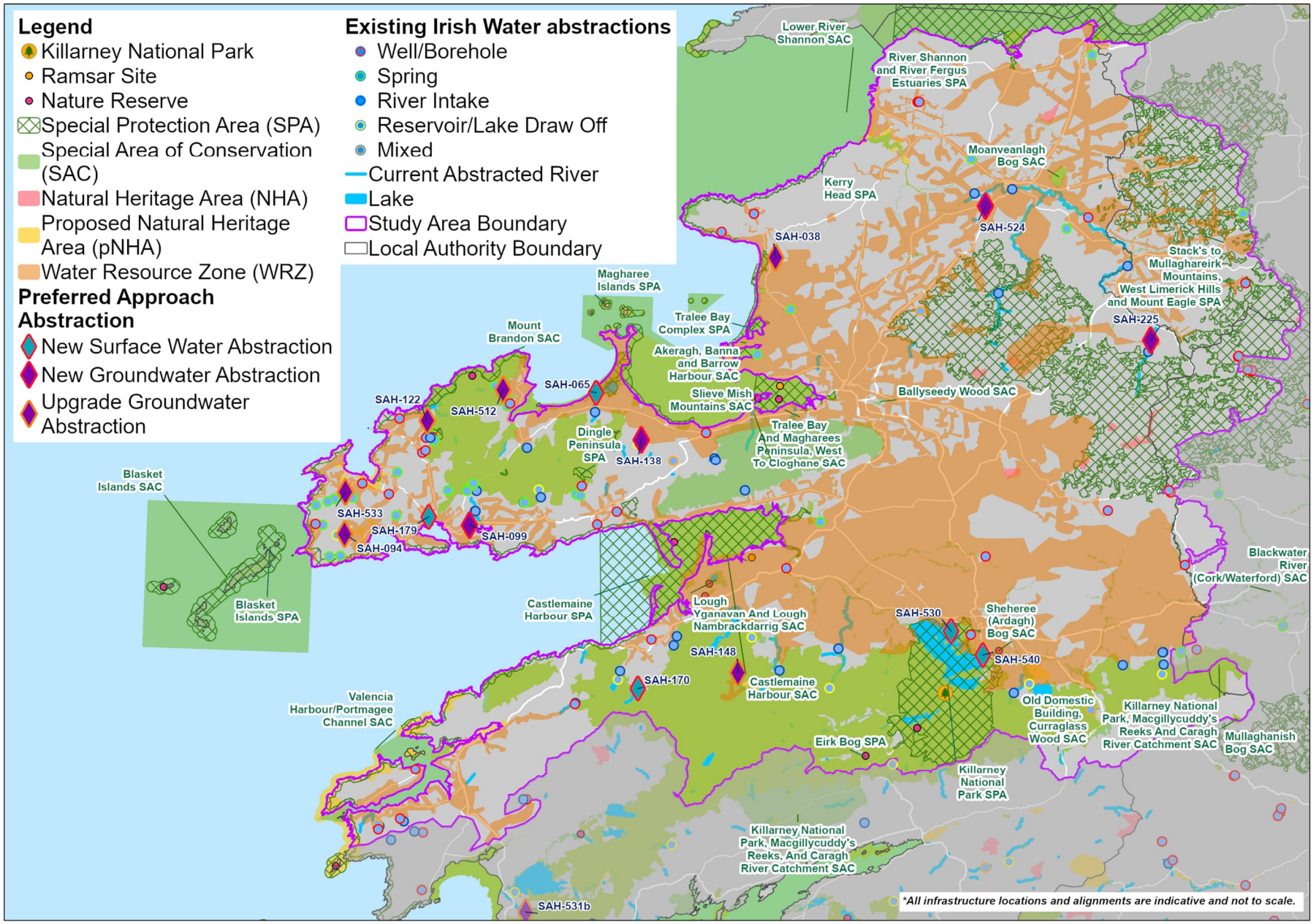

Figure 6.1 SA Preferred Approach Abstractions in SAH

6.2 Cumulative Effects with Other Developments

The SAH Preferred Approach has been assessed alongside other developments that could occur within the plan area. Proposals for other strategic developments within SAH 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. 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 SAH there are a number of regeneration and construction projects in and near Killarney and Listowel and along N70 route. In addition to these, there are other developments that could cause cumulative effects with the SA Preferred Approach. Other developments that were not considered further due to the scale and nature of the developments meaning they are unlikely to have interaction with the SA Preferred Approach. These developments are the Coláiste Íosagáin Campus, Skibbereen Community Hospital, Bandon Water Main and Kinsale Community Hospital.

6.2.1 Cumulative Effects during Construction

The projects near or in Baile na Fheirtéaraigh, Killarney and Listowel and along N22, N70 and N86 roads could result in cumulative effects with the SA Preferred Approach if they were to be constructed at the same time (represented in Table 6.2 as ‘BF’, ‘Ki’, ‘L’, ‘N22’, ‘N70’ and ‘N86’, respectively). Potential effects could include increased traffic and noise to the residential and commercial properties in Baile na Fheirtéaraigh, Killarney and Limerick or along the three roads. 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. 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.

There is potential for cumulative effects from mortality, disturbance, spread of invasive non-native species and pollution impacts on the Tralee Bay and Magharees Peninsula, West to Cloghane SAC and pollution and disturbance impacts on Tralee Bay Complex SPA if the construction phase of N86 Tralee to An Daingean and projects in or near Tralee are concurrent with the SA Preferred Approach (identified as ‘TMW’ and ‘T’ in Table 6.2, respectively). Projects in and near Tralee include Phase 1 Tralee Town Centre, Positioning Tralee as an Economic Driver, Tralee Flood Relief Scheme, Tralee Northern Relief Road and Tralee Wastewater Network. There is potential for cumulative effects from pollution on Akeragh, Banna and Barrow Harbour SAC and Dingle Peninsula SPA if the construction phase of N86 Tralee to An Daingean is concurrent with the SA Preferred Approach (these are identified as ‘ABB’ and ‘D’ in Table 6.2, respectively). If construction of the SA Preferred Approach is concurrent with Cahersiveen Town Centre Regeneration Project, South Kerry Greenway and Valentia Trans-Atlantic Cable Station works, there is potential for pollution impacts to Valencia Harbour/Portmagee Channel SAC (represented in Table 6.2 as ‘V’). Similarly, if construction of the SA Preferred Approach is concurrent with Cahersiveen Town Centre Regeneration Project, South Kerry Greenway and Valentia Trans-Atlantic Cable Station and N70 Glanbehy Bridge Road Project works, there is potential for pollution impacts to Iveragh Peninsula SPA (represented in Table 6.2 as ‘I’).

