7 Preferred Approach – Study Area

7.1 Introduction

The purpose of this section of the RWRP-EM is to examine all potential Feasible Options that could be used to address the identified Need across the 134 Water Resource Zones (WRZs) in the Region. The Approach Development Process, which is set out in Section 8.3.7 of the Framework Plan, seeks to identify the Preferred Approach for addressing Need at three spatial Levels: individual WRZs, Study Area Level, and Regional Level (Figure 7.1). This process involves comparison of the Feasible Options at each Level, using defined criteria.

The Approach Development Process is undertaken sequentially for each WRZ and Study Area, before looking at approaches to address Need at a wider regional Level. This Section 7 will outline how the process is applied at WRZ and Study Area Level and Section 8 outlines the development of the Preferred Approach at Regional Level.

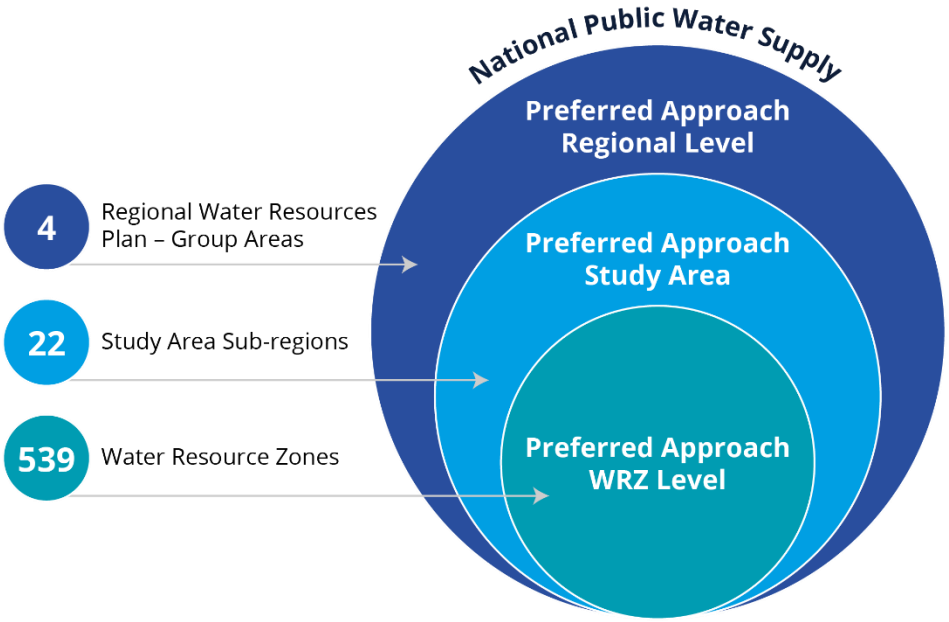

Figure 7.1 Spatial Level Assessment

The process we follow, which is based on a hierarchical view of the Region, allows us not only to resolve Need across the individual supplies, but also allows us to understand the potential for the strategic possibilities for collective water supply needs across the Eastern and Midlands Region. This complete view means that each WRZ is no longer looked at in isolation (which was historically the case). It also enables the establishment of a wider plan that allows for the integration of WRZs, in circumstances where such integration is identified as the best outcome. This approach aligns with other jurisdictions that have fewer WRZs and will help deliver a more sustainable and cost-effective water supply service.

This Section:

- Outlines the Approach Development Process we have implemented to determine the Study Area Preferred Approach (Section 7.2).
- Describes the Study Area Preferred Approach we have developed to address long term Need within the Eastern and Midlands Region and compares this with the WRZ Level Approach (Section 7.3 and 7.4).
- Summarises the Preferred Approach for each Study Area (Section 7.5).
- Presents the ‘Interim Solutions’ we have identified to address the short-term Needs within the Eastern and Midlands Region (Section 7.6).

- Details the outcomes of the sensitivity analysis of each of the Preferred Approaches to changes in climate change, abstraction limits, leakage targets and growth projections (Section 7.7).

7.2 Approach Development Process

7.2.1 Approach Categories

The Framework Plan establishes an Approach Development Process (Section 8.3.7) to compare various Options to address Need within each WRZ and Study Area, and across the Eastern and Midlands Region as a whole. This process is designed to identify the option that meets identified Deficits while providing the best overall outcomes when considered against a range of criteria.

Specifically, this Approach Development Process assesses the Feasible Options under six defined "Approach Categories". These categories are Least Cost, Best AA (Best Appropriate Assessment), Best Environmental, Most Resilient, Lowest Carbon and Quickest Delivery. These Approach Categories were selected to align the NWRP with all relevant Government Policy. The six categories, along with the associated policy drivers, are summarised in Table 7.1, and explained in more detail below.

We use these Approach Categories as a starting point to determine the best performing option to meet the Deficit, relative to a particular outcome. For example, a “Least Carbon” approach would be the option that would meet the Deficit and involve the least embodied and operational carbon load over the lifetime of the option.

Table 7.1 Range of Approaches to Test Feasible Options

Approaches Tested	Description	Policy Driver
Least Cost	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)	Lowest score against the European Sites (Biodiversity) sub-criteria question: Score = 0 equates to no likely significant effects (LSEs). If, in our opinion, these 0 scoring Options meet the Deficit/ plan objectives, they are automatically picked as the Preferred Approach. Score = -1 or -2 equates to LSEs that can be addressed with general/standard mitigation measures. Score = -3 equates to LSEs that may be harder to mitigate or require significant project level assessment.	Habitats Directive
Quickest Delivery	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.	Statutory Obligations under the Water Supply Act 2007 and Drinking Water Regulations
Best SEA Environmental	This is the Option or combination of options with the highest total score across the 19 No. Strategic Environmental Assessment (SEA) Multi-Criteria Assessment (MCA) sub-criteria questions.	SEA Directive and Water Framework Directive

Approaches Tested	Description	Policy Driver
Most Resilient	This is the Option or combination of Options with the highest total score against the four (4) resilience criteria. These include outages, financial uncertainty, regulatory changes, and climate change.	National Adaptation Plan and Climate Action Plan
Lowest Carbon	This is the Option or combination of Options with the lowest embodied and operational carbon cost	Climate Action Plan

Least Cost Approach

The Least Cost Approach is determined using an Irish Water Net Present Value (NPV) assessment tool which establishes the Option with the lowest comparative NPV cost encompassing: Environmental and Social Costs, Carbon Costs, Capital Costs and Operational Costs. The NPV assessment tool utilises a strict set of requirements and is limited in the flexibility it offers. Therefore, where a number of Options provide similar NPV costs, and in some circumstances, so as to ensure that no such Options are excluded at this early stage by reference only to "least cost", 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. This approach also recognises the desk-based nature of the NPV assessment, and the fact that these figures will change at Project stage. To then determine the individual "least cost" Option in each case, Irish Water has applied wider factors, including SEA and Habitats objectives, as part of its exercise of professional judgement as provided for in Section 8.3.7.4 in the Framework Plan. Further details of this approach are provided in Section 7.2.2. below. This approach also ensures that our plan level assessments align with the requirements of the Public Spending Code and the National Adaptation Framework[1].

Best Appropriate Assessment (Best AA) Approach

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

Quickest Delivery Approach

The quickest delivery is based on the estimated time for an Option to be brought into operation (including typical feasibility, consent, construction and commissioning durations) as identified at Fine Screening. This approach allows us to potentially optimise the Preferred Approach by minimising the time taken for an Option to be become operational. This could be appropriate in a WRZ with a critical water quality issue that might impact on public health, as this approach would identify the Option that could potentially be delivered in the shortest possible timeframe. As the NWRP does not confer funding or statutory consent for any project, and the identified Needs across the Eastern and Midlands Region must be considered, we would be unlikely to modify an approach based on Quickest Delivery, unless there is a critical driver.

Best Environmental Approach

The Best SEA Environmental Approach is the Option performing best overall across the 19 SEA objective-based MCA environmental criteria, assessed as part of the Fine Screening assessment described in Section 8.3.5 of the Framework Plan. Positive and negative scores are summed separately.

The purpose of this approach is to ensure that the SEA objectives to minimise potential impact are considered through the Option Assessment and Approach Selection process. For each Option, we assess the MCA scoring in detail across all SEA assessment criteria, using the sum negative scores. We also review the scoring against individual criteria to identify where assessment reflects important differences between Option focusing on potential operational or long-term effects. This ensures that we can review the relative merits of each Option. When the combination with the lowest environmental score also scores any -3 score under the Best AA criteria, we review the other combinations to determine if there are any combinations with a no -3 biodiversity score. The Best Environmental is the Combination with the best performing environmental score with the least no of -3 scores against the best AA criteria.

Table 8.6 of the Framework Plan lists the criteria, sub-criteria and questions that are applied when completing the MCA assessment.

Most Resilient Approach

The Most Resilient Approach is the Option with the highest scores from the four MCA screening questions (refer to Table 8.6 of the Framework Plan) relating to resilience criteria. This approach is aligned to the NWRP objective to ensure a safe and secure water supply in the short, medium and long term.

Lowest Carbon Approach

The Lowest Carbon Approach is the Option with the lowest embodied and operational carbon costs. This approach is aligned with Irish Water's carbon reduction policies and the National Adaptation Framework (NAF)[1] in relation to climate change.

7.2.2 Approach Ranking and Appraisal

The EBSD (Economics of Balancing Supply and Demand) method is applied to rank the Options in order of lowest to highest NPV cost and with regard to their applicable MCA scores for the six Approach Categories. The EBSD method determines an optimum combination of options to address the future Need, balancing across the range of NWRP and SEA objectives outlined above. Further detail on the EBSD method is outlined in Section 8.3.7 of the Framework Plan.

In some instances, Options may achieve similar, although not exactly identical, scores within an Approach Category. In these circumstances, to ensure that Options which perform better overall are not excluded from the approach development process, Irish Water takes a wider look at the combination to consider which of these comparable Options to categorise as the "Best" approach within each category. In particular, Irish Water takes into account whether the Option or combination of option meets the SEA and Habitats objectives outlined in the Framework Plan. This is an example of the exercise of professional judgement from the multi-disciplinary teams identified in Section 8.3.7.4 of the Framework Plan as being necessary.

We then compare the Option identified as the best performing within each of the six Approach Categories (Least Cost, Best AA, Lowest Carbon etc.) against each other to come up with a Preferred Approach that meets the objectives of the Framework Plan and aligns with all relevant Government Policy. This comparison process is outlined in Figure 7.2.

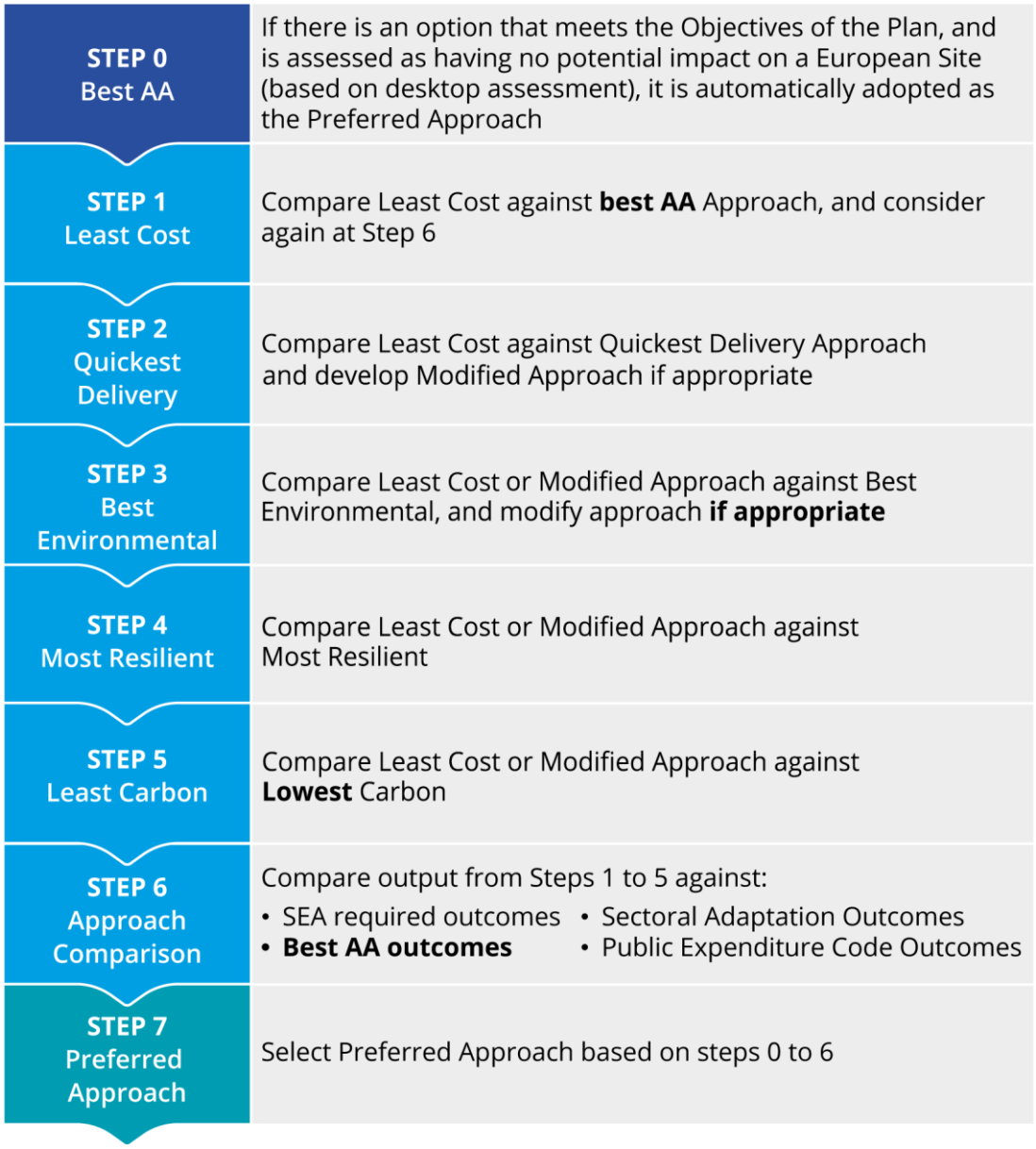

Figure 7.2 Seven (7)-Step Approach Development Process

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

It should be noted that the identification of a Preferred Approach at a plan level does not confer any consent to develop a project, nor does it preclude other Options being considered subsequently at the project level. Assessments at this stage are desk based and plan level assessments. Environmental impacts and costing of projects are further reviewed at project level where alternatives will need to be considered as part of the Environmental Impact Assessment process in the usual way. No statutory consent or funding consent is conferred by inclusion of any Options in the NWRP. Any projects that are progressed following this plan identification as a Preferred Approach in the Regional Plans, will require individual environmental assessments, including Environmental Impact Assessment and Appropriate Assessment (as required), in support of planning applications (where a project requires planning permission) or in support of licencing applications (for example, for new abstractions).