There is potential for cumulative effects from disturbance and pollution impacts on the Killarney National Park SPA and Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC if the construction phase of the South Kerry Greenway (SAC only), N70 Glanbehy Bridge Road Project (SAC only), N22 Road Improvement Scheme (both) and projects in or near Killarney (both), including Destination Killarney and Smarter Travel Killarney, are concurrent with the SA Preferred Approach (these are represented in Table 6.2 as 'K' and 'KMC, respectively). There is potential for cumulative effects from pollution on Castlemaine Harbour SAC and SPA if the construction phase of the N22 Road Improvement Scheme (both), N86 Tralee to An Daingean (both), South Kerry Greenway (both), N70 projects (both) and projects in or near Killarney (SAC only) are concurrent with the SA Preferred Approach (these are identified as 'C1' and 'C2' in Table 6.2, respectively). Lastly, there is potential for cumulative effects from habitat loss, pollution, spread of invasive non-native species and disturbance impacts on the Lower River Shannon SAC if the construction phase of N69 Listowel Bypass is concurrent with the SA Preferred Approach (identified as 'LRS' in Table 6.2). With the implementation of mitigation measures as outlined in section 6.3.3 of the NIS, there will be no adverse cumulative effects on the integrity of any of the SACs or SPAs mentioned.

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

Preferred Approach	SAH-179	SAH-122	SAH-099	SAH-173	SAH-038	SAH-138	SAH-225	SAH-065	SAH-094	SAH-169	SAH-148	SAH-170	SA Option 24	SA Option 12	SA Option 33	SA Option 31	SA Option 30	SA Option 40
Baile na Fheirtéaraigh Development															BF			
Cahersiveen Town Centre Regeneration Project												I				V / I		
Destination Killarney				C1							KMC	KMC C1				KMC	KMC C1 Ki K	KMC C1 K
Smarter Travel Killarney				C1							KMC	KMC C1				KMC	KMC C1 Ki K	KMC C1 K
Great Southern Greenway Limerick																		
N69 Listowel Bypass							LRS						LRS L					
N22 Road Improvement Scheme											KMC					KMC	KMC C1 Ki K N22	
N70 Glanbehy Bridge Road Project				C1 C2		C2					KMC	KMC C1 Ki K N70				KMC I	KMC C1 C2	KMC C1
				C1 C2		C2						C1 C2					C1 C2	C1

Preferred Approach	SAH-179	SAH-122	SAH-099	SAH-173	SAH-038	SAH-138	SAH-225	SAH-065	SAH-094	SAH-169	SAH-148	SAH-170	SA Option 24	SA Option 12	SA Option 33	SA Option 31	SA Option 30	SA Option 40
N70 Milltown Bypass Project												N70						
N86 Tralee to An Daingean	N86		N86	C1 C2 D N86	ABB T	TMW C2		TMW T D				C C2			D		C1 C2 TMW T ABB	C1
Phase 1 Tralee Town Centre - Rock Street, Russell Street and Bridge Street					T	TMW		TMW T										
Positioning Tralee as an Economic Driver					T	TMW		TMW T										
Tralee Flood Relief Scheme					T	TMW		TMW T										
Tralee Northern Relief Road					T	TMW		TMW T										
Tralee Wastewater Network					T	TMW		TMW T										
Shannon Foynes Port Company - Vision 2041																		
Shannon Integrated Framework Plan																		
South Kerry Greenway				C1		C2					KMC	KMC C1				KMC	KMC C1	KMC

Preferred Approach	SAH-179	SAH-122	SAH-099	SAH-173	SAH-038	SAH-138	SAH-225	SAH-065	SAH-094	SAH-169	SAH-148	SAH-170	SA Option 24	SA Option 12	SA Option 33	SA Option 31	SA Option 30	SA Option 40
				C2								C2 I				V I	C2	C1
Valentia Trans-Atlantic Cable Station												I				V I		

Key	
	Construction Phase
	Operation Phase
	Construction and Operation
LRS	Lower River Shannon SAC
ABB	Akeragh, Banna and Barrow Harbour SAC
T	Tralee Bay Complex SPA
TMW	Tralee Bay and Magharees Peninsula, West to Cloghane SAC
D	Dingle Peninsula SPA
V	Valencia Harbour/Portmagee Channel SAC
I	Iveragh Peninsula SPA
K	Killarney National Park SPA
KMC	Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC
C1	Castlemaine Harbour SAC
C2	Castlemaine Harbour SPA
N22	N22
N70	N70
N86	N86
BF	Baile na Fheirtéaraigh
Ki	Killarney
L	Listowel

6.2.2 Cumulative Effects during Operation

There could be cumulative effects on Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC and Tralee Bay and Magharees Peninsula, West to Cloghane SAC and Tralee Bay Complex SPA from habitat degradation and water table impacts if operation of the SAH Preferred Approach is concurrent with N22 Road Improvement Scheme, N70 Glanbehy Bridge Road, South Kerry Greenway and projects in or near Killarney and N69 Listowel Bypass and projects in or near Tralee, respectively. These are represented in Table 6.2 as ‘KMC’, and ‘TMW’ and ‘T’, respectively. If the operation of SA Preferred Approach is also concurrent with N69 Listowel Bypass project, there is potential for cumulative effects on Lower River Shannon SAC from habitat degradation and water table impacts. With the implementation of standard good practice measures there will be no adverse effects on the integrity of these European sites.

The plan level assessment indicates that there could be cumulative effects in terms of carbon emissions, as all developments will generate carbon emissions from operation whether this is from routine

maintenance activities to water treatment and the energy required for moving water. As outlined in section 6.1.2, any increase in carbon can be considered a significant effect, as these increases add cumulatively across all developments and contribute to the carbon emissions at a national level. The same mitigation measures suggested for the SAH 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 SAH and a range of options and SA approaches have been considered and assessed, including a 'Do Minimum' approach.

Key beneficial impacts assessed include moderate beneficial impacts for options associated with increasing resilience and the quality of water supply for local communities; and the subsequent benefits of this for public health. There are also moderate long-term beneficial impacts associated with the decommissioning of WTPs for landscape and visual amenity.

Key potential adverse impacts identified at plan level include:

- Moderate adverse effects during construction for options SAH-179, SA option 24 and SA option 30 due to potential short-term adverse impacts to public health and/or quality of life from dust, noise and/traffic in the urban and rural areas and amenity area loss/loss of access to amenity areas;
- Moderate adverse effects during construction due to SA options 24, 33 and 40 being located within or being hydrologically linked to European and nationally designated sites. This has the potential to cause short-term disturbance and/or pollution which could affect QI species and hydrologically connected habitats;
- Moderate adverse effects during operation due to options SAH-038, 065, 148, 170, 225 and SA options 12, 30 and 31 being located within or being hydrologically linked to European and nationally designated sites. This has the potential to cause hydrological changes that could impact aquatic QI species or habitats as a result of the associated abstractions. SA options 30 and 40 specifically could result in impacts around Lough Leane for slender naiad (*Najas flexilis*) and Killarney shad (*Alosa fallax killarnensis*) through a reduction or change in water levels/flows (water table/availability) and or changes in water quality (habitat degradation/hydrological changes).
- Major adverse effects to the water environment during operation due to high level groundwater assessments indicating the potential for long term abstraction impacts for SA options 12, 33, and options SAH-122, 038 and 148. However, further studies are required to understand impacts and develop mitigation;
- Moderate adverse effects during construction of SA option 30 associated with cultural heritage as the option is located in a known archaeological site; and
- Moderate adverse effects to environmental climate change resilience for options SAH-170 and 179 due to the requirement of new surface water abstractions, and option SAH-225 due to the requirement of a new groundwater abstraction. Options SAH-038, 094, 122, 148 and SA option 12 and 33 also have potential for moderate adverse effects due to the level of increase in their existing groundwater abstractions.