As explained in Section 6, the Options to resolve a Deficit can include a transfer of water from outside the WRZ or Study Area. The feasible source area will depend on the size of the demand centre. It is usually not feasible to develop Options that require small volumes of water to be transferred over a distance of five (5) kilometres or more, due to potential water quality issues associated with such transfers.

The Approach Development Process contains three tiers. We first start with WRZ Level and then apply the process sequentially to each Study Area and then the Region as follows:

Stage 1 – We assess the WRZ individually to develop an initial Preferred Approach, the - WRZ Preferred Level approach - for all of the supplies in the Study Area

Stage 2 – We assess whether there are any larger Option that might resolve Deficits across multiple WRZs that are located within the same Study Area. We then develop combinations of these Options (SA Combinations).

Stage 3 – We assess the SA Combinations and the WRZ Level approach in order to determine the best performing combination across the six Approach Categories. This is known as the Preferred Approach at SA Level. We set out the process for identifying the Preferred Approach for WRZ and Study Area Level below, and Section 8 outlines how this is done at Regional Level.

7.2.3 Stage 1 – WRZ Level Approach

7.2.3.1 Test a Range of Approach Types - WRZ Level

The purpose of the NWRP is to examine all potential Options that could be used to resolve the Need within the WRZ (Unconstrained Options) and then to eliminate those that are not feasible or that have identifiable environmental issues at a desktop level (Option assessment screening). This is set out in Section 6.

The remaining Feasible Options are categorised as Options that resolve the Need for one WRZ only ("WRZ Option"), and Options that resolved the Need for more than one WRZ ("Study Area Option"). To illustrate, Table 7.2 below provides an overview of the number of feasible WRZ Options and Study Area Options for the 13 WRZs in Study Area 4.

Table 7.2 SA4 – Option Types

Water Resource Zone	Option Type	
	WRZ Option	Study Area Option
Ardcarraig Clogherinkoe	1	1
Ballany	6	2
Ballymahon	6	4
Clonard/ Abbeysfields Housing Estate	2	3
Clonbullogue	1	1
Clonuff	1	0
Daingean	1	2
Edenderry and Rhode	5	2
Enfield WS	4	3
Geashill	2	1
Longwood WS	2	3
Mullingar Regional	10	8
Walsh Island	1	2

As set out further in the Study Area Technical Appendices 1-9, Feasible Options to resolve the Need at WRZ Level and Study Area Level may consist of individual or multiple projects, the progression of which will be subject to budgetary and regulatory constraints.

Irish Water's next step is to assess the Feasible Options for each WRZ and identify the best performing Option within each of the six Approach Categories for the relevant WRZ.

To illustrate using the Ballany WRZ, as can been seen from Table 7.2 there are six (6) feasible WRZ Options for that WRZ. Further details of these WRZ Options are provided in Table 7.3. We use the EBSD tool to rank the WRZ Options against the six Approach Categories as outlined in Table 7.3, and Irish Water then determines which Option provides the best outcome in each category (e.g., Least Cost, Best AA etc). As set out in the example below, Option SA4-05, provides the best outcome under three Approach Categories, being Best AA (biodiversity), Best SEA (overall environmental), and Lowest Carbon. In relation to the other Approach Categories, SA4-08 ranks the best for Quickest Delivery and SA4-09 ranks the best for Least Cost and Most Resilient.

Table 7.3 SA4, Ballany WRZ Option

Water Resource Zone Name	Feasible Option SA4			Approach					
	No. of WRZ Options	Option Code	Option Description	Least Cost	Quickest Delivery	Best AA	Best Environmental	Lowest Carbon	Most Resilient
Ballany	6	SA4-04	New SW abstraction from Lough Sheelin	-	-	-	-	-	-
		SA4-05	Supply part of Ballany from Kells/Oldcastle WTP (Co. Meath)	-	-	✓	✓	✓	-
		SA4-06	Supply part of Ballany from Athboy (Co. Meath)	-	-	-	-	-	-
		SA4-07	Supply part of Ballany from Baileborough PWS (Co. Cavan)	-	-	-	-	-	-
		SA4-08	Supply part of Ballany from Lough Kinale PWS (Co. Longford)	-	✓	-	-	-	-
		SA4-09	Supply Ballany from neighbouring Multyfarnham Group Water Scheme	✓	-	-	-	-	✓

The above process is completed in respect of each of the 134 WRZs across the nine (9) Study Areas within the Eastern and Midlands Region. A record of this analysis is set out in the Technical Report for each of the Study Areas (Appendices 1-9).

7.2.3.2 Approach Appraisal - WRZ Level

Once Irish Water has identified the Options with the best outcomes within each of the Approach Categories, these Options are then brought through to the Approach Development Process, as set out in Figure 7.2 above. As noted previously, this process allows us to compare the best ranked approaches within each category at WRZ Level relative to each other, to select the Options that provides the best overall solution for that WRZ. This process is demonstrated in Figure 7.3 for the Ballany WRZ in SA4.

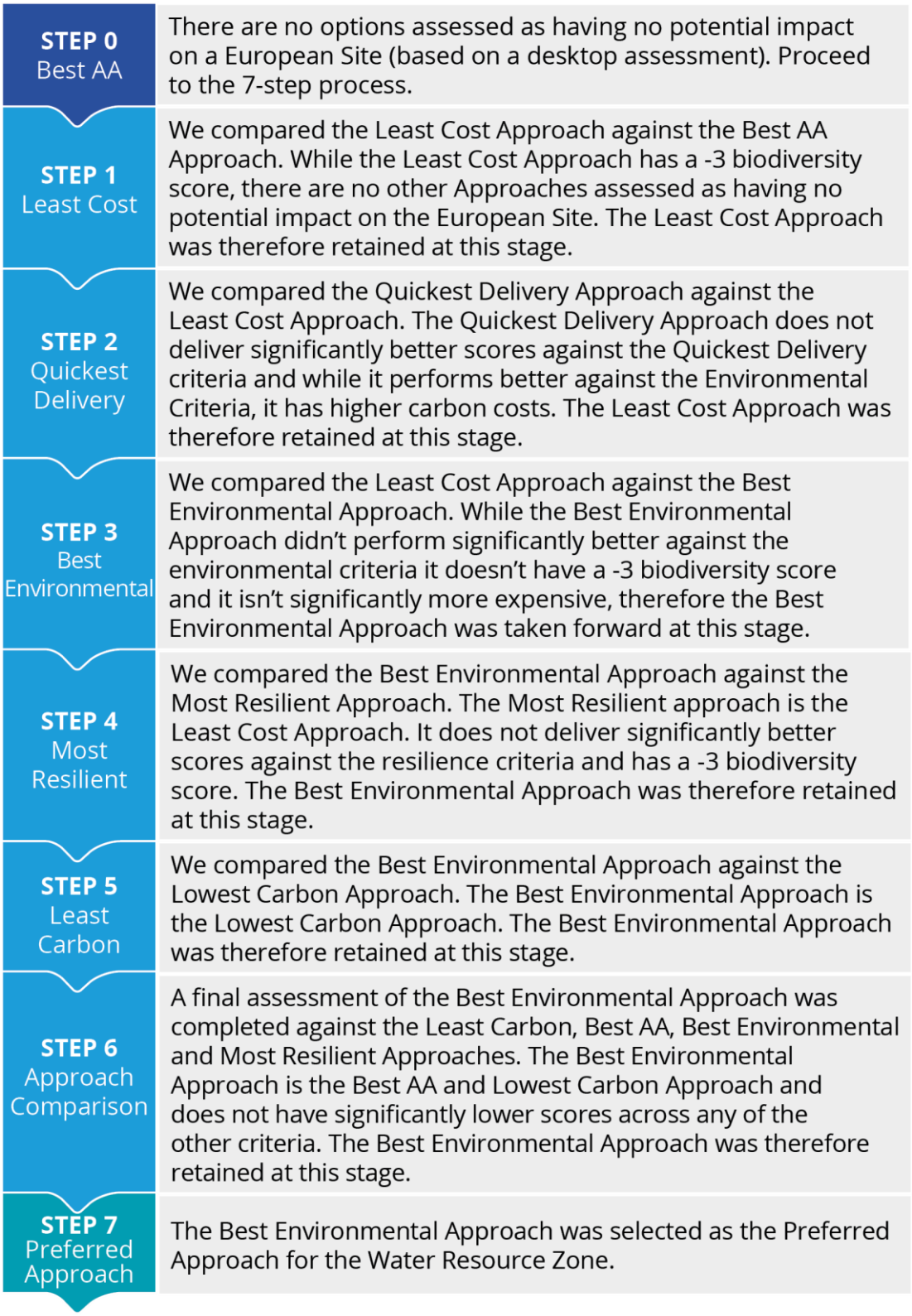

Figure 7.3 WRZ Level Preferred Approach Development – SA4, Ballany WRZ

7.2.3.3 Selection of Preferred Approach – WRZ Level Approach

We follow this same process for the WRZs within each Study Area, until we have the initial Preferred Approach for each WRZ within each of the nine (9) Study Areas in the Eastern and Midlands Region.

When it comes to assessment at Study Area Level, the individual WRZ Preferred Approach will be combined for assessment purposes and referred to as the **WRZ Level Approach**. The WRZ Level Approach is the combination of all individual WRZ Preferred Approaches that together will meet the Need for the entire Study Area (although it will do so on a WRZ-by-WRZ basis). This Stage 1 Process is outlined in Figure 7.4.

The outcome of the Stage 1 process for SA4 is summarised in Table 7.4. This shows the combination of the WRZ Preferred Approach in the Study Area and their alignment with the six Approach Categories as determined by the application of the 7-step process to each WRZ.

As can be seen from the table, the Preferred Approach for only two (2) of the thirteen (13) WRZs is a source from another Study Area – Mullingar Regional involves a connection from the New Shannon Source (NSS) (transfer from the Parteen Basin to the GDA) and Enfield is rationalised to the Greater Dublin Area (GDA). The Preferred Approach for the remaining WRZs are local Options, i.e., supplies from within the same Study Area. Local supplies from the same study area account for approximately 90% of the Preferred Approach at WRZ Level across the Eastern and Midlands Region.

Historically, this is the way water supplies have been operating in Ireland. Geographical constraints on supplies have led to a system that contains a significant number of isolated supplies, which is less resilient than larger centralised supplies. For this reason, Irish Water then looks at solutions for WRZ at a broader Study Area Level to see if there are circumstances, whereby a larger more resilient supply might be available to meet the local need.

Figure 7.4 Preferred Approach Development – Stage 1

Table 7.4 SA4 WRZ Level Approach – Assessment Outcome

Water Resource Zone Name	Feasible Option SA4 Tipperary North		Approach							
	Option Code	Option Description	Zero AA	Least Cost	Quickest Delivery	Best AA	Best Environmental	Lowest Carbon	Most Resilient	Preferred Approach
Ballany	SA4-05	Supply part of Ballany from Kells/Oldcastle WTP (Co. Meath)	-	-	-	✓	✓	✓	-	✓
Ballymahon	SA4-12	Increase SW abstraction from River Inny	-	-	-	✓	✓	✓	-	✓
Mullingar Regional	SA4-36d	New Connection from NSS to Mullingar Regional	-	✓	-	-	-	-	✓	✓
Clonard/ Abbeysfields Housing Estate	SA4-47	Increase GW abstraction to supply Deficit	-	✓	✓	✓	✓	✓	✓	✓
Longwood WS	SA4-49	New GW at Longwood - locally important gravel aquifer	-	-	-	✓	✓	✓	-	✓
Enfield WS	SA4-54	Rationalise Enfied WRZ to GDA (Kilcock connection)	-	✓	✓	✓	-	✓	✓	✓
Ardcarraig Clogherinkoe	SA4-59	Increase GW abstraction at Ardcarraig Clogherinkoe	-	✓	✓	✓	✓	✓	✓	✓
Geashill	SA4-62	New GW abstraction at Geashill	-	-	-	-	✓	✓	-	✓
Edenderry and Rhode	SA4-65b	New GW source to supply Edenderry and Rhode WRZ (Trim groundwater body; Kilrathmurry gravels groundwater body - approx. distance 3km; new watermains required)	-	-	✓	✓	✓	-	-	✓
Clonbullogue	SA4-98	No Deficit - WQ upgrade required only	-	✓	✓	✓	✓	✓	✓	✓

Water Resource Zone Name	Feasible Option SA4 Tipperary North		Approach							
	Option Code	Option Description	Zero AA	Least Cost	Quickest Delivery	Best AA	Best Environmental	Lowest Carbon	Most Resilient	Preferred Approach
Clonuff	SA4-99	No Deficit - WQ upgrade required only	-	✓	✓	✓	✓	✓	✓	✓
Daingean	SA4-100	No Deficit - WQ upgrade required only	-	✓	✓	✓	✓	✓	✓	✓
Walsh Island	SA4-101	No Deficit - WQ upgrade required only	-	✓	✓	✓	✓	✓	✓	✓

7.2.4 Stage 2 – Study Area Combinations

As outlined in Section 6, there are three types of Options considered within the NWRP:

- WRZ Option – Option that address Need in one WRZ only
- SA Option – Option that can address needs across multiple WRZs in a Study Area
- Regional Option – Option that can address the needs in multiple WRZs across multiple Study Areas.

Accordingly, once the Preferred Approach for each of the individual WRZs has been identified, the next step is to determine the overall Preferred Approach for each of the nine (9) Study Areas in the Eastern and Midlands Region. To achieve this outcome, we identify the "Study Area Option", which as noted above are Options that can address Need in more than one WRZ. Irish Water then develops various combinations which contain Study Area Options and WRZ Options to provide supply for the entire Study Area. These are called "SA Combinations". The Stage 2 process is summarised in Figure 7.5.

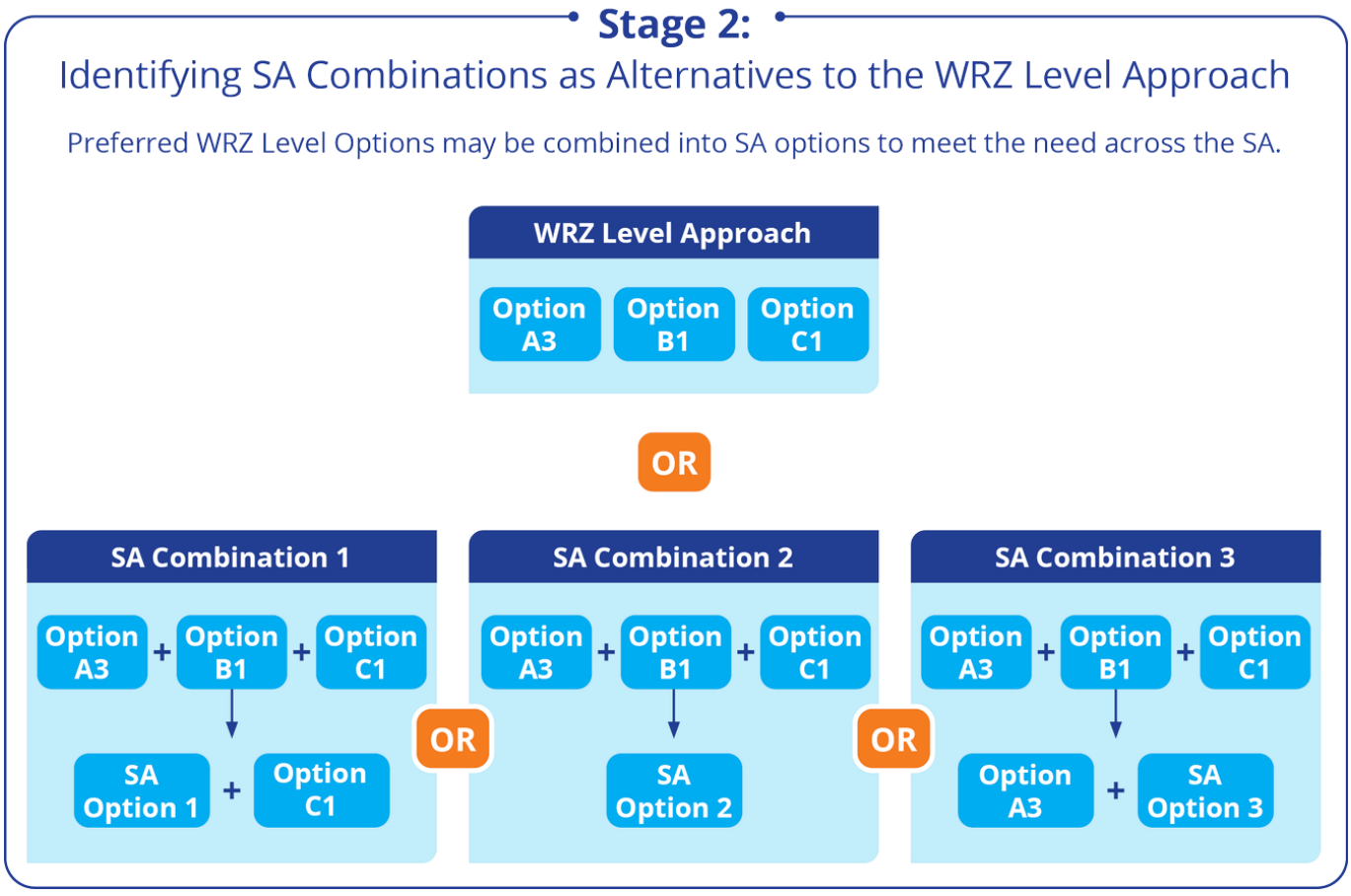

Figure 7.5 Preferred Approach Development – Stage 2

As mentioned above, for each Study Area, one of the SA Combinations will always be the WRZ Level Approach, which as explained above is the overall combination of each individual WRZ Preferred Approach within the relevant Study Area. In Table 7.5 we show an example of this for Study Area 3.

Table 7.5 SA3 WRZ Level Approach - Assessment Outcome

Key	WRZ Level Approach Option	○	SA Grouped Option	□

WRZ	WRZ Level approach	SA combination 1 (SA grouped option 3)	SA combination 2 (SA grouped option 4)	SA combination 3 (SA grouped option 7)	SA combination 4 (SA grouped option 8)	SA combination 5 (SA grouped option 9)	SA combination 6 (SA grouped option 10)	SA combination 7 (SA grouped option 16)	SA combination 8 (SA grouped option 17)	SA combination 9 (SA grouped option 20)	SA combination 10 (SA grouped option 22)	SA combination 11 (SA grouped option 22b)	SA combination 12 (SA grouped option 23)	SA combination 13 (SA grouped option 8 and 16)
Athboy	○	○	□	□	□	□	○	○	○	□	□	□	□	□
Bailieboro RWSS	○	○	○	○	○	○	○	□	○	○	○	○	○	□
Ballivor	○	○	□	○	○	□	○	○	○	○	○	○	□	□
Kells-Oldcastle	○	○	□	○	□	□	○	○	□	○	□	□	□	□
Kilmessan	○	○	□	○	○	□	○	○	○	○	○	○	□	□
Moynalty	○	○	○	○	○	○	○	□	○	○	○	○	○	□
Navan-Midmeath	○	□	□	□	□	□	□	○	□	□	□	□	□	□
Slane	○	○	□	○	□	○	○	○	○	○	□	□	○	□
South Louth and East Meath	○	□	□	□	○	□	□	○	○	□	□	□	□	□
St Louis, National School, Rathkenny	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Trim	○	○	□	□	□	□	○	○	○	○	□	□	□	□

Table 7.5 demonstrates the variety of SA combinations for SA3. For example, SA combination 1 contains Group Option 3, which resolves the Need for two (2) WRZs, Navan Mid Meath and South Louth East Meath. Therefore, a SA combination for this Group includes the Group Option for Navan Mid Meath and South Louth East Meath while the Need for the remaining WRZ is resolved by the Preferred Approach at WRZ Level.

Even when we consider all permutations of Study Area Options to create the SA combinations, there are some water supplies that will always require a WRZ Level Option. These WRZs are typically very small, isolated supplies serving a limited number of people. Due to the age of our water network and water quality issues associated with transferring small volumes of water over long distances, a local supply is a more suitable solution for such WRZs. In these cases, the emphasis of the NWRP is to ensure that the best possible resilient local sources are identified.

In Table 7.6 we show the number of SA Combinations (including the WRZ Level Approach) identified for each Study Area.

Table 7.6 Number of SA Combinations for each Study Area

Number of SA Combinations								
SA1	**SA2**	**SA3**	**SA4**	**SA5**	**SA6**	**SA7**	**SA8**	**SA9**
20	2	14	9	14	17	5	20	12

7.2.5 Stage 3 – Study Area Level Preferred Approach

7.2.5.1 Test a Range of Approach Types – Study Area Level

As part of Stage 3, we compare the WRZ Level Approach and the SA Combinations, developed in Stage 2.

The purpose of this exercise is to ensure that the Preferred Approach selected at Study Area Level for each Study Area is the combination of options that provide the best overall outcome, when considered against the six Approach Categories. To assist us in this exercise, again we use the EBSD tool to rank the Study Area Combinations against the six Approach Categories and identify the Options that deliver the best outcomes relative to each of these categories.

Table 7.7 shows an example of the output from the EBSD process for SA3.

Table 7.7 Stage 3 – EBSD Output for SA3 (SA Combinations Assessment)

WRZ	WRZ Level approach	SA combination 1 (SA grouped option 3)	SA combination 2 (SA grouped option 4)	SA combination 3 (SA grouped option 7)	SA combination 4 (SA grouped option 8)	SA combination 5 (SA grouped option 9)	SA combination 6 (SA grouped option 10)	SA combination 7 (SA grouped option 16)	SA combination 8 (SA grouped option 17)	SA combination 9 (SA grouped option 20)	SA combination 10 (SA grouped option 22)	SA combination 11 (SA grouped option 22b)	Preferred Approach SA combination 12 (SA grouped option 23)	SA combination 13 (SA grouped option 8 and 16)
Least Cost							Worst						Best	
Quickest Delivery							Best							Worst
Best AA *no. of -3 scores against biodiversity	0 No. -3 scores	0 No. -3 scores	0 No. -3 scores	0 No. -3 scores	1 No. -3 scores	0 No. -3 scores	1 No. -3 scores	0 No. -3 scores	0 No. -3 scores	0 No. -3 scores	0 No. -3 scores	0 No. -3 scores	0 No. -3 scores	1 No. -3 scores
Lowest Carbon								Best				Worst		
Most Resilient						Worst		Best						
Best Environmental			Best				Worst							

Ranked order (best to worst)	Best													Worst

The SA combinations outlined in Table 7.5, including the WRZ Level Approach, are assessed to determine the 'Best' performing combination in each approach category. These are summarised in Table 7.8. As can be seen in Table 7.8, when we present the data in this way it allows us to understand the relative benefits of each group of Options.

Table 7.8 Best Combinations for SA3

Approach Categories	Best Performing Combination
Least Cost (LCo)	SA Combination 12 (Group 23)
Best Environmental (BE)	SA Combination 2 (Group 4)
Quickest Delivery (QD)	SA Combination 6 (Group 10)
Most Resilient (MR)	SA Combination 7 (Group 16)
Lowest Carbon (LC)	SA Combination 7 (Group 16)
Best AA (BA)	SA Combination 2 (Group 4)

7.2.5.2 Approach Appraisal – Study Area Level

We then compare the best performing Option or combinations of options (listed in Table 7.8) within each of the six Approach Categories using the 7-step process set out in Figure 7.2 above, to establish the Preferred Approach at Study Area Level. As at WRZ Level, this process allows us to compare the best ranked approaches within each Approach Category at Study Area Level relative to each other, to select the option or combination of options that provides the best overall solution for that Study Area. Again, this process is conducted via a workshop, and the decision-making and outcomes are recorded for each supply.

As an illustration, we set out in Figure 7.6 how we applied this process to Study Area 3.

STEP 0 Best AA	There is no SA combination in SA3 assessed as having no potential impact on a European Site (based on a desktop assessment). Proceed with the 7-step process.
STEP 1 Least Cost	We compared the Least Cost Approach against the Best AA Approach. There is no SA combination in SA3 assessed as having no potential impact on a European Site. The Least Cost Approach does not contain any options with a -3 biodiversity score and is comparable to the Best AA Approach, therefore the Least Cost Approach was retained at this stage.
STEP 2 Quickest Delivery	We compared the Quickest Delivery Approach against the Least Cost Approach. The Quickest Delivery Approach has higher carbon costs than the Least Cost Approach, performs poorly against the environmental criteria and has an option with a -3 biodiversity score. The Least Cost Approach was therefore retained at this stage.
STEP 3 Best Environmental	We compared the Least Cost Approach. There was not a significant difference between the environmental score for the Best Environmental Approach. The Least Cost Approach and the Least Cost Approach performed better against the quickest delivery and carbon criteria, while the resilience scores were comparable. The Least Cost Approach was therefore retained at this stage.
STEP 4 Most Resilient	We compared the Least Cost against the Most Resilient Approach. The Most Resilient Approach performs poorly against the environmental criteria, and considering the carbon costs for the Least Cost Approach are 5% of the carbon costs for the Least Carbon Approach, the Least Cost Approach was retained at this stage.
STEP 5 Least Carbon	We compared the Least Cost Approach against the Least Carbon Approach. The Least Carbon Approach is the same as the Most Resilient Approach and as noted above this combination performs poorly against the environmental criteria, and considering the carbon costs for the Least Cost Approach are 5% of the carbon costs for the Least Carbon Approach, the Least Cost Approach was retained at this stage.
STEP 6 Approach Comparison	A final assessment of the Least Cost Approach. The Least Cost Approach is comparable to the Best AA, Best Environmental, Quickest Delivery and Least Carbon Approach. The Most Resilient Approach performs poorly against the environmental criteria. The Least Cost Approach overall is a well performing option against the SEA and Habitats Objectives of the Plan and was therefore retained at this stage.
STEP 7 Preferred Approach	The Least Cost Approach was therefore selected as the Preferred Approach for the Water Resource and Study Area Levels.

Figure 7.6 SA Level Preferred Approach Development – SA3

7.2.5.3 Selection of Preferred Approach – SA Level Approach

Table 7.9 summarises the comparison of the best performing SA combinations for SA 3.

When we compare the four (4) best performing approaches against each other (representing the Stage 3 analysis for the selection of the Preferred Approach), their relative performance against categories they were not identified as 'best' in, may be different compared to their relative performance within the wider ranking against all the combinations, as presented in Table 7.7. Furthermore, in Table 7.7 the colour scale used to indicate the relative ranking of all combinations requires more gradations of colour to account for the large number of option combinations that can be assessed.

Table 7.9 only contains four different combinations and therefore the colours denoting relative performance between the 'Best Performing SA Combinations' for a particular Approach Type are different to the colour representing relative performance within the wider ranking. For example, for Combination 12, the Quickest Delivery Score is ranked third against the three (3) other Best Performing SA Combination (represented by a yellow colour in Table 7.9); whereas it is ranked amongst the best five (5) of all fourteen (14) combinations (represented by a lighter green colour code in Table 7.7).

Table 7.9 suggests that Group 23, Group 4 and Group 16 are the Best AA because they have the same number of -3 biodiversity scores (i.e., none of these Options had -3 scores). However, Group 4 was selected as the Best AA approach after comparing the number of -2 and -1 biodiversity scores.

Table 7.9 Summary of the MCA Scoring for the Best Performing SA Combinations – SA3

Category Criteria	Preferred Approach Combination 12 (Group 23) (LCo)	Combination 2 (Group 4) (BE, BA)	Combination 6 (Group 10) (QD)	Combination 7 (Group 16) (LC, MR)
Least Cost Score	Best		Worst	
Quickest Delivery Score		Worst	Best	
Best AA Score	No -3 Biodiversity Scores	No -3 Biodiversity Scores	One -3 Biodiversity Score	No -3 Biodiversity Scores
Lowest Carbon Score			Worst	Best
Most Resilient Score		Worst		Best
Best Environmental Score		Best	Worst	

Key			
Ranked order (best to worst)			
Worst			Best

The outcome when we follow the 7-step process is that SA combination 12 (Group 23) is the Preferred Approach for Study Area 3. As can be seen with reference to Table 7.7, this combination of Feasible Options is well balanced in terms of performance against all criteria and performs significantly better overall than any other combination (including the WRZ Level Approach). In particular, the combination of

options performs well against the environmental criteria and contains no option with a -3-biodiversity score.

The general Preferred Approach development process at Study Area Level (Stage 3) is summarised in Figure 7.7.

Figure 7.7 SA Preferred Approach Development – Stage 3

7.3 WRZ Level Approach and SA Preferred Approach

7.3.1 Approach Description

The application of the three stage Approach Development Process resulted in the Preferred Approach at Study Area Level comprising grouped Options (supplying multiple WRZs within a Study Area) for eight (8) of the nine (9) Study Areas in the Eastern and Midlands Region. The exception is SA9 where there is only one WRZ. All Options (or combination of Options) that address the Need for SA9 are defined as WRZ Options, as they will provide a supply to only a single WRZ. Therefore, the WRZ Level Approach and the SA Preferred Approach for SA9 are the same.