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 SAH 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 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 Minor Adverse to Moderate Beneficial The PA is expected to improve overall drinking water quality reliability and sustainability through the decommissioning of failing WTPs and the replacement of abstractions vulnerable to drought conditions. The PA is expected to reduce risks to access of good quality water supply across different conditions and over the plan period.	Standard good construction practice and consultation Further assessment of risks to water quality and consideration of catchment management initiatives to improve water quality and reduce treatment cost. For example, working with landowners and managers on practices to reduce levels of sediment and pollution from entering water courses through run off.	• 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 amenities are impeded
2. Protect and enhance biodiversity and	C Minor Adverse to Moderate Adverse O Neutral to Moderate Adverse	Routing/siting to avoid impacts. Standard good construction practice and specific measures as	• Temporary and permanent habitats lost vs habitats created/enhanced	• Monitor construction activities to ensure compliance

SEA Objectives	SA Preferred Approach (PA) (SA Approach 1) Residual Effects Including Mitigation C – Construction (Short Term) O – Operational (Long Term)	Mitigation	Monitoring	
			Study Area Level	Scheme Level
contribute to resilient ecosystems	Impacts from construction works for pipelines and service reservoirs on biodiversity. These can be minimised through careful routing and siting. Potential for construction and operational impacts on European and National designated sites.	identified in the NIS of the Framework Plan. Design to meet no net loss biodiversity or achieve enhancement, where possible, on or off site and in line with the Biodiversity Action Plan objectives. Further hydrological/hydrogeological assessments to determine impacts on designated sites. Operating rules to limit impacts on European and National sites.	• Site condition and population data for QI of European and National designated sites.	
3. To protect landscapes, townscapes and visual amenity	C Neutral to Moderate Adverse O Moderate Beneficial to Minor Adverse 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 in sensitive landscapes • Land use/landscape features re-established for schemes over appropriate period – areas/km successfully restored to meet requirements	• Duration of construction works • Number of complaints received regarding visual impact of construction works

SEA Objectives	SA Preferred Approach (PA) (SA Approach 1) Residual Effects Including Mitigation C – Construction (Short Term) O – Operational (Long Term)	Mitigation	Monitoring	
			Study Area Level	Scheme Level
4. Protect and where appropriate enhance, built and natural assets and reduce waste	C Neutral to Moderate Adverse O Neutral to Moderate Adverse New resources required for construction works, including extensive lengths of pipeline, service reservoirs and new/upgraded WTPs. Ongoing maintenance requirements.	Materials management to be integrated into design to optimise use of existing resources and minimise waste from construction and operation.	• Loss of greenfield land, including agricultural, forestry or other land uses • Disruptions to strategic infrastructure/services • Use of waste management plans • Volume of drinking water treatment residuals sent to landfill	• Construction wastes sent to landfill
5. Reduce greenhouse gas emissions	C Neutral to Major Adverse O Neutral to Major 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 kgsCO_2equic/ML

SEA Objectives	SA Preferred Approach (PA) (SA Approach 1) Residual Effects Including Mitigation C – Construction (Short Term) O – Operational (Long Term)	Mitigation	Monitoring	
			Study Area Level	Scheme Level
6. Contribute to environmental climate change resilience	C Neutral to Moderate Adverse O Neutral to Moderate Adverse 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 SAH-122, SAH-038 and SAH-148 require further assessment to understand their sustainability in the longer term.	Consider how operation can further reduce climate change pressure on at risk sources and associated designations, particularly for SAH-122, SAH-038 and SAH-148. Sustainability review of sources taking account of groundwater and surface water interconnections.	• WFD waterbody status objectives at risk and designated site condition status • Frequency of drought orders requiring change to normal abstractions/ compensation releases	• None identified
7. Protect and improve surface water and groundwater status	C Neutral O Neutral to Major Adverse Generally, new/increased abstractions are limited to allowable limits and have a low risk of adverse effect on WFD waterbody status objectives.	Further investigation to consider effects on groundwater abstraction on the surface water environment.	• WFD waterbody status objectives at risk	• Pollution incidents during construction

SEA Objectives	SA Preferred Approach (PA) (SA Approach 1) Residual Effects Including Mitigation C – Construction (Short Term) O – Operational (Long Term)	Mitigation	Monitoring	
			Study Area Level	Scheme Level
8. Avoid flood risk	C Neutral to Minor Adverse O Neutral Potential loss of flood plain increasing flood risk from construction and location of above ground structures for SAH-179 and SA option 30, 31 and 40.	Siting and design of schemes to take account of flood risk and design for flood risk resilience.	• Number of options at risk of flooding at each AEP level	• Lost time to flooding • Lost time to power supply interruptions
9. Protect and where appropriate, enhance cultural heritage assets	C Neutral to Moderate 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	C Neutral to Minor Adverse O Neutral	Standard good practice to conserve and reinstate soils.	• Soil Management Plans implemented	• Total volume of soil removed or reused on site

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
function of soils	Potential for loss and damage to valuable soils during construction but impacts to geological assets are expected to be avoided.		• Volume of contaminated land restored, or soils removed	

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 SAH 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 SAH abstractions have good quantitative status (Irish Water, 2022); therefore, the likelihood of affecting their WFD objectives in terms of quantitative status is low. In addition, the majority of GWB's are currently 'not at risk'. 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 SAH, 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 several SACs and SPAs. The potential effects include:

- Habitat loss, pollution, spread of invasive non-native species, disturbance, habitat degradation and water table/availability on the Lower River Shannon SAC ;
- Pollution impacts on Akeragh, Banna and Barrow Harbour SAC;
- Disturbance, pollution, mortality, habitat degradation, habitat loss and water table/availability impacts on Tralee Bay Complex SPA;
- Habitat loss, mortality, disturbance, spread of invasive non-native species, pollution, habitat degradation and water table/availability impacts on Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC;
- Pollution and disturbance impacts on Iveragh Peninsula SPA;
- Pollution impacts on Valencia Harbour/Portmagee Channel SAC;
- Habitat loss, mortality, disturbance, spread of invasive non-native species, pollution, habitat degradation and water table/availability impacts on Tralee Bay and Magharees Peninsula, West to Cloghane SAC;
- Habitat loss, mortality, pollution and disturbance impacts on Dingle Peninsula SPA;
- Habitat loss, mortality, disturbance, spread of invasive non-native species and pollution impacts on Castlemaine Harbour SAC;
- Pollution impacts on Castlemaine Harbour SPA ; and
- Habitat loss, disturbance and pollution impacts on Killarney National Park SPA.

The assessment concluded that with the mitigation identified there will be no adverse effects on the integrity of the European sites in-combination with other plans or projects.

Potential in-combination effects between preferred options were identified for several SACs and SPAs. The potential impacts include:

- Habitat loss, mortality, spread of invasive non-native species, disturbance and pollution impacts on Lower River Shannon SAC;
- Disturbance impacts on Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA;
- Spread of invasive non-native species and pollution impacts on Mount Brandon SAC;
- Pollution impacts on Akeragh, Banna and Barrow Harbour SAC;
- Habitat loss, mortality, spread of invasive non-native species, disturbance, pollution, habitat degradation and water table/availability impacts on Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC;
- Habitat loss, disturbance, and pollution impacts on Tralee Bay Complex SPA;
- Disturbance impacts on Iveragh Peninsula SPA;
- Spread of invasive non-native species, disturbance and pollution impacts on Tralee Bay and Magharees Peninsula, West to Cloghane SAC;
- Disturbance and pollution impacts on Dingle Peninsula SPA;
- Pollution impacts on Castlemaine Harbour SAC; and
- Habitat loss, disturbance and pollution impacts on Killarney National Park SPA.

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 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 South West Region options and cumulative effects.

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Appendix A Fine Screening Summaries

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

Table A.1 Fine Screening Summary of Surface Water Option in SAH

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
SAH-001	New SW abstraction from Muckross Lake treat at Lough Guitane WTP									3	0	-30
SAH-002	New SW abstraction from the Lower Leane catchment treat at Lough Guitane WTP									2	0	-28
SAH-003	New SW abstraction from Lough Caragh and new WTP onsite									2	0	-26

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
SAH-004	New SW abstraction from River Flesk treat at Lough Guitane WTP									1	0	-25
SAH-007a	New SW source required for Central Regional									1	0	-19
SAH-011	Raise Lough level to increase storage volume									3	0	-25
SAH-021	New SW abstraction from Lough Caragh and new WTP									2	0	-24
SAH-023a	New SW source required for Central Regional									1	0	-22
SAH-026	Conjunctive Use - New source (from one of the bigger lakes) to supplement both Mid Kerry and Lough Guitane									1	0	-21
SAH-026a	Conjunctive Use - New source (from one of the bigger lakes) to									1	0	-22

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
	supplement both Mid Kerry and Lough Guitane											
SAH-032	New SW abstraction from An Geal Lough and upgrade An Daingean WTP									1	0	-21
SAH-036a	New SW source required for Central Regional									1	0	-21
SAH-062	Supplement Cahersiveen from River Inny									0	0	-16
SAH-065	New SW abstraction from Lough Gill and upgrade Castlegregory WTP									4	0	-23
SAH-071a	Supply Maulin. New source required. Inny option has the largest allowable abstraction									1	0	-22
SAH-105	Increase SW abstraction from Clyadh River and upgrade									0	0	-10

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
	Brosna/Knocknagoshel WTP											
SAH-120	New SW abstraction from Fheothanach Stream (Disused source) and upgrade WTP									0	0	-15
SAH-174	Lower intake for increased abstraction									2	0	-16
SAH-170	New abstraction from Coomasaharn Lake, upgrade Mountain Stage WTP to treat									1	0	-16
SAH-171	New SW abstraction from the Lower Leane catchment for full demand and treat at Lough Guitane WTP									3	0	-24
SAH-175	New abstraction from Muckross Lake and WTP at abstraction to feed									4	0	-31

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
	deficit in Central Regional and Mid Kerry											
SAH-176	New abstraction from Muckross Lake and WTP at abstraction to feed deficit in Central Regional and Mid Kerry									4	0	-31
SAH-177	New abstraction from theLower Leane catchment and WTP at abstraction to feed deficit in Central Regional and Mid Kerry									3	0	-29
SAH-178	New abstraction from theLower Leane catchment and WTP at abstraction to feed deficit in Central Regional and Mid Kerry									3	0	-29
SAH-179	New SW abstraction from Milltown River and WTP									0	0	-22

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
SAH-181	Increase abstraction from Lough Currane and supply Cahersiveen and Emlaghpeasta									0	0	-15
SAH-182	Rationalise Cahersiveen to Waterville, with Lough Currance abstraction increased to meet deficit									0	0	-15
SAH-183	New SW abstraction from Ferta River									0	0	-21
SAH-188	New abstraction and WTP at Lough Caragh to meet deficit in Mid Kerry, Mountain Stage and Central Regional									1	0	-24
SAH-189	New abstraction and WTP at Lough Caragh to meet deficit in Mid Kerry, Mountain Stage and Central Regional									1	0	-24

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SAH-190	New abstraction and WTP at Lough Caragh to meet deficit in Mid Kerry, Mountain Stage and Central Regional									1	0	-24
SAH-194	New Lower Leane catchment abstraction for Central Regional and transfers to Listowel and Abbeyfeale									3	0	-28
SAH-195	New Lower Leane catchment abstraction for Central Regional and transfers to Listowel and Abbeyfeale									3	0	-28
SAH-196	New Lower Leane catchment abstraction for Central Regional and transfers to Listowel and Abbeyfeale									3	0	-28

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
SAH-197	New Lower Leane Regional Scheme with new WTP at Lough Leane									4	0	-31
SAH-198	New Lower Leane Regional Scheme with new WTP at Lough Leane									4	0	-31
SAH-199	New Lower Leane Regional Scheme with new WTP at Lough Leane									4	0	-31
SAH-201	New Lower Leane Regional Scheme with new WTP at Lough Leane									4	0	-31
SAH-202	New Lower Leane Regional Scheme with new WTP at Lough Leane									4	0	-31

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
SAH-203	New Lower Leane Regional Scheme with new WTP at Lough Leane									4	0	-31
SAH-204	Rationalise Emlaghpeasta to Waterville, with Lough Currance abstraction increased to meet deficit									0	0	-15
SAH-209	New SW source required for Central Regional									1	0	-19
SAH-211	New SW source required for Central Regional									1	0	-22
SAH-220	New SW source required for Central Regional									1	0	-22
SAH-221	New SW abstraction from the Lower Leane catchment for full demand and new WTP									5	0	-30

Table A.2 Fine Screening Summary of Surface Water and Interconnection Options in SAH

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
SAH-023	Augment part of Mid-Kerry to Central Regional scheme (schemes close to Killarney)									1	0	-22
SAH-219	Augment part of Mid-Kerry to Central Regional scheme (schemes close to Killarney)									1	0	-22