Table 7.10 illustrates the benefits of developing the Preferred Approach at Study Area Level. The 134 WRZs across the Eastern and Midlands Region will be supplied by 85 WRZ Options and 13 grouped supply systems. This creates an interconnected network and allows us to rationalise our infrastructure providing a more resilient supply to our customers. There is also the benefit of moving away from some of our potentially unsustainable abstractions by reducing our abstraction points. Reviewing our supplies at a Study Area Level allows us to understand the regional sustainability of our abstractions.

Table 7.10 SA Preferred Approach

Study Area	Number of WRZs	SA Preferred Approach		Number of WRZs benefitting from a SA Grouped Option
		WRZ Option	SA Grouped Option	
SA1	18	9	2	9
SA2	12	10	1	2
SA3	11	4	1	7
SA4	13	2	1	11
SA5	10	10	-	-
SA6	28	24	1	4
SA7	10	7	1	3
SA8	31	18	5	13
SA9	1	1*	n/a	n/a
Region Total	**134**	**85**	**13**	**49**

* SA9 consists of a single WRZ. Therefore, all Options (or combination of Options) that address the Need for SA9 are defined as WRZ Options as they will provide a supply to only one WRZ.

Table 7.11 summarises the WRZ Level Approach and the SA Preferred Approach for the nine (9) Study Areas of the Eastern and Midlands Region. Option types include new and increased groundwater (GW) and surface water (SW) abstractions, new and upgraded water treatment plants (WTPs), rationalisations (connection of WTPs and/or WRZs, usually accompanied by decommissioned abstractions and WTPs) and transfers from sources within or outside of the Study Area.

The Technical Report for SA9, the Greater Dublin Area (GDA), was prepared first due to the fact that this is the Study Area with the highest population and greatest Supply Demand Balance Deficit. The

Preferred Approach for SA9, as set out in Table 7.11, comprises the development of the New Shannon Source (NSS) and a pipeline transfer to provide supply to the GDA. The sustainable yield available from the NSS has the potential to supply a demand that is greater than the demand required in the GDA. Therefore, the SA9 Preferred Approach provides the opportunity to supply WRZs in other Study Areas. Subsequently, when developing the Preferred Approach for other WRZs and Study Areas for the Eastern and Midlands Region, Cross Study Area Interconnection Options were considered such as transfers from the GDA directly, and transfers from the NSS via a direct connection with the proposed pipeline transferring treated water from the NSS to the GDA WRZ.

These Cross Study Area interconnections were identified as part of the Preferred Approach for eight (8) of the nine (9) Study Areas. The PA identified for four (4) of these Study Areas (SA4, SA6, SA7, SA8) will obtain supply from the NSS via a connection to the pipeline transferring treated water from the NSS to the GDA. The PA identified for three (3) Study Areas (SA1, SA2 and SA3) will connect via the GDA supply network. In total the Cross SA interconnection involves eleven (11) Options that will benefit 37 WRZs, including the GDA. These Options are assessed again at a Regional Level as set out in Section 8.

Where WRZs depend on the development of the Preferred Approach for the GDA, alternative Options have been identified in the event that the Preferred Approach for the GDA cannot advance. The alternative Options for the relevant Study Areas is described in the SA Technical Reports (Appendices 1-9) and summarised in Table 8.4 in Section 8, which explains the development of the Regional Preferred Approach.

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

Full details of the SA Preferred Approach development are included in Technical Appendices 1-9.

Table 7.11 WRZ Level Approach and SA Preferred Approach

Study Area	WRZ Level Approach	SA Preferred Approach
SA1 Mid Wicklow	**18 WRZ Options:** – 10 Options with increased/new GW/SW abstractions. – 1 increased GW abstraction. – 2 new SW abstractions and WTPs. – 2 rationalisations (Ballinpark to Avoca Ballinclash WTP and Ballymorris to Aughrim). Decommission 2 WTPs. – 3 Options with WTP upgrades (WQ only).	**9 WRZ Options:** – 5 Options with increased GW abstractions. – 1 GW rationalisation (Ballinpark to Avoca Ballinclash WTP). Additional supply from NSS*. Decommission 1 WTP. – *3* Options with WTP upgrades (WQ only). **2 SA Grouped Options:** – Rationalise 6 WRZs to Vartry WTP in SA9, improving resilience through interconnections. Transfer from NSS* to supply Deficit. – Decommission 7 WTPs – Increase groundwater abstraction at an existing wellfield at Woodenbridge. – Decommission 2 WTPs
SA2 West Wicklow	**12 WRZ Options:** – 9 Options with increased GW abstractions and 2 new WTPs. – 1 new GW abstraction. – 1 rationalisation and transfer from the NSS* (Hacketstown to Rathvilly SA6). – 1 Options with WTP upgrade/s (WQ only).	**10 WRZ Options:** – 7 Options with increased GW abstractions. – 1 new GW abstraction. – 1 rationalisation and transfer from the NSS* (Hacketstown to Rathvilly SA6). – 1 Option with WTP upgrade (WQ only). **1 SA Grouped Option:** – Rationalise 2 WRZs (Hollywood - Donard and Dunlavin) to Ballymore Eustace WTP (SA9) via a new connection to the Ballymore Eustace - Old Kilcullen trunk main. Additional supply from the NSS*. Decommission 3 WTPs.
SA3 Meath	**11 WRZ Options:** – 8 Options with new/increased GW/SW abstractions. 3 New WTPs. Decommission 2 WTP. – 2 rationalisation and transfer from the NSS*(GDA To South Louth and East Meath; Mullingar to Ballivor). Decommission 2 WTPs. – 1 Options with WTP upgrade/s (WQ only).	**4 WRZ Options:** – 2 Options with increased GW abstractions. – 1 Option with WTP upgrade/s (WQ only). – 1 new GW abstraction and 1 new WTP. **1 SA Grouped Option:** – A single rationalisation and transfer from the NSS* resolve the Deficit for seven (7) of the WRZs, namely Athboy, Ballivor, Kells-Oldcastle, Kilmessan, Navan-Mid Meath, South Louth and East Meath, and Trim. This involves improved interconnection between WRZs, and connection to the GDA. – 4 Options with WTPs upgrades (WQ only). – Decommission 11 WTPs.

Study Area	WRZ Level Approach	SA Preferred Approach
SA4 West Meath	**13 WRZ Options:** – 6 Options with new/increased GW/SW abstractions. Decommission 1 WTP. – 2 cross SA transfers (Kells-Oldcastle (SA3) to Ballany; NSS* to Mullingar). Decommission 1 WTP. – 1 rationalisation and transfer (GDA to Enfield). Decommission 1 WTP. – 4 Options with WTP upgrades (WQ only).	**2 WRZ Options:** – 2 Options with WTP upgrades (WQ only). **1 SA Grouped Option:** – A single rationalisation and transfer resolve the Deficit for eleven (11) of the WRZs, namely Ballany, Ballymahon, Mullingar, Clonard/ Abbeysfields Housing Estate, Longwood WS, Enfield WS, Ardcarraig Clogherinkoe, Geashill, Edenderry and Rhode, Daingean and Walsh Island. This includes improved interconnection between WRZs, and connection to the NSS*. – Decommission 13 WTPs.
SA5 Offaly/Roscommon	**10 WRZ Options:** – 5 Options with increased GW/SW abstractions. – 2 Options with new GW abstractions.1 new WTP – 3 Options with WTP upgrades (WQ only).	**10 WRZ Options:** The SA Preferred Approach improves the WRZ Level Approach by increasing the existing GW abstraction at 2 locations, Lisbrock and Killeglan, to supply Roscommon, instead of constructing a new abstraction. This reduces the overall cost. All other WRZ Options remain the same as the WRZ Level Approach.
SA6 Laois	**28 WRZ Options:** – 23 new/increased GW abstractions and 1 new WTP. – 1 rationalisation (Coonin Hill, Drim and Knocks WTPs) – GW source. Decommission 2 WTPs. – 2 cross SA transfer (NSS* to Tullamore; GDA via Srowland to Carlow Town). Decommission 2 WTPs. – 2 Options with WTP upgrades (WQ only).	**24 WRZ Options:** – 5 new GW abstractions. 1 new WTP – 15 Options with increased GW abstractions. – 1 rationalisation (Coonin Hill, Drim and Knocks WTPs) –GW source. Decommission 2 WTPs. – 1 cross SA transfer (GDA via Srowland to Carlow Town). – 2 Options with WTP upgrades (WQ only). 2 SA Grouped Options: – Interconnecting Ballinakill and Durrow and includes increased GW abstraction. – 1 cross SA transfer (NSS* to Tullamore and Mountbolus). Decommission 3 WTPs.

Study Area	WRZ Level Approach	SA Preferred Approach
SA7 North Tipperary	**10 WRZ Options:** – 2 new GW abstractions. Decommission 1 WTP (Terryglass). – 3 Options with increased GW/SW abstractions. – 1 cross study transfer (new connection point from the NSS* to Cloughjordan). Decommission 1 WTP. – 1 rationalisation and increased abstraction (Dunkerrin, Lisduff and Moneygall WTPs). Decommission 3 WTPs. – 3 Options with WTP upgrades (WQ only).	**7 WRZ Options:** – 2 new GW abstractions. Decommission 1 WTP (Terryglass). – 2 Options with increased GW/SW abstractions. – 3 Options with WTP upgrades (WQ only). 1 SA Grouped Option: – Interconnection between three (3) WRZs, namely Dunkerrin/Moneygall, Greyford Source to Crotta and Cloughjordan. – Transfer from the NSS*. – 6 decommissioned WTPs.
SA8 Limerick Clare	**31 WRZ Options:** – 3 new GW abstractions and 1 new WTP. – 17 Options with increased GW/SW. abstractions. – 1 new connection point from the NSS* to Newport. Decommission 2 WTPs. – 3 rationalisation and transfer (Limerick to Croom PWS; O'Briensbridge PWS; and Murroe/Foileen/Cappamore). Decommission 6 WTPs. – 6 Options with WTP upgrades (WQ only) – 1 Advanced Leakage Reduction (Ennis) + 1 local increase in GW abstraction.	**18 WRZ Options:** – 1 new GW abstractions. – 11 Options with increased GW/SW abstractions. – 2 rationalisation and transfer (Limerick to Croom PWS; Limerick to O'Briensbridge PWS). Decommission 3 WTPs. – 3 Options with WTP upgrades (WQ only). – 1 Advanced Leakage Reduction (Ennis) + 1 local increase in GW abstraction. **5 SA Grouped Options:** – Supply spare capacity from Limerick City to neighbouring WRZs, rationalising Cappamore/Murroe/Foileen, Pallasgreen and Doon. Decommission 8 WTPs. – Increase SW abstraction and supply spare capacity from Limerick City to neighbouring WRZs, South West Regional, Foynes Shannon Estuary and Adare. Decommission 1 WTP. – Supply spare capacity from Glenosheen/Jamestown/Kilmallock to KilfinaneArdpatrick. Rationalise Kilfinnane Ardpatrick to Kilmallock WRZ (rationalise to Jamestown WTP). Decommission 2 WTPs. – 1 interconnection from the NSS* to Newport and Killaloe. Decommission 3 WTPs. – 1 rationalisation and increased groundwater abstraction (Upperchurch to Kilcommon). Decommission 1 WTP.

Study Area	WRZ Level Approach	SA Preferred Approach
SA9** Greater Dublin Area	The SA Preferred Approach comprises one (1) Option, and if progressed, will involve the development of a single project that includes a new surface water abstraction from the Parteen Basin, referred to as the New Shannon Source (NSS) of 194 Ml/day to meet the Deficit for the GDA. This volume does not include additional supply that may be required to meet the Need in other Study Areas where the Preferred Approach requires a supply from the GDA or the NSS. The additional abstraction volume required to address the collective Need of these Study Areas and the GDA, is assessed as part of the development of the Regional Preferred Approach (see Section 8). The option also includes: – A new 185 Ml/day WTP at Birdhill. – Twin rising mains from abstraction to new WTP (2 km). – New break pressure tank, 2 clear water tanks, new pumping station (ps) and booster pumping station, new termination point reservoir in Peamont. – 1600 mm diameter pipeline from WTP to break pressure tank (~41 km). – 1600 mm diameter pipeline from the break pressure tank to the termination point reservoir (~130 km). <u>Common to All Requirements</u> In addition to the above combination of Options, interventions for improved resilience and quality have been identified. These interventions include upgrades to all WTPs, new storages, new and upgraded trunk mains, pump upgrades and rationalisation of 2 (two) WTPS – Roundwood Well WTP and Glenealy WTP. They do not provide additional supply to the GDA and are common to all Option Combinations that are assessed for SA9. The SA9 Preferred Approach Summary Table in Section7.5.9 lists the components of the Common to All Requirements.	

* New Shannon Source (NSS) - transfer from the Parteen Basin to the Greater Dublin Area (GDA).

** SA9 consists of a single WRZ. For this reason, all Options (or combinations of Options) that address the Need for SA9 are defined as WRZ Options. The WRZ Level Approach and SA Preferred Approach are therefore the same.

A summary of the infrastructure components for the WRZ Level Approach and SA Approach Type is provided in Table 7.12.

Table 7.12 SA Preferred Approach (PA) and WRZ Level Approach Assessment – Infrastructure Components

SA	Approach Type	Infrastructure Component						
		New Pipeline (km)	New WTPs	Upgrade WTPs *	New/ Upgraded Abstracts.	Decomm. WTPs	Decomm. Abstracts.	Water Storage
SA1	SA Preferred Approach	62	0	10	6	10	10	5
	WRZ Level Approach	14	2	18	15	2	1	3
SA2	SA Preferred Approach	27	0	9	7	3	3	3
	WRZ Level Approach	12	2	11	6	1	1	2
SA3	SA Preferred Approach	160	1	8	3	11	12	7
	WRZ Level Approach	111	3	12	8	4	4	7
SA4	SA Preferred Approach	174	0	2	0	13	13	2
	WRZ Level Approach	109	0	12	6	3	3	8
SA5	SA Preferred Approach	25	1	15	9	0	0	6
	WRZ Level Approach	23	1	14	8	0	0	7
SA6	SA Preferred Approach	81	1	36	23	6	7	10
	WRZ Level Approach	83	1	39	26	4	4	11
SA7	SA Preferred Approach	35	0	11	4	7	7	4
	WRZ Level Approach	16	0	13	6	5	5	4
SA8	SA Preferred Approach	146	0	29	16	18	19	14
	WRZ Level Approach	76	1	41	22	5	2	11
SA9**	SA Preferred Approach***	259	1	0	1	2	2	10
Total	SA Preferred Approach	969	4	120	70	70	73	61
	WRZ Level Approach	703	11	160	98	26	20	63
Difference		**+266**	**-7**	**-40**	**-28**	**+44**	**+53**	**-2**

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

** SA9 consists of a single WRZ. For this reason, all Options (or combinations of Options) that address the Need for SA9 are defined as WRZ Options. The WRZ Level Approach and SA Preferred Approach are therefore the same.