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

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
SAH-005	New GW abstraction in Karstic region and new WTP									1	0	-20
SAH-014	New GW abstraction close to Tralee									0	0	-16
SAH-020	Increase GW abstraction at Poulgorm Spring and Upgrade Knocknavota WTP - will require new boreholes in the region of the spring									1	0	-15
SAH-027	Increase GW abstraction (partial deficit) from Mannings Spring and upgrade An Baile Mor WTP									1	0	-16
SAH-034	Recommission Culligh spring in Dingle- currently abandoned but could be									0	0	-14

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
	brought back into production											
SAH-039	Increase GW abstraction from Slugaire Well (local important aquifer) and upgrade Ballyheigue WTP									1	0	-16
SAH-044	Potential for new GW abstraction at Larig Reservoir, Ballyheigue Reservoir site									1	0	-14
SAH-059	Increase GW abstraction at BH - Conversion of existing trial to production wells									1	0	-19
SAH-060	New GW abstraction at WTP - Conversion of existing trial to production wells									1	0	-14

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
SAH-067	Increase GW abstraction from Portmagee BH (poorly productive aquifer) and upgrade Portmagee WTP									1	0	-15
SAH-068	Increase GW abstraction from Maulin Well (local important aquifer) and upgrade Málainn WTP									1	0	-14
SAH-084	Increase GW abstraction from Tobar Bhreandáin WTP BH (local important aquifer) and upgrade Tobar Bhreandáin WTP									1	0	-14
SAH-085	Abandon An Ghraig Cloichear WTP,Tir Abhainn Thoir WTP and Leataoibh WTP and feed from Tobar Bhrendain WTP, An Riasc WTP and Cill Maoilcheadair WTP									1	0	-14

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
SAH-094	Increase GW abstraction from Ceann Trá WTP BHs (Local important aquifer) and upgrade Ceann Tra WTP									0	0	-12
SAH-099	New GW abstraction in Dingle area to serve the customers currently served by An Mhín Aird Gualainn WTP									0	0	-13
SAH-102a	Increase GW abstraction and supply An Mhin Aird									1	0	-16
SAH-106	New GW abstraction - Karstic Geology - New WTP required									0	0	-16
SAH-107	Increase GW abstraction at BH. (Currently 5 springs and 2 BHs) Locally Important Aquifer - Bedrock which is									1	0	-14

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
	Moderately Productive only in Local Zones											
SAH-108	Increase GW abstraction at An Clochan. Ce Brennan and Clochan are connected - Could feed from either depending on where yield is									1	0	-14
SAH-108a	Increase GW abstraction at An Clochan.Ce Brennan and Clochan are connected - Could feed from either depending on where yield is									1	0	-14
SAH-109	Increase GW abstraction from Awnaskirtaun Spring and upgrade existing Rathmore WTP									1	0	-10

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SAH-112	Increase abstraction from Cloghaun Spring and upgrade An Fheothanach WTP									1	0	-11
SAH-113	Increase GW abstraction from BH at WTP (local important aquifer) and upgrade An Mhuirioch/ Baile Breach WTP									1	0	-10
SAH-118	Increase GW abstraction from An Fheothanach WTP BH (local important aquifer) and upgrade An Fheothanach WTP									1	0	-9
SAH-123	Increase GW abstraction with 1 new BH. (Currently 1 Spring source)									1	0	-12
SAH-138	New GW abstraction from Aughacasla BHs and upgrade existing Aughacasla WTP to									0	0	-8

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
	supply deficit. Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones											
SAH-140	Increase GW abstraction at BH. (1 Spring) Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones									2	0	-14
SAH-148	Increase GW abstraction from source Lyranes BH (local important aquifer) and upgrade Lyranes WTP									1	0	-13
SAH-158	New GW abstraction - abstraction point TBC. Poorly productive aquifer									0	0	-18
SAH-161a	New GW source and rationalise Abbeyfeale									0	0	-20

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
SAH-162a	New GW source and Interconnect to Abbeyfeale									0	0	-20
SAH-167	New GW from Gravel belt between Abbeyfeale and Listowel									0	0	-18
SAH-172	New GW abstraction from Ballybunnion GWB									0	0	-16
SAH-186	Increase GW abstraction from Tobar Bhreandáin WTP BH and supply Dun Chaoin									1	0	-12
SAH-187	Increase GW abstraction from Tobar Bhreandáin WTP BH (local important aquifer) and upgrade Tobar Bhreandáin WTP									1	0	-12
SAH-191	New GW abstraction in the limestones									1	0	-20

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
SAH-192	New GW abstraction in the sand and gravel aquifer									1	0	-16
SAH-222	New boreholes at Dun Chaoin and coonect to Tobar Bhreandain									1	0	-14
SAH-223	New boreholes at Dun Chaoin and coonect to Tobar Bhreandain									1	0	-14
SAH-224	New GW as interim (likely to only provide partial deficit)									0	0	-17
SAH-225	Develop trial well at Brosna raw waer pump house, upgrade WTP and undertake source protection works									0	0	-13

Table A.4 Fine Screening Summary of Groundwater and Interconnection Options in SAH

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
SAH-103	Reduce usage at An Mhin Arid Puc and supplement from Annascaul WSS									1	0	-16
SAH-103a	Supply An Mhin Aird									1	0	-16
SAH-156a	Increase GW abstraction at BH. (Currently 5 springs and 2 BHs) and Rationalise Lios Cearnaigh PWS									1	0	-14
SAH-162	Interconnect Abbeyfeale and Listowel Regional WRZs (approx. distance 1km, new watermains and network upgrades required) for increased resilience and supply deficit									0	0	-20

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
SAH-184	Interconnect Ceann Tra and Dun Caoin - local increase at both WRZs required									1	0	-11
SAH-185	Interconnect Ceann Tra and Dun Caoin - local increase at both WRZs required									0	0	-10

Table A.5 Fine Screening Summary of Groundwater and Rationalisation Options in SAH

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
SAH-102	Rationalise An Mhin Aird Puc WTP and feed from Annascaul WSS									1	0	-16
SAH-161	Rationalise Abbeyfeale WRZ to Listowel Regional WRZ (approx. distance 1km, new watermains and network upgrades required)									0	0	-20

Table A.6 Fine Screening Summary of Groundwater/Surface Water Conjunctive Use Options in SAH

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
SAH-180	Increase SW abstraction from Clyadh River and upgrade Brosna/Knocknagoshel WTP during times of high flow. Develop new GW in Karstic region with treatment on site for times of low flow									0	0	-16

Table A.7 Fine Screening Summary of Impoundment Use Options in SAH

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
SAH-016	Construction of impounded storage at River Smearlagh to supply Abbeyfeale and Listowel									3	2	-22
SAH-166	Construction of impounded storage at River Smearlagh to supply Abbeyfeale and Listowel									3	2	-22