***Infrastructure components associated with the 'Common to All Requirements' (see Table 7.11 SA9 Preferred Approach description) are not included.

7.3.2 Assessment against the Six Approach Categories

Table 7.13 compares the relative Multi Criteria Assessment (MCA) scores of the Preferred Approach at Study Area Level against the WRZ Level Approach for each of the six Approach Categories. A comparative description for each Study Area is presented in Table 7.14. Further justification for the selection of the SA Preferred Approach is set out in detail in the supporting Study Area Technical Reports (Appendix 1 - 9). The SEA Eastern and Midlands Regional Report contains more information related to the environmental assessment outcomes and the NIS (Natural Impact Statement) contains further detail on the assessment of Likely Significant Effects (LSEs) on European sites (as identified for the Framework Plan).

Table 7.13 SA Preferred Approach (PA) and WRZ Level Approach Assessment – MCA Scores

Study Area	Approach Type	Approach Category					
		Least Cost	Quickest Delivery	Best AA*	Lowest Carbon	Most Resilient	Best Env.
SA1	SA Preferred Approach	Best		0 No. -3 scores		Worst	Best
	WRZ			0 No. -3 scores	Best	Best	Worst
SA2	SA Preferred Approach	Best	Worst	0 No. -3 scores	Worst	Best	Best
	WRZ	Worst	Best	0 No. -3 scores	Best	Worst	Worst
SA3	SA Preferred Approach	Best		0 No. -3 scores			
	WRZ			0 No. -3 scores			
SA4	SA Preferred Approach	Best	Best	0 No. -3 scores	Worst	Best	Best
	WRZ			0 No. -3 scores			Worst
SA5	SA Preferred Approach	Best	Worst	0 No. -3 scores			Worst
	WRZ			0 No. -3 scores			
SA6	SA Preferred Approach	Best		0 No. -3 scores			
	WRZ		Best	1 No. -3 scores			
SA7	SA Preferred Approach		Worst	0 No. -3 scores		Best	Best
	WRZ			0 No. -3 scores			Worst
SA8	SA Preferred Approach	Best		1 No. -3 scores			Best
	WRZ			1 No. -3 scores			
SA9**	SA Preferred Approach	Best		1 No. -3 scores	Best	Best	Best

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

** SA9 consists of a single WRZ. For this reason, all Options (or combinations of Options) that address the Need for SA9 are defined as WRZ Options. The WRZ Level Approach and SA Preferred Approach are therefore the same.

Table 7.14 SA Level Preferred Approach (PA) comparison with WRZ Level Approach

Study Area	SA Preferred Approach (PA) comparison with WRZ Level Approach
SA1	**The PA is the Least Cost, Best AA and Best Environmental approach.** The WRZ Level Approach has a lower pipeline length. However, it has a smaller number of decommissioned WTPs, and a higher number of WTP upgrades and new/upgrade abstractions. These contribute to an NPV that is 21% higher than the Preferred Approach. Neither approach consists of high-risk Options that could impact on European sites. Whilst the PA will have a slightly longer delivery timescale, the Quickest Delivery Approach scores considerably lower against environmental objectives and has a higher carbon score. The PA scores best against the SEA objectives for public wellbeing and landscape due to the decommissioning and rationalisation of existing infrastructure. The PA also has the lowest number of increased groundwater abstractions and related to this has the lowest impacts to biodiversity. The reduction in resilience is not significant between the PA and WRZ Level Approach and therefore the PA is the most appropriate choice when considering scores across all of the Approach Categories. The PA has a slight increase in carbon compared to the WRZ Level Approach (which is the Best Carbon approach). This is associated with the energy required to treat, store and pump the water through the proposed 62 km network. However, this is not considered to be significant when compared against the other benefits of the PA.
SA2	**The PA is the Least Cost, Best AA, Most Resilient and Best Environmental approach.** Compared with the WRZ Level Approach, the SA Preferred Approach requires 15km of extra pipeline. However, the WRZ Level Approach requires 2 new WTPS and upgrades to 2 additional WTPs compared with the PA. The PA therefore has an estimated NPV that is 9% lower than the WRZ Level Approach. Neither approach consists of high-risk Options that could impact on European sites. The delivery of the PA will take more time than the WRZ Level Approach but the environmental, cost and resilience benefits of the PA outweighed the additional delivery time requirements. The PA scores better against the SEA objectives as it is likely to have lower materials and waste impacts due to the rationalisation of assets. It is also likely to have a lower landscape impact as it requires less above ground infrastructure. The PA has a higher carbon impact due to the increased energy requirements through the abstraction, pumping and treatment requirements associated with this option, however, lower performance in this category is outweighed by the significant gains in resilience, overall environmental improvement and costs savings associated with the PA.

Study Area	SA Preferred Approach (PA) comparison with WRZ Level Approach
SA3	**The PA is the Least Cost Approach.** The PA includes a SA Grouped Option that intends to rationalise seven (7) of the WRZs. It has a longer length of pipeline requirement to the WRZ Level Approach; however, when all projects are delivered it will reduce the number of upgraded WTPs, new WTPs and upgraded abstractions as well as decommissioning more WTPs. The NPV for the PA and the WRZ Level Approach are similar and estimated to be within 3% of each other; however, the PA has improved scorings on most of the other Approach Categories. Neither approach consists of high-risk Options that could impact on European sites. The PA scores better against the SEA objectives as it is likely to have a lower impact on public health and well-being and improve the landscape due to the higher number of WTPs being decommissioned and less construction. The lower resilience score for the PA is not considered to be significant. No other approach enables similar resilience to the WRZ Level Approach whilst maintaining the environmental credentials offered by the PA.
SA4	**The PA is the Least Cost, Quickest Delivery, Best AA, Most Resilient and Best Environmental approach.** The PA includes a SA Grouped Option that intends to rationalise 11 of the 13 WRZs. This requires an additional 65 km of pipeline compared with the WRZ Level Approach, however, enables the decommissioning of 10 more WTPs, and correspondingly 10 less WTP upgrades. The NPV for the PA is comparable to the WRZ Level Approach and is estimated to be 3% lower. The PA scores best for five of the Approach Categories. Neither approach consists of high-risk Options that could impact on European sites. As the PA only involves three (3) separate Options, it is the Quickest Delivery approach. It also connected to a more resilient source, with increasing resilience over the long-term. The PA whole life carbon estimate (including construction and operation) indicates increased contribution to carbon emissions mostly through operational energy use. Mitigation for carbon emissions would be considered and could include increased sourcing of energy from renewable sources and improving energy efficiency.
SA5	**The PA is the Least Cost Approach.** The PA and WRZ Level Approach are similar in terms of infrastructure development. The PA has an estimated NPV that is 8% lower than the WRZ Level Approach, due mainly to the capital and operational costs. The two approaches achieve a similar ranking against the remaining five Approach Categories, the two approaches achieve a similar ranking. The PA leads to a small decrease in environmental resilience compared with the WRZ Level Approach. This is due to the higher number of new/upgraded abstractions which result in worse scores against biodiversity, landscape and carbon criteria. This is not considered significant because there are no alternative approaches which would enable better environmental resilience whilst improving the AA score.

Study Area	SA Preferred Approach (PA) comparison with WRZ Level Approach
SA6	**The PA is the Least Cost Approach.** The PA is similar in terms of infrastructure development as the WRZ Level Approach. The NPV for the PA and the WRZ Level Approach are similar with a less than 1% difference. The PA has been selected as it has no high-risk Options that could impact on European sites, while the WRZ Level Approach has one high-risk Option. The PA also avoids potential impacts on the Owenbeg River section of the River Barrow and Nore SAC. Whilst the delivery time of the PA will be longer than the WRZ Level Approach the difference is not considered to be significant when taking into account that a quicker delivery is anticipated to lead to a decline in environmental credentials and some impacts on European Sites.
SA7	**The PA is the Best AA, Most Resilient and Best Environmental approach.** The PA requires 19km more pipeline to connect grouped supplies; however, has two (2) fewer upgraded WTPs and increased abstractions and decommissions three (3) more WTPs. The NPV for the PA and the WRZ Level Approach are similar and is estimated to be within 1% of each other. Neither approach consists of high-risk Options that could impact on European sites. The PA has been selected as it has a higher environmental score and is more resilient than the WRZ Level Approach. It also performs slightly better than the WRZ Level approach for carbon. The slightly higher cost of the SA Preferred Approach (approximately 1% higher) is not considered significant when compared against the environmental gains offered by the PA. The increase in delivery time between the WRZ Level Approach and the PA is also not considered to be significant.
SA8	**The PA is the Lowest Cost and Best Environmental approach.** The WRZ Level Approach requires 70 km less pipeline than the PA; however, it has 12 more WTP upgrades, 1 new WTP, new/upgraded abstractions and decommissions less WTPs. The PA has an estimated NPV that is 13% lower than the WRZ Level Approach. The lower cost is associated with the reduced number of WTP and abstraction upgrades as a consequence of the rationalised supplies. Both the WRZ Level Approach and PA consist of one (1) high-risk Option that could impact on European sites. Mitigation measures to address the risk are set out in the Natura Impact Statement (NIS) to the RWRP-EM. The PA scores best for the SEA objectives compared with all other option combinations for the Study Area. This is attributed to the improved landscape resulting from the decommissioned WTPs and absence of new WTPs. The PA is also likely to have less adverse impact on the water environment due to the reduced number of increased abstractions. The higher carbon and resilience score is not considered significant when compared against the environmental gains through the selection of the PA.
SA9	**The PA is the Lowest Cost, Best AA, Lowest Carbon, Most Resilient and Best Environmental approach.** As a single WRZ, the Preferred Approach for SA9 is both the WRZ Level Approach and the SA Preferred Approach. A comparative assessment between the two approaches is therefore not applicable. The SA9 Technical Report (Appendix 9) includes a comparative assessment between other combinations of Options that were assessed to determine the Preferred Approach for SA9.

Appropriate Assessment (AA)

The assessment of the Likely Significant Effects (LSEs) on European sites resulted in no -3 scores for the Preferred Approach (PA) for SA1 toSA7. (A score of -3 equates to LSEs that may be harder to mitigate or require significant project level assessment). There are options with -2 and -1 scores where there is potential for LSEs, however these can be addressed with general/standard mitigation measures.

The Preferred Approach (PA) for SA8 and SA9 each have one (1) Option with a -3 score. Whilst the Preferred Approach for SA8 and SA9 are assessed to have potential LSE (-3 score), other approaches were assessed as less favourable overall as they have higher environmental impacts and are less resilient.

For SA8, the -3 score relates to the connection to Limerick City WRZ, for which the abstraction is direct from the Lower River Shannon SAC. Although there are several options that connect to the Limerick WRZ, a single -3 score is assigned as it is the same abstraction that is assessed as a single impact.

The SA9 -3 score is linked to the New Shannon Source surface water abstraction, where construction activity and abstraction may impact the Lower River Shannon SAC.

Our assessment shows that all potential LSEs on European Sites across all Study Areas can be addressed by mitigation measures as set out in the NIS to the RWRP-EM. No Adverse Effect on Site Integrity (AESI) are identified at plan level.

SEA Objectives

Six (6) of the nine (9) Study Areas have a SA Preferred Approach that is the Best Environmental Approach. This includes SA1, SA2, SA4, SA7, SA8 and SA9. The Preferred Approach for these Study Areas include a transfer from the Parteen Basin (the New Shannon Source) and corresponding supply rationalisations that involves the decommissioning of WTPs and their associated abstractions. The decommissioned WTPs will likely improve the landscape, and the rationalisation is likely to have less adverse impact on the water environment due to the reduced number of increased abstractions.

Although the Preferred Approach for SA5 scores worst against the Best Environmental criteria compared with other option combinations, there is not a significant difference between the best environmental scores. There are also no alternative option combinations that would enable better environmental resilience whilst improving the AA score. The Preferred Approach does score relatively well for carbon compared with other option combinations.

The SA3 and SA6 Preferred Approach score better than their corresponding WRZ Level Approach for the Best Environmental criteria, however, they are not ranked as the Best Environmental against other option combinations. The scores, however, were not significantly lower that the scores for the option combination selected as the Best Environmental Approach. For SA3, the main difference between the Best Environmental Approach and the Preferred Approach is that the Preferred Approach includes an additional groundwater abstraction and WTP upgrade, decommissions more WTPs and has half the pipeline length. It therefore has a lower associated cost. The difference in the environmental scores is not considered significant compared with the cost benefit outcome. For SA6, the Best Environmental Approach has over double the length of pipeline and a higher number of treated water storages. For this reason, the Preferred Approach scores ‘Best’ in the Least Cost category.

Across the region, the Preferred Approach, through supply rationalisation, includes the decommissioning of 44 more WTPs and 53 more abstractions. Nine (9) of the 20 surface water abstraction sites will be abandoned. Cessation of abstractions from these surface water sources has potential to benefit ecology and support water Framework Directive (WFD) objectives.

Least Carbon

Many of the SA Preferred Approaches do not rank high relative to other option combinations against the Least Carbon criteria. It should be noted that at detailed project level, the carbon performance can be

improved significantly through energy efficient design and investigation of low carbon initiatives. Also, further work on future operational modes will allow us to optimise the interconnected supplies, to provide resilience and environmental benefit whilst balancing energy and carbon impacts[2].

7.3.3 Cost Comparison

The cost efficiency derived through the rationalisation of supplies and network connections can be seen by comparing the Net Present Value (NPV) for the WRZ Level Approach with the SA Preferred Approach. The percentage difference between the two (2) approaches is presented in Table 7.15.

SA1 and SA8 notably achieve the largest reductions of 21% and 13% respectively. The reduction can be associated with the rationalisation of six (6) WRZs to Vartry WTP by one SA Grouped Option for SA1; rationalising 10 WRZS across SA8, including five (5) connections to the Limerick City supply. Further detail of these Options is provided in Section 7.5.8 and the corresponding Technical Appendices.

Table 7.15 Cost Comparison

Cost Difference (%) SA Preferred Approach cf. WRZ Level Approach								
SA1	SA2	SA3	SA4	SA5	SA6	SA7	SA8	SA9
-21%	-9%	3%	-3%	-8%	-0.3%	1%	-13%	N/A

= Reduced cost

= Increased cost

The comparison of costs is not applicable for SA9 as the SA Preferred Approach and the WRZ Level Approach are the same.

Figure 7.8 compares the total cost of the WRZ Level Approaches and the SA Preferred Approaches for SA1 to SA8. SA9 is not included in this comparison as the WRZ Level Approach is the SA Preferred Approach, hence the cost if presented in the two charts would be the same.

There is an overall 6% reduction in the total plan level cost across SA1 to SA8, which is achieved by interconnecting and rationalising supplies at the Study Area Level. The environmental and social costs and carbon costs are slightly higher for the SA Preferred Approach overall. This is mostly associated with the additional construction of the pipeline infrastructure to interconnect WRZs and sources. However, the operational cost is considerably reduced, due to the rationalisation of multiple supplies and associated decommissioned WTPs.

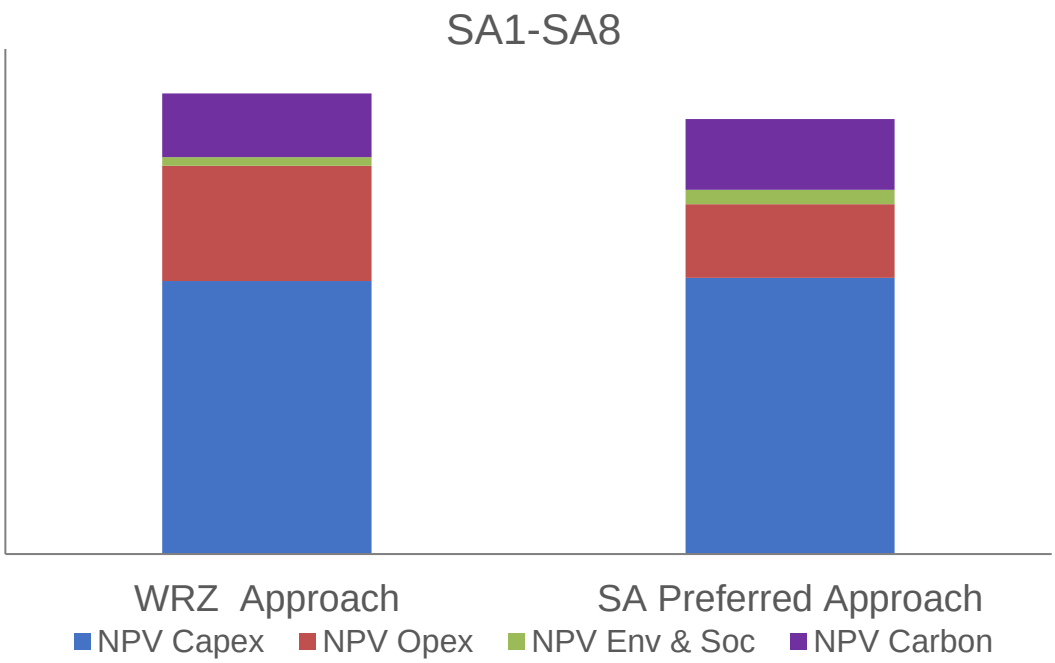

Figure 7.8 NPV Costs for WRZ Level Approach and Study Area Preferred Approach (SA1-SA8)

7.4 SA Preferred Approach

7.4.1 Water Supply Sources

The SA Preferred Approach for the nine (9) Study Areas address the supply Deficit through:

- Independent local WRZ supplies - small local surface water and groundwater sources;
- Within SA interconnected supplies - interconnected WRZs supplied from a source within the SA; and/or
- Cross SA interconnected supplies – interconnected WRZs supplied from a source outside the SA.

For WRZs that are not in Deficit, the Preferred Approach includes only a WTP Water Quality processing upgrade (WQ upgrade only).

Table 7.16 lists the number of WRZs supplied by each source type, and the WRZs where a WTP upgrade (WQ only) is required.

Table 7.16 Preferred Approach Source Types (by WRZ)

WRZ Source Type	Number of WRZs								
	SA1	SA2	SA3	SA4	SA5	SA6	SA7	SA8	SA9
Local source (GW)	5	7	3	-	5	21	3	14	-
Local source (SW)	-	-	-	-	3	-	1	1	-
Within SA interconnection	3	-	-	-	-	2	-	13	-
Cross SA interconnection	7	3	7	11	-	3	3	2	1
WTP upgrade (WQ only)	3	2	1	2	2	2	3	1	-

Under the Preferred Approach sixty-one (61) local groundwater supplies (increased or new) and five (5) local surface water supplies (increased or new) contribute to meeting an estimated 8% and 6% of the Deficit across the Eastern and Midlands Region, respectively. The supplies are mostly expansions of existing sources with some new abstractions.

As noted in Section 7.3.1, eight (8) of the nine (9) Study Areas benefit from Cross SA interconnections supplied from the New Shannon Source (NSS), which is the Preferred Approach for SA9, Greater Dublin Area (GDA). Four (4) of these Study Areas (SA4, SA6, SA7, SA8) will obtain supply from the NSS via a connection to the pipeline transferring treated water from the NSS to the GDA. Three (3) Study Areas (SA1, SA2 and SA3) will connect via the GDA supply network. The Cross SA interconnection involves ten (10) Options that benefit thirty-seven (37) WRZs, including the GDA, and contributes to resolving 80% of the Deficit across all Study Areas.

The remaining 6% of the Deficit across the nine (9) Study Areas is met by Within SA Interconnections. These include: four (4) interconnections to the Limerick City supply system, utilising the spare capacity at Clareville WTP; and four (4) rationalisations to groundwater sources with associated upgraded existing supplies.

The relative contribution of the types of sources that will address the supply Deficit is represented in Figure 7.9.

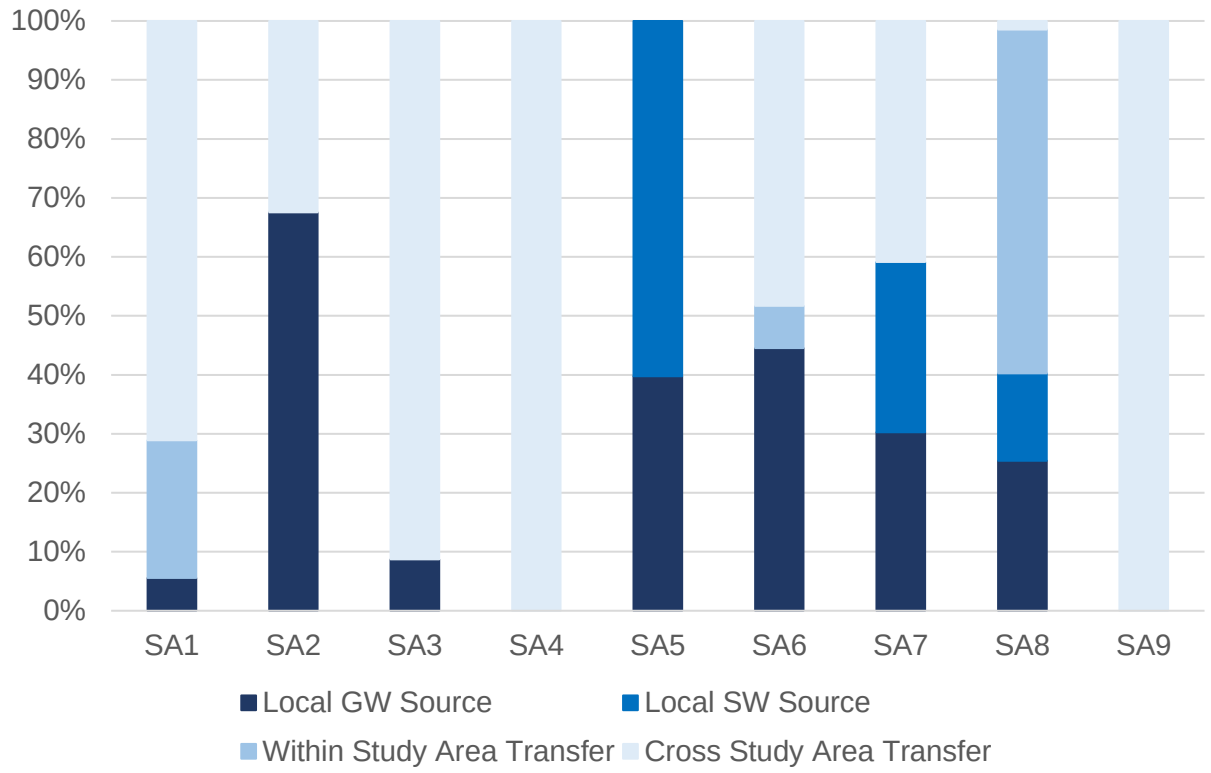

Figure 7.9 Preferred Approach Source Type – Percentage (%) of Deficit Supplied

Rationalised Supplies

Seven (7) Study Areas include Options that rationalise water supply systems. This involves the connection of a WRZ to another water supply system, accompanied by the decommissioning of Water Treatment Plants (WTPs) and their abstractions. Across the Eastern and Midlands Region the SA Preferred Approach will decommission 70 WTPs and abandon 73 abstractions.

Rationalised systems provide the benefit of a reduced number of WTPs, which is likely to have SEA benefits of reduced landscape impact, and over the longer term will reduce operational costs. Resilience and Flexibility are also improved through larger, interconnected supplies.

7.4.2 Changes to Existing Infrastructure

Figure 7.10 shows the existing WTPs and key interconnecting pipelines across the region. Currently, the two largest WTPs are Ballymore Eustace WTP and Leixlip WTP, which supply the Greater Dublin Area (GDA) and have capacities exceeding 200,000 m^3/day. Table 7.17 lists the WTPs with capacities exceeding 10,000 m^3/day and the WRZs they supply.

Table 7.17 Water Treatment Plant Capacities >10,000 m^3/day

Water Treatment Plant	WRZ Name	Capacity* (m^3/day)
Athlone WTP	Athlone	12,400
Ballyboden WTP	Greater Dublin Area	12,800
Ballymore Eustace WTP	Greater Dublin Area	286,000
Castle Lake WTP	Shannon/Sixmilebridge	13,800
Clareville WTP	Limerick	79,800
Coolbawn WTP	Nenagh	12,800
Drumcliffe WTP	Ennis	14,700
Foynes WTP	Shannon Estuary	20,500
Leixlip WTP	Greater Dublin Area	215,400
Liscartan WTP	Navan and Midmeath	13,200
Portloman WTP	Mullingar Regional	20,100
Rathvilly WTP	Carlow North	10,500
Srowland WTP	Greater Dublin Area	34,800
Staleen WTP	South Louth and East Meath	28,900
Vartry WTP	Greater Dublin Area	68,800

*22 hr WTP Design Capacity

The changes to existing infrastructure associated with the SA Preferred Approaches are shown in Figure 7.11 to Figure 7.13. The figures display new, upgraded and decommissioned WTPs and new interconnecting mains. Water treatment plants (WTPs) with a capacity upgrade will also have an associated increased or new abstraction. Water treatment plants (WTPs) upgraded for water quality only are associated with WRZs that will remain in surplus throughout the 25-year planning period. The decommissioned WTPs identify systems involving rationalisation of the WRZ supply system to an adjacent WRZ.

Figure 7.11 displays the changes to existing WTPs where the Preferred Approach involves a local groundwater or surface water source (Local WRZ source). Figure 7.12 displays the infrastructure changes associated with WRZs where the Preferred Approach is to supply the Deficit by interconnecting

to another WRZ within the same Study Area; while Figure 7.13 displays the cross study area supplies, which are provided by interconnecting to the GDA or directly to the New Shannon Source transfer pipeline.

The figures highlight that most of the local sources are within SA2, SA5, SA6 and SA7. Water resource zones (WRZs) in SA8 are served by a combination of local independent sources and within study area interconnections to the Limerick Supply system, and SA1, SA3 and SA4 will be mostly served by connecting to the GDA.