Table A.8 Fine Screening Summary of Interconnection Use Options in SAH

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
SAH-061	Connect Cahersiveen and Waterville for resilience purposes									0	0	-11
SAH-061a	Connect Cahersiveen and Waterville for resilience purposes									0	0	-11
SAH-064	Supply deficit from Central Regional WRZ via Aughacasla									1	0	-21
SAH-064a	New SW source required for Central Regional, includes rationalisation of Camp WTP									1	0	-21
SAH-071	Augment Maulin from Waterville									1	0	-22
SAH-110a	New SW source required for Central Regional									1	0	-21

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
SAH-153a	New SW source required for Central Regional									1	0	-21
SAH-155	Reduce usage at Inch WTP and supply from Annascaul WSS									1	0	-16
SAH-155a	Increase GW source at Spring and Supply Inch									1	0	-16
SAH-064b	Supply deficit from Central Regional WRZ via Aughacasla									1	0	-21
SAH-212	Supply deficit from Central Regional WRZ via Aughacasla									1	0	-22
SAH-213	New SW source required for Central Regional, includes rationalisation of Camp WTP									1	0	-22
SAH-214	Supply deficit from Central Regional WRZ via Aughacasla									1	0	-22

Table A.9 Fine Screening Summary of Rationalisation Options in SAH

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
SAH-007	Abandon Camp and Camp Lower WTP and supply from Central Regional									1	0	-17
SAH-036	Rationalise both Glenderry WTP and Ballyheigue WTP and feed from Central Regional									1	0	-21
SAH-038	Increase Ballyheigue abstraction. Abandon existing BH at Glenderry Well and rationalise WTP									1	0	-17
SAH-110	Rationalise Rathmore WTP and connect to Central Regional WRZ									1	0	-21
SAH-121	Abandon Baile na bhFionnúrach WTP and									1	0	-9

Option Reference	Name	Environmental								Total -3 Scores	Environmental Scoring	
		Population, Health, Economy and Recreation	Water Environment: Quality and Resources	Biodiversity, Flora and Fauna	Material Assets	Landscape and Visual	Climate Change	Culture, Heritage and Archaeology	Geology and Soils		Positive Score - Potential Beneficial Effects	Negative Scores - Potential Adverse Effects
	connect to An Fheothanach											
SAH-122	Amalgamate all sources in WRZ to one WTP and rationalise smaller WTP - Upgrade an Fheothanach WTP									1	0	-9
SAH-145	Increase GW abstraction from Annascaul WTP BH1 (local important aquifer) and upgrade Annascaul WTP. Rationalisation of Ballintermon WTP and feed customers from Annascaul WSS									1	0	-10
SAH-153	Rationalise Inch WTP and feed from Central Regional									1	0	-21
SAH-156	No deficit in WRZ - Small WRZ only 10properties -									1	0	-14

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
	Abandon and connect to An Clochan - 1km mains required											
SAH-208	Abandon Camp and Camp Lower WTP and supply from Central Regional									1	0	-19
SAH-210	Rationalise both Glenderry WTP and Ballyheigue WTP and feed from Central Regional									1	0	-22
SAH-215	Rationalise Rathmore WTP and connect to Central Regional WRZ									1	0	-22
SAH-217	Rationalise Inch WTP and feed from Central Regional									1	0	-22

Table A.10 Fine Screening Summary of WTP Upgrade Options in SAH

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
SAH-173	WTP Upgrade – No deficit									0	0	-5
SAH-169	No Deficit – WTP Upgrade									0	0	-5

Appendix B SA Approaches for SAH

Note: SA Options are also referred to as Group Options

WRZ	Preferred Approach - SA Approach 4		Least Cost - SA Approach 4		Best Environmental - SA Approach 5	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
1900SC0021: Abbeyfeale Water Supply	SAH-162 Interconnect Abbeyfeale and Listowel Regional WRZs	24	SAH-162 Interconnect Abbeyfeale and Listowel Regional WRZs	24	SAH-162 Interconnect Abbeyfeale and Listowel Regional WRZs	24
1300SC0004: An Baile Mor / An Daingean	SAH-179 New SW abstraction	-	SAH-179 New SW abstraction	-	SAH-203 New Lower Leane Regional Scheme with new WTP	36
1300SC0008: An Clochan	SAH-108 Increase GW abstraction	12	SAH-108 Increase GW abstraction	12	SAH-107 Increase GW abstraction	-
1300SC0007: An Fheothanach / An Mhuirioch/ Baile Breach	SAH-122 Amalgamate all sources in WRZ to one TWP and rationalise smaller ETP – upgrade an Fheothanach WTP	-	SAH-122 Amalgamate all sources in WRZ to one TWP and rationalise smaller ETP – upgrade an Fheothanach WTP	-	SAH-122 Amalgamate all sources in WRZ to one TWP and rationalise smaller ETP – upgrade an Fheothanach WTP	-
1300SC0003: An Mhin Aird	SAH-099 New GW abstraction	-	SAH-099 New GW abstraction	-	SAH-202 New Lower Leane Regional Scheme with new WTP	36
1300SC0002: Annascaul / Ballintermon	SAH-173 WTP upgrade	-	SAH-173 WTP upgrade	-	SAH-536 New Lower Leane Regional Scheme with new WTP	36

WRZ	Preferred Approach - SA Approach 4		Least Cost - SA Approach 4		Best Environmental - SA Approach 5	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
1300SC0010: Ardfert North/ Glenderry Ballyheigue WRZ	SAH-038 Increase Ballyheige abstraction, abandon existing BH at Glenderry Well and rationalise WTP	-	SAH-038 Increase Ballyheige abstraction, abandon existing BH at Glenderry Well and rationalise WTP	-	SAH-038 Increase Ballyheige abstraction, abandon existing BH at Glenderry Well and rationalise WTP	-
1300SC0030: Aughacasla	SAH-138 New GW abstraction and upgrade WTP	-	SAH-138 New GW abstraction and upgrade WTP	-	SAH-138 New GW abstraction and upgrade WTP	-
1300SC0005: Baile An Fheirtearaigh / Tir Abhainn Thoir / Cill Maoilcheadair / An Ghraig/Cloichear	SAH-187 Increase GW abstraction and upgrade WTP	33	SAH-187 Increase GW abstraction and upgrade WTP	33	SAH-085 Abandon An Ghraig Cloichear WTP,Tir Abhainn Thoir WTP and Leataoibh WTP and feed from Tobar Bhrendain WTP, An Riasc WTP and Cill Maoilcheadair WTP	-
1300SC0012: Brosna/Knocknagoshel PWSS 016F	SAH-225 Develop trial well at Brosna raw water pump house, upgrade WTP and undertake source protection works	-	SAH-225 Develop trial well at Brosna raw water pump house, upgrade WTP and undertake source protection works	-	SAH-225 Develop trial well at Brosna raw water pump house, upgrade WTP and undertake source protection works	-
1300SC0032: Cahersiveen	SAH-182 Rationalise Cahersiveen to Waterville, with Lough Currance abstraction	31	SAH-182 Rationalise Cahersiveen to Waterville, with Lough Currance abstraction	31	SAH-062 Supplement Cahersiveen from River Inny	-