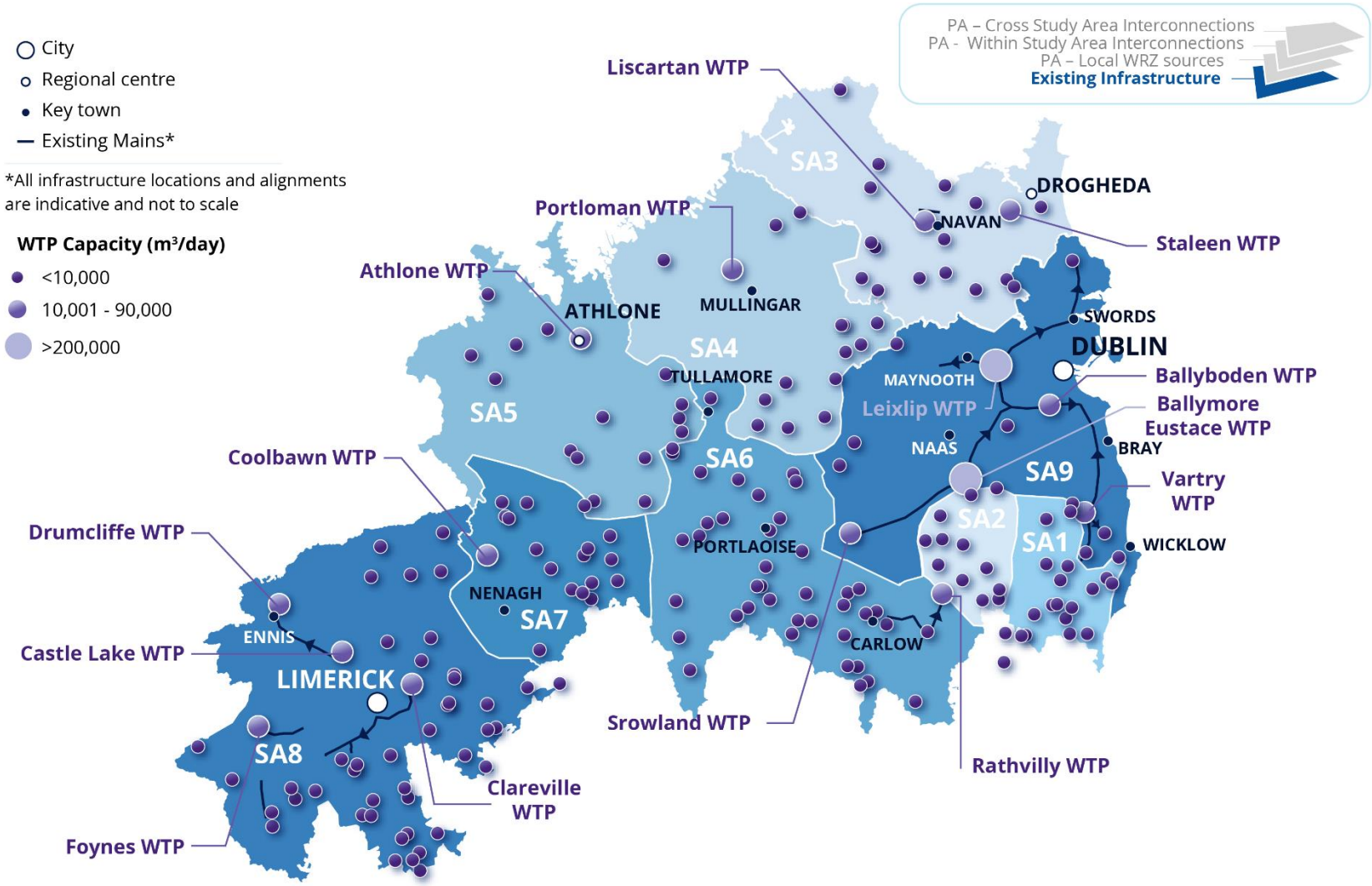

Figure 7.10 Existing Infrastructure

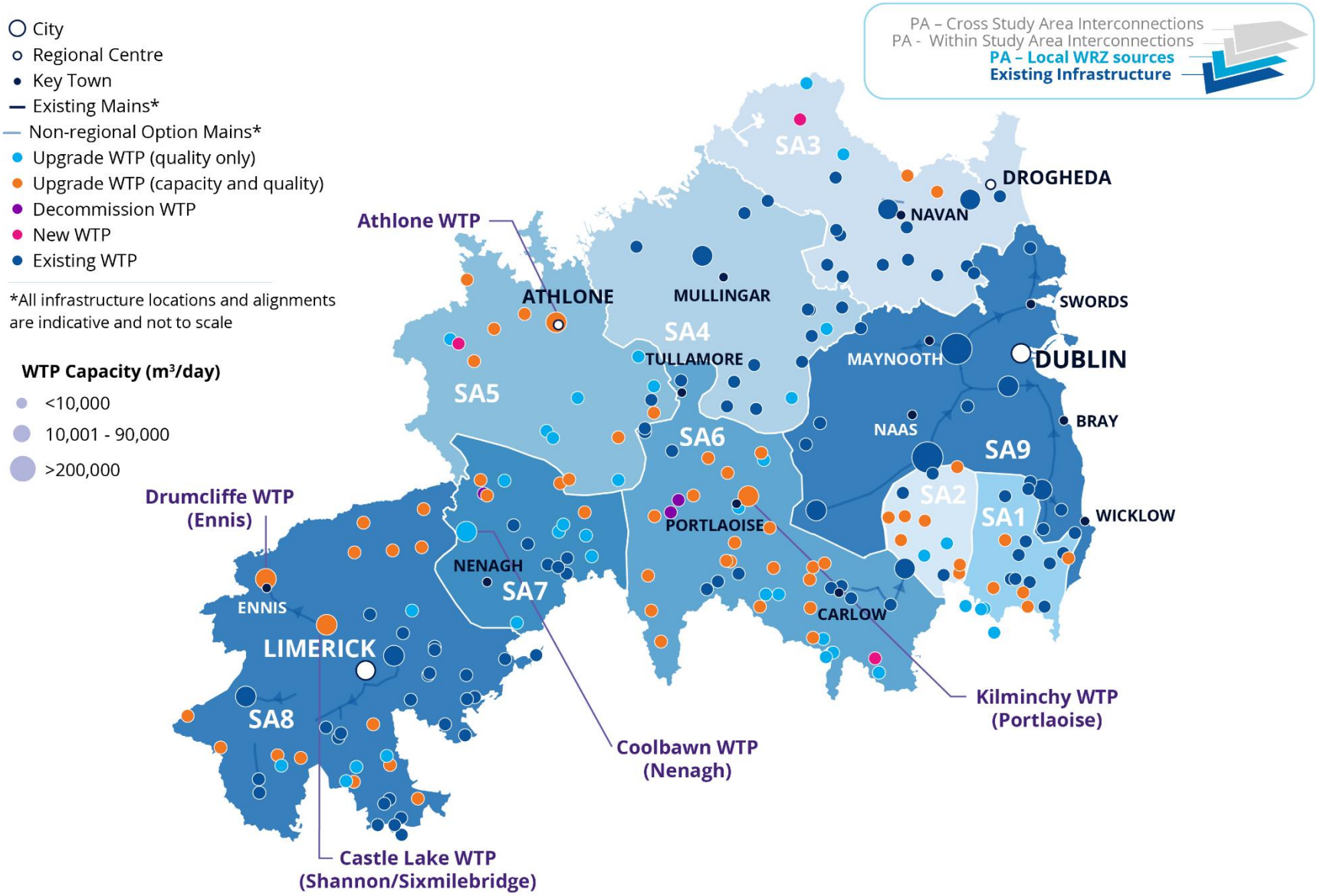

Figure 7.11 Preferred Approach – Local WRZ Sources

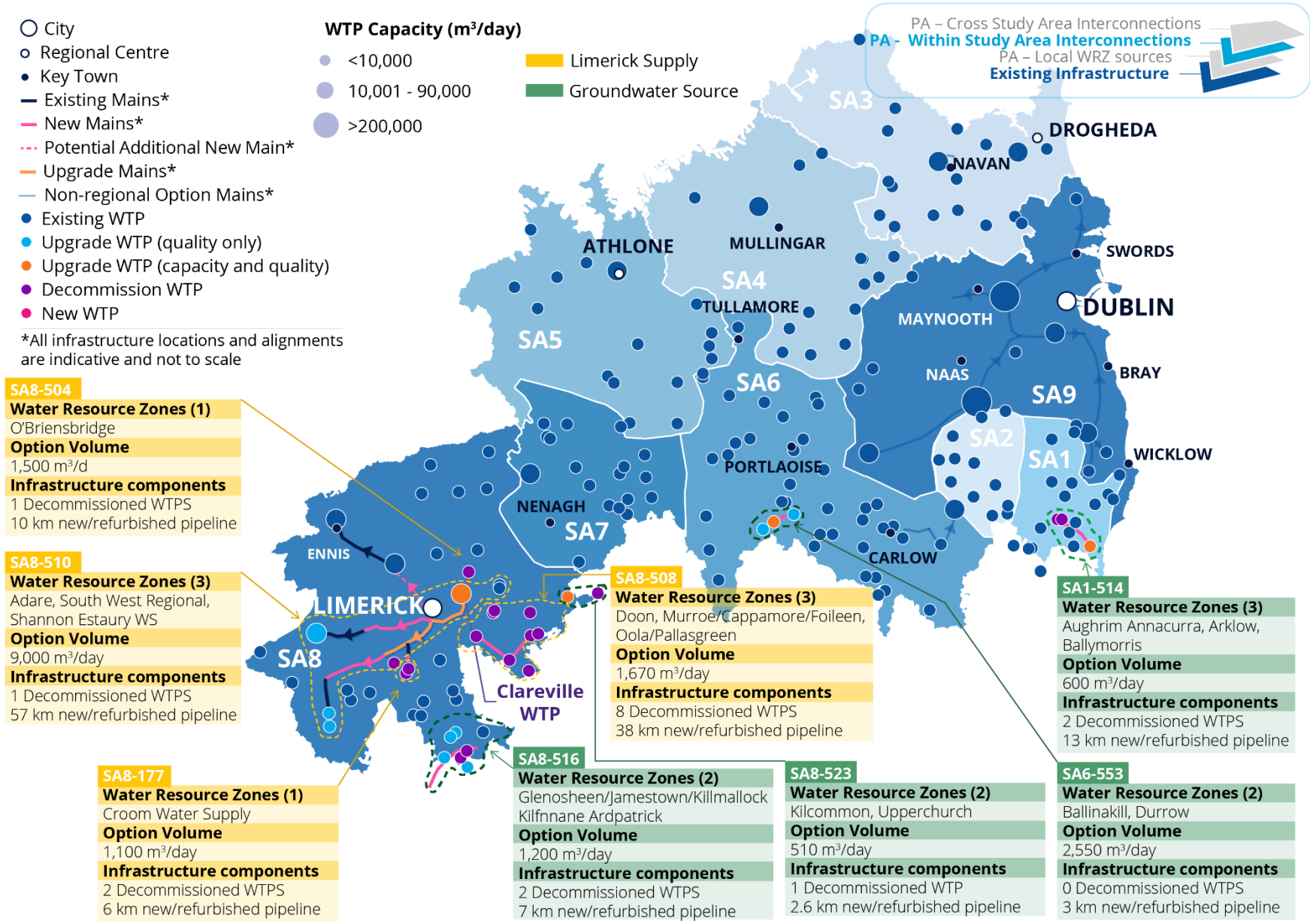

Figure 7.12 Preferred Approach – Within SA Interconnections

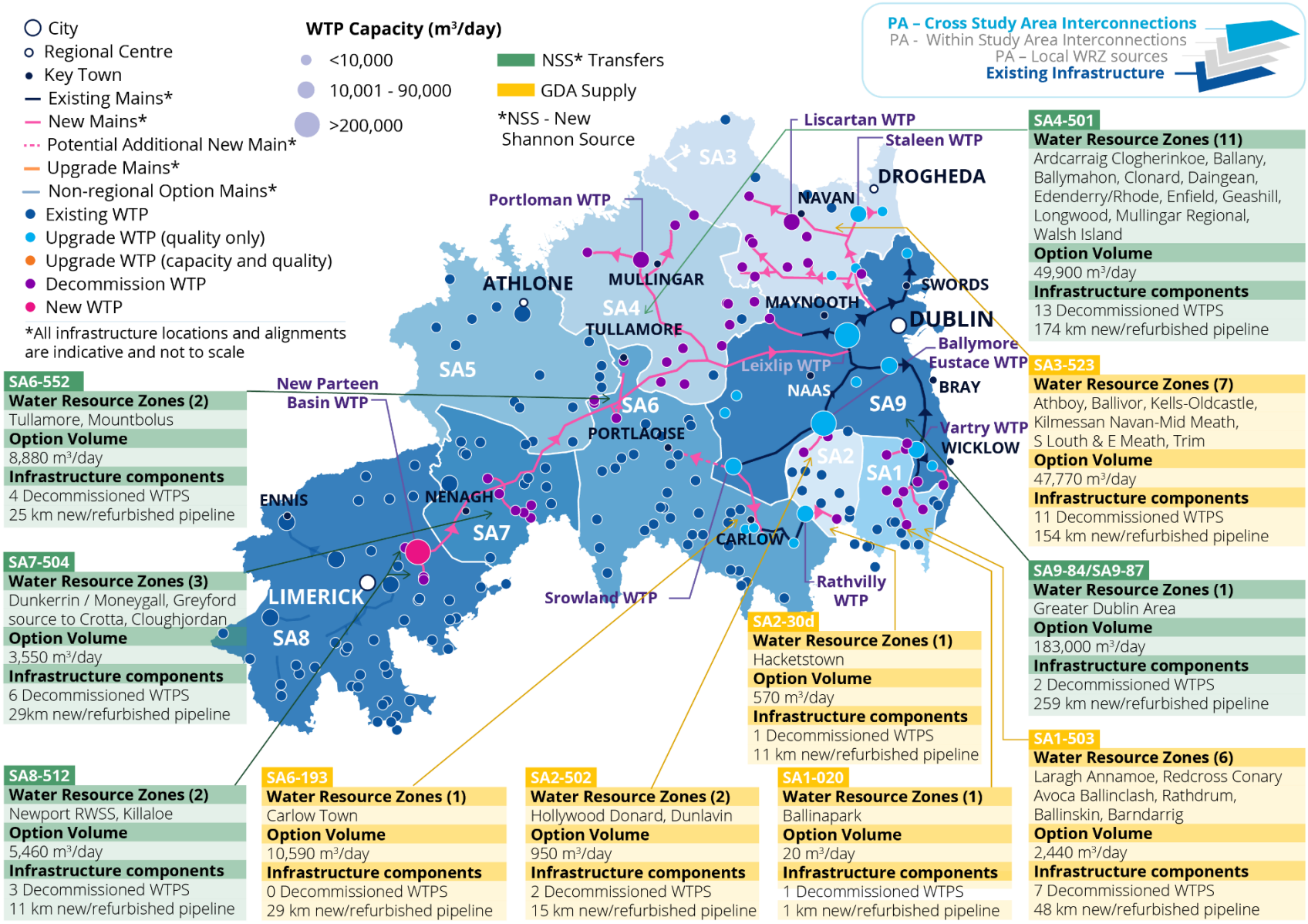

Figure 7.13 Preferred Approach – Cross SA Interconnections

7.4.3 Addressing Leakage

Leakage reduction measures are a key component of the Preferred Approach to addressing Need across the Eastern and Midlands Region. As outlined in Section 5.2, the measures aim to achieve the National Sustainable Economic Level of Leakage (SELL) targets by 2034.

The total volume reduction required to meet the National SELL target is 213 Ml/day. This will be achieved through the following contributions:

- 39% within the GDA (representing 84 Ml/day).
- 11% for other WRZs across the Eastern and Midlands Region (representing 22.5 ML/day).
- 50% through measures implemented in WRZs across the South West, North West and South East Regions (representing 106.5 Ml/day).

The Preferred Approach for the GDA includes leakage reduction that will fully achieve the 84 Ml/day SELL target for the GDA by 2034.

For WRZs outside of the GDA that are located within the Eastern and Midlands Region, the Preferred Approach incorporates 3 Ml/day of the 22.5 ML/day SELL target. This has been prioritised across the Study Areas based on:

- Size of supply demand Deficits;
- Existing abstractions with sustainability issues; and
- Observed impacts during the 2018 drought.

Therefore, across the Eastern and Midlands Region, the Preferred Approach includes the following leakage reductions which contribute to achieving the SELL target:

- SA3 - 356 m^3 per day through net leakage reduction in Athboy, Bailieboro, Navan Mid Meath and Trim.
- SA4 - 251 m^3 per day through net leakage reduction in Ballymahon and Mullingar Regional.
- SA5 – 570 m^3 per day through net leakage reduction in Birr/Kinnitty, South Roscommon and Athlone.
- SA6 - 823 m^3 per day through net leakage reduction in Carlow North, Clogh- Castlecomer, Portlaoise, Portarlington and Tullamore.
- SA8 - 978 m^3 per day through net leakage reduction in Ennis, Shannon/ Sixmilebridge, and Limerick City.
- SA9 – 92,429 m^3 per day through net leakage reduction.

(Note: 1,000 m^3 per day is equivalent to 1 Ml/day).

Further to the volume reductions incorporated as part of the Preferred Approach, Irish Water has committed to achieve the remaining 19.5 Ml/day of the SELL target for the Eastern and Midlands Region by 2034; and has set an additional leakage target for the Region of 35.5 ML/day that exceeds the SELL target, also to be met by 2034. This will be achieved by reducing leakage levels to 21% of Total Demand for larger WRZs where the demand is greater than 1,500 m^3 per day.

The achievement of these additional leakage targets may mean that the supply volume delivered by the Preferred Approach would not be required in full. This will provide the opportunity to adapt the Preferred Approach, for example through changes in the delivery timeframe or modular designs. In the circumstance that higher than projected growth occurs, the additional leakage reductions would go towards balancing the additional demand generated through higher growth.