WRZ	Preferred Approach - SA Approach 4		Least Cost - SA Approach 4		Best Environmental - SA Approach 5	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
1300SC0009: Castlegregory PWSS 024D	SAH-065 New SW abstraction and upgrade WTP	-	SAH-065 New SW abstraction and upgrade WTP	-	SAH-065 New SW abstraction and upgrade WTP	-
1300SC0028: Ce Bhreannain	SAH-108a Increase GW abstraction	12	SAH-108a Increase GW abstraction	12	SAH-140 Increase GW abstraction	-
1300SC0022: Ceann Tra PWS 074D	SAH-094 Increase GW abstraction and upgrade WTP	-	SAH-094 Increase GW abstraction and upgrade WTP	-	SAH-094 Increase GW abstraction and upgrade WTP	-
1300SC0013: Central Regional - Lough Guitane	SAH-177 New abstraction and WTP	30	SAH-177 New abstraction and WTP	30	SAH-197 New Lower Leane Regional Scheme with new WTP	36
1300SC0006: Dun Chaoin PWS 034D	SAH-186 Increase GW abstraction	33	SAH-186 Increase GW abstraction	33	SAH-123 Increase GW abstraction	-
1300SC0016: Emlaghpeasta / Portmagee / Maulin	SAH-204 Rationalise Emlaghpeasta to Waterville, with Lough Currance abstraction increased to meet deficit	31	SAH-204 Rationalise Emlaghpeasta to Waterville, with Lough Currance abstraction increased to meet deficit	31	SAH-068 Increase GW abstraction and upgrade WTP	-
1300SC0026: Lios Cearnaigh PWS 052D	SAH-169 WTP upgrade	-	SAH-169 WTP upgrade	-	SAH-169 WTP upgrade	-

WRZ	Preferred Approach - SA Approach 4		Least Cost - SA Approach 4		Best Environmental - SA Approach 5	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
1300SC0011: Listowel Regional Public Water Supply	SAH-162a New GW source and interconnect	24	SAH-162a New GW source and interconnect	24	SAH-162a New GW source and interconnect	24
1300SC0024: Lyranes 303A	SAH-148 Increase GW abstraction and upgrade WTP	-	SAH-148 Increase GW abstraction and upgrade WTP	-	SAH-148 Increase GW abstraction and upgrade WTP	-
1300SC0015: Mid Kerry	SAH-178 New abstraction and WTP	30	SAH-178 New abstraction and WTP	30	SAH-198 New Lower Leane Regional Scheme with new WTP at Lough Leane	36
1300SC0025: Mountain Stage PWS 062A	SAH-170 New abstraction and WTP upgrade	-	SAH-170 New abstraction and WTP upgrade	-	SAH-199 New Lower Leane Regional Scheme with new WTP at Lough Leane	36
1300SC0031: Rathmore	SAH-215 Rationalise Rathmore WTP and connect Central Regional WRZ	40	SAH-215 Rationalise Rathmore WTP and connect Central Regional WRZ	40	SAH-109 Increase GW abstraction and upgrade WTP	-

WRZ	Quickest Delivery - SA Approach 2		Most Resilient - SA Approach 3		Lowest Carbon - SA Approach 1	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
1900SC0021: Abbeyfeale Water Supply	SAH-162 Interconnect Abbeyfeale and Listowel Regional WRZs	24	SAH-162 Interconnect Abbeyfeale and Listowel Regional WRZs	24	SAH-162 Interconnect Abbeyfeale and Listowel Regional WRZs	24
1300SC0004: An Baile Mor / An Daingean	SAH-179 New SW abstraction	-	SAH-179 New SW abstraction	-	SAH-179 New SW abstraction	-
1300SC0008: An Clochan	SAH-107 Increase GW abstraction	-	SAH-107 Increase GW abstraction	-	SAH-107 Increase GW abstraction	-
1300SC0007: An Fheothanach / An Mhuirioch/ Baile Breach	SAH-122 Amalgamate all sources in WRZ to one TWP and rationalise smaller ETP – upgrade an Fheothanach WTP	-	SAH-122 Amalgamate all sources in WRZ to one TWP and rationalise smaller ETP – upgrade an Fheothanach WTP	-	SAH-122 Amalgamate all sources in WRZ to one TWP and rationalise smaller ETP – upgrade an Fheothanach WTP	-
1300SC0003: An Mhin Aird	SAH-099 New GW abstraction	-	SAH-099 New GW abstraction	-	SAH-099 New GW abstraction	-
1300SC0002: Annascaul / Ballintermon	SAH-173 WTP upgrade	-	SAH-145 Increase GW abstraction from Annascaul WTP BH1 (local important aquifer) and upgrade Annascaul WTP. Rationalisation of Ballintermon WTP and feed customers from Annascaul WSS	-	SAH-173 WTP upgrade	-

WRZ	Quickest Delivery - SA Approach 2		Most Resilient - SA Approach 3		Lowest Carbon - SA Approach 1	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
1300SC0010: Ardfert North/ Glenderry Ballyheigue WRZ	SAH-038 Increase Ballyheige abstraction, abandon existing BH at Glenderry Well and rationalise WTP	-	SAH-038 Increase Ballyheige abstraction, abandon existing BH at Glenderry Well and rationalise WTP	-	SAH-038 Increase Ballyheige abstraction, abandon existing BH at Glenderry Well and rationalise WTP	-
1300SC0030: Aughacasla	SAH-214 Supply deficit from Central Regional WRZ via Aughacasla	39	SAH-138 New GW abstraction and upgrade WTP	-	SAH-138 New GW abstraction and upgrade WTP	-
1300SC0005: Baile An Fheirtearaigh / Tir Abhainn Thoir / Cill Maoilcheadair / An Ghraig/Cloichear	SAH-085 Abandon An Ghraig Cloichear WTP,Tir Abhainn Thoir WTP and Leataoibh WTP and feed from Tobar Bhrendain WTP, An Riasc WTP and Cill Maoilcheadair WTP	-	SAH-187 Increase GW abstraction and upgrade WTP	33	SAH-187 Increase GW abstraction and upgrade WTP	33
1300SC0012: Brosna/Knocknagoshel PWSS 016F	SAH-225 Develop trial well at Brosna raw water pump house, upgrade WTP and undertake source protection works	-	SAH-225 Develop trial well at Brosna raw water pump house, upgrade WTP and undertake source protection works	-	SAH-225 Develop trial well at Brosna raw water pump house, upgrade WTP and undertake source protection works	-
1300SC0032: Cahersiveen	SAH-182 Rationalise Cahersiveen to Waterville, with Lough Currance abstraction	31	SAH-182 Rationalise Cahersiveen to Waterville, with Lough Currance abstraction	31	SAH-182 Rationalise Cahersiveen to Waterville, with Lough Currance abstraction	31

WRZ	Quickest Delivery - SA Approach 2		Most Resilient - SA Approach 3		Lowest Carbon - SA Approach 1	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
1300SC0009: Castlegregory PWSS 024D	SAH-212 Supply deficit from Central Regional WRZ via Aughacasla	39	SAH-065 New SW abstraction and upgrade WTP	-	SAH-065 New SW abstraction and upgrade WTP	-
1300SC0028: Ce Bhreannain	SAH-140 Increase GW abstraction	-	SAH-140 Increase GW abstraction	-	SAH-140 Increase GW abstraction	-
1300SC0022: Ceann Tra PWS 074D	SAH-185 Interconnect Ceann Tra and Dun Caoin	32	SAH-094 Increase GW abstraction and upgrade WTP	-	SAH-094 Increase GW abstraction and upgrade WTP	-
1300SC0013: Central Regional - Lough Guitane	SAH-177 New abstraction and WTP	30	SAH-002 New SW abstraction	-	SAH-177 New abstraction and WTP	30
1300SC0006: Dun Chaoin PWS 034D	SAH-184 Interconnect Ceann Tra and Dun Caoin	32	SAH-186 Increase GW abstraction	33	SAH-186 Increase GW abstraction	33
1300SC0016: Emlaghpeasta / Portmagee / Maulin	SAH-204 Rationalise Emlaghpeasta to Waterville, with Lough Currance abstraction increased to meet deficit	31	SAH-204 Rationalise Emlaghpeasta to Waterville, with Lough Currance abstraction increased to meet deficit	31	SAH-204 Rationalise Emlaghpeasta to Waterville, with Lough Currance abstraction increased to meet deficit	31
1300SC0026: Lios Cearnaigh PWS 052D	SAH-169 WTP upgrade	-	SAH-169 WTP upgrade	-	SAH-169 WTP upgrade	-

WRZ	Quickest Delivery - SA Approach 2		Most Resilient - SA Approach 3		Lowest Carbon - SA Approach 1	
	Option Description	SA Option	Option Description	SA Option	Option Description	SA Option
1300SC0011: Listowel Regional Public Water Supply	SAH-162a New GW source and Interconnect to Abbeyfeale	24	SAH-162a New GW source and Interconnect to Abbeyfeale	24	SAH-162a New GW source and Interconnect to Abbeyfeale	24
1300SC0024: Lyranes 303A	SAH-148 Increase GW abstraction and upgrade WTP	-	SAH-148 Increase GW abstraction and upgrade WTP	-	SAH-148 Increase GW abstraction and upgrade WTP	-
1300SC0015: Mid Kerry	SAH-178 New abstraction from Lower Leane catchment and WTP at abstraction	30	SAH-021 New SW abstraction and new WTP	-	SAH-178 New abstraction from Lower Leane catchment and WTP at abstraction	30
1300SC0025: Mountain Stage PWS 062A	SAH-170 New abstraction and upgrade to WTP	-	SAH-170 New abstraction and upgrade to WTP	-	SAH-170 New abstraction and upgrade to WTP	-
1300SC0031: Rathmore	SAH-109 Increase GW abstraction and upgrade WTP	-	SAH-215 Rationalise Rathmore WTP and connect to Central Regional WRZ	40	SAH-109 Increase GW abstraction and upgrade WTP	-

WRZ	Best Appropriate Assessment - SA Approach 5	
	Option Description	SA Option
1900SC0021: Abbeyfeale Water Supply	SAH-162 Interconnect Abbeyfeale and Listowel Regional WRZs	24

WRZ	Best Appropriate Assessment - SA Approach 5	
	Option Description	SA Option
1300SC0004: An Baile Mor / An Daingean	SAH-203 New Lower Leane Regional Scheme with new WTP	36
1300SC0008: An Clochan	SAH-107 Increase GW abstraction	-
1300SC0007: An Fheothanach / An Mhuirioch/ Baile Breach	SAH-122 Amalgamate all sources in WRZ to one TWP and rationalise smaller ETP – upgrade an Fheothanach WTP	-
1300SC0003: An Mhin Aird	SAH-202 New Lower Leane Regional Scheme with new WTP	36
1300SC0002: Annascaul / Ballintermon	SAH-536 New Lower Leane Regional Scheme with new WTP	36
1300SC0010: Ardfert North/ Glenderry Ballyheigue WRZ	SAH-038 Increase Ballyheige abstraction, abandon existing BH at Glenderry Well and rationalise WTP	-
1300SC0030: Aughacasla	SAH-138 New GW abstraction and upgrade WTP	-
1300SC0005: Baile An Fheirtearaigh / Tir Abhainn Thoir / Cill Maoilcheadair / An Ghraig/Cloichear	SAH-085 Abandon An Ghraig Cloichear WTP,Tir Abhainn Thoir WTP and Leataoibh WTP and feed from Tobar Bhrendain WTP, An Riasc WTP and Cill Maoilcheadair WTP	-

WRZ	Best Appropriate Assessment - SA Approach 5	
	Option Description	SA Option
1300SC0012: Brosna/Knocknagoshel PWSS 016F	SAH-225 Develop trial well at Brosna raw water pump house, upgrade WTP and undertake source protection works	-
1300SC0032: Cahersiveen	SAH-062 Supplement Cahersiveen from River Inny	-
1300SC0009: Castlegregory PWSS 024D	SAH-065 New SW abstraction and upgrade WTP	-
1300SC0028: Ce Bhreannain	SAH-140 Increase GW abstraction	-
1300SC0022: Ceann Tra PWS 074D	SAH-094 Increase GW abstraction and upgrade WTP	-
1300SC0013: Central Regional - Lough Guitane	SAH-197 New Lower Leane Regional Scheme with new WTP	36
1300SC0006: Dun Chaoin PWS 034D	SAH-123 Increase GW abstraction	-
1300SC0016: Emlaghpeasta / Portmagee / Maulin	SAH-068 Increase GW abstraction and upgrade WTP	-
1300SC0026: Lios Cearnaigh PWS 052D	SAH-169 WTP upgrade	-
1300SC0011: Listowel Regional Public Water Supply	SAH-162a New GW source and interconnect	24

WRZ	Best Appropriate Assessment - SA Approach 5	
	Option Description	SA Option
1300SC0024: Lyranes 303A	SAH-148 Increase GW abstraction and upgrade WTP	-
1300SC0015: Mid Kerry	SAH-198 New Lower Leane Regional Scheme with new WTP	36
1300SC0025: Mountain Stage PWS 062A	SAH-199 New Lower Leane Regional Scheme with new WTP	36
1300SC0031: Rathmore	SAH-109 Increase GW abstraction and upgrade WTP	-