In order to ensure that the solutions (Preferred Approach) which we develop (Section 6-8) remain appropriate in the scenario of reduced leakage and static demand we have carried out a sensitivity analysis of our solutions (Preferred Approach). This has allowed us to understand the impact of leakage reductions on the proposed solution (Preferred Approach) and whether it would still be valid under a reduced leakage scenario. This process allows us to balance the delivery of the solution (Preferred Approach) between the Lose Less pillar (Section 5.2) and Supply Smarter pillar (Section 5.4).

7.4.4 Addressing Water Quality

Our Interim Barrier Assessment (described in our Framework Plan and summarised in Section 3.3.2 of this RWRP-EM) identified Water Quality driven Need to inform the Preferred Approach development. The assessment determined that 181 of the 201 water treatment plants in the Region have a high risk of not meeting one or more of four Water Quality Barriers. However, in some cases our desktop assessments can over-estimate risk, particularly when there is little available data on the catchment characteristics of our raw water sources. As our "Source to Tap" Drinking Water Safety Plan (DWSP) assessments (which are a requirement under the Recast Drinking Water Directive (DWD)[3] are developed for each water supply, the barrier scores for all our supplies will be updated and become more reliable.

A **'Barrier'** consists of any actions, processes, procedures, standards or assets (treatment plants, water mains, pumping stations etc) put in place across the entire system from catchment to tap to achieve water of sufficient quality and quantity. The four Barriers include: 1) Protection against bacteria and virus; 2) Maintain chlorine residuals in the network; 3) Protozoa removal processes; 4) Prevention of the formation of trihalomethanes (THMS).

It should be noted that the assessment is not an indicator of non-compliance with the European Union (Drinking Water) Regulations 2014, as amended (Drinking Water Regulations)[4], but an assessment of the asset capability standard compared with the asset standard as set out in Section 5.7 of the Framework Plan. The assessment provides an indication of the Need to invest in areas of our asset base (human and structural) through resource planning, to ensure that we can address potential risks or emerging risks to our supplies.

The Preferred Approach for all Study Areas includes upgrades to water quality treatment efficiency for all treatment plants that are not associated with an in-flight project (a project that is in progress - these are described in Section 4 of the RWRP-EM). The Water Treatment Plant (WTP) upgrades are designed to address the risks identified in Section 3.3.2 through improvements in filtration, coagulation and ultraviolet (UV) treatment. They do not include improvement measures that are related to actions required on WTPs that are subject to an EPA direction or are listed on the EPA Remedial Action List (as outlined in Table 3.15 of this RWRP-EM).

7.4.5 Environmental Sustainability

As outlined at Section 3.7.2 of the Framework Plan, the Government is currently developing new legislation that will introduce abstraction licensing. Licence applications will be assessed against environmental criteria to ensure compliance with the Water Framework Directive (WFD) (2000/60/EC), both for the specific abstraction and in combination with other activities. The Environmental Protection Agency (EPA) will determine the licences.

The River Basin Management Plan (RBMP)[5] suggests that abstractions greater than 25 m^3/day may be reviewed to examine any potential risk to WFD objectives; and all abstractions greater than 2,000 m^3/day will require a licence. The new regulatory regime will inevitably result in modifications to the way that Irish Water currently abstract from its individual water sources. However, as this legislation is still being developed, Irish Water do not have full visibility of the future regulatory regime and therefore cannot reliably include an estimation of sustainable abstraction within the Supply Demand Balance (SDB) calculations. A more detailed site by site assessment will be required when the legislation is published in its final form.

Notwithstanding this, as discussed in Section 2 of this Plan, in the absence of legislative requirements, Irish Water has proactively undertaken an independent conservative assessment of abstractions based on UKTAG standards to determine (i) the potential impact on our SDB and (ii) to identify possible

alternative solutions to improve the sustainability of our abstractions. This assessment procedure is set out in Appendix C of the Framework Plan and is in line with a precautionary approach. Under the proposed regulatory regime, sustainable abstraction quantities will be adjudicated by the EPA, and therefore the assessment undertaken by Irish Water is a conservative estimate only, the purpose of which is to help influence future planning.

A sensitivity analysis (presented in Section 7.6) is conducted for each WRZ, to allow us to stress test the sensitivity of the Preferred Approach against potential sustainability driven reductions to existing abstractions (again, taking a conservative and precautionary approach as to the level of reductions that may be required). This will ensure that our decision making is robust, and the Preferred Approaches are adaptable and compatible with future potential regulatory regimes, in so far as this can be anticipated at this stage.

Our assessment has identified twenty (20) surface water sites where potential abstraction reductions may be required in the future. This is based on conservative estimates of what a future regime may require. These sites are listed in the Table 2.4 of this Plan.

Figure 7.14 and Figure 7.15 show our existing surface water and ground water abstraction sites. For surface water, the sites where potential abstraction reductions may be required in the future, as a result of the new licencing regime, are highlighted in red.

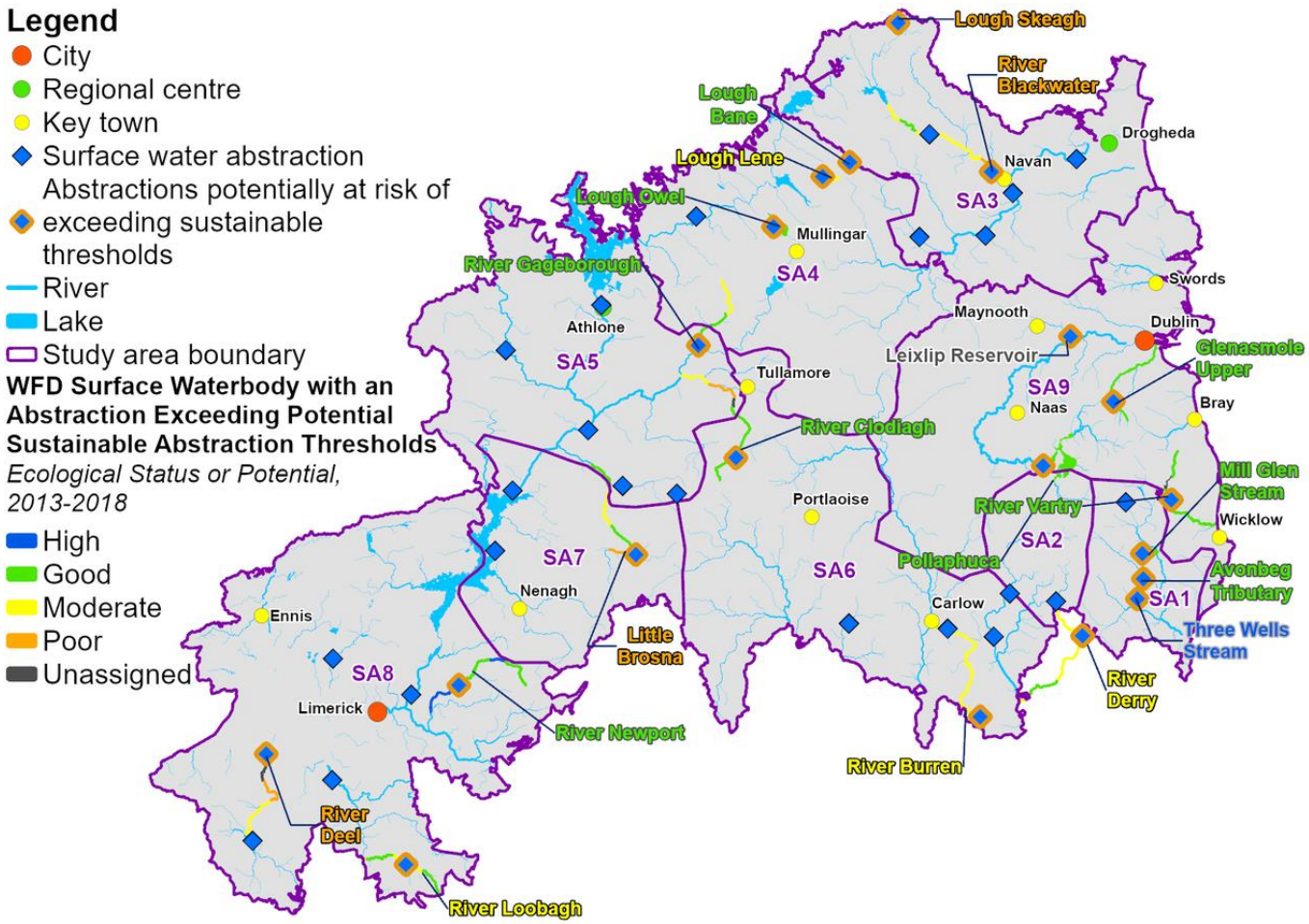

Figure 7.14 Existing Surface Water Abstractions

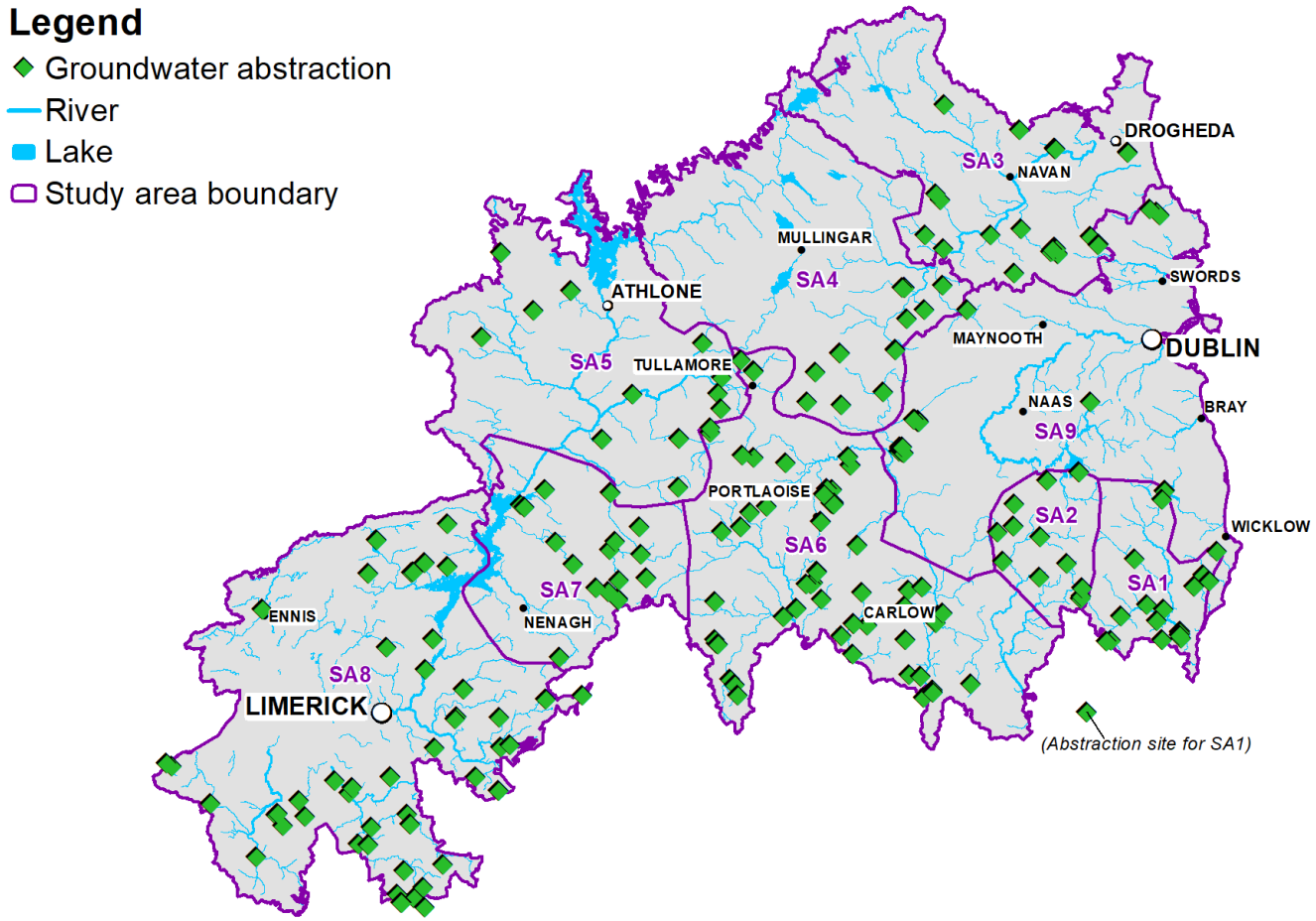

Figure 7.15 Existing Groundwater Abstractions

When developing our Preferred Approach, we considered solutions to improve the sustainability at the sites that were assessed to be potentially impacted by new legislation. Through the rationalisation of supplies, it is anticipated that nine (9) of the 20 surface water abstraction sites will be abandoned. This has the potential to improve the environmental outcomes at these sites and reduce the uncertainty posed by the future legislation.

Table 7.18 lists the abstractions that will be abandoned as part of the SA Preferred Approach. Figure 7.16 displays their location in the context of the waterbody WFD Ecological Status or Potential.

Table 7.18 Preferred Approach – Abandoned Abstractions Potentially At Risk of Exceeding Sustainable Abstraction Thresholds

Study Areas	Abandoned Abstractions Potentially At Risk of Exceeding Sustainable Abstraction Thresholds	
	Number of Abstraction Sites	Site Name (WRZ) / WFD Waterbody Name
SA1	3	Tributary of Avonberg Ballinder (Rathdrum Public Supply) / Mill Glen Stream Three Wells Stream (Aughrim Annacurra Public Supply) / Three Wells Stream Tributary of Avonberg River (Avoca Ballinclash Public Supply) / Avonberg Stream
SA2	0	n/a
SA3	2	River Blackwater – Liscarton (Navan-Mid Meath) / River Blackwater Lough Bane (Kells-Oldcaslte) / Lough Bane
SA4	2	Lough Lene (Ballany) / Lough Lene Lough Owel (Mullingar Regional) / Lough Owel
SA5	0	n/a
SA6	1	Clodiagh River (Tullamore) / River Clodiagh
SA7	0	n/a
SA8	1	Mulkear River (Newport RWSS) / River Newport
SA9	0	n/a

For the remaining eleven (11) abstractions, the Preferred Approach will facilitate the reduction of supplies from three (3) of these abstractions and reduce pressure on a further two (2) by supplying projected increases in demand with alternative sources. Six (6) abstractions may require alternative supply solutions. This is outlined in Table 7.16, which summarises the outcomes of the sensitivity analysis that is undertaken to ensure the Preferred Approaches are adaptable and compatible with future potential regulatory regimes.

The actual reductions that may be needed in future will depend on the specific requirements of the future legislation. Irish Water will update the NWRP as appropriate to account for these requirements, once known, using the monitoring and feedback process set out in Section 9 of this Plan. Figure 7.17 and Figure 7.17 show the changes to abstractions under the Preferred Approach development, including abstractions that will be increased, upgraded and abandoned.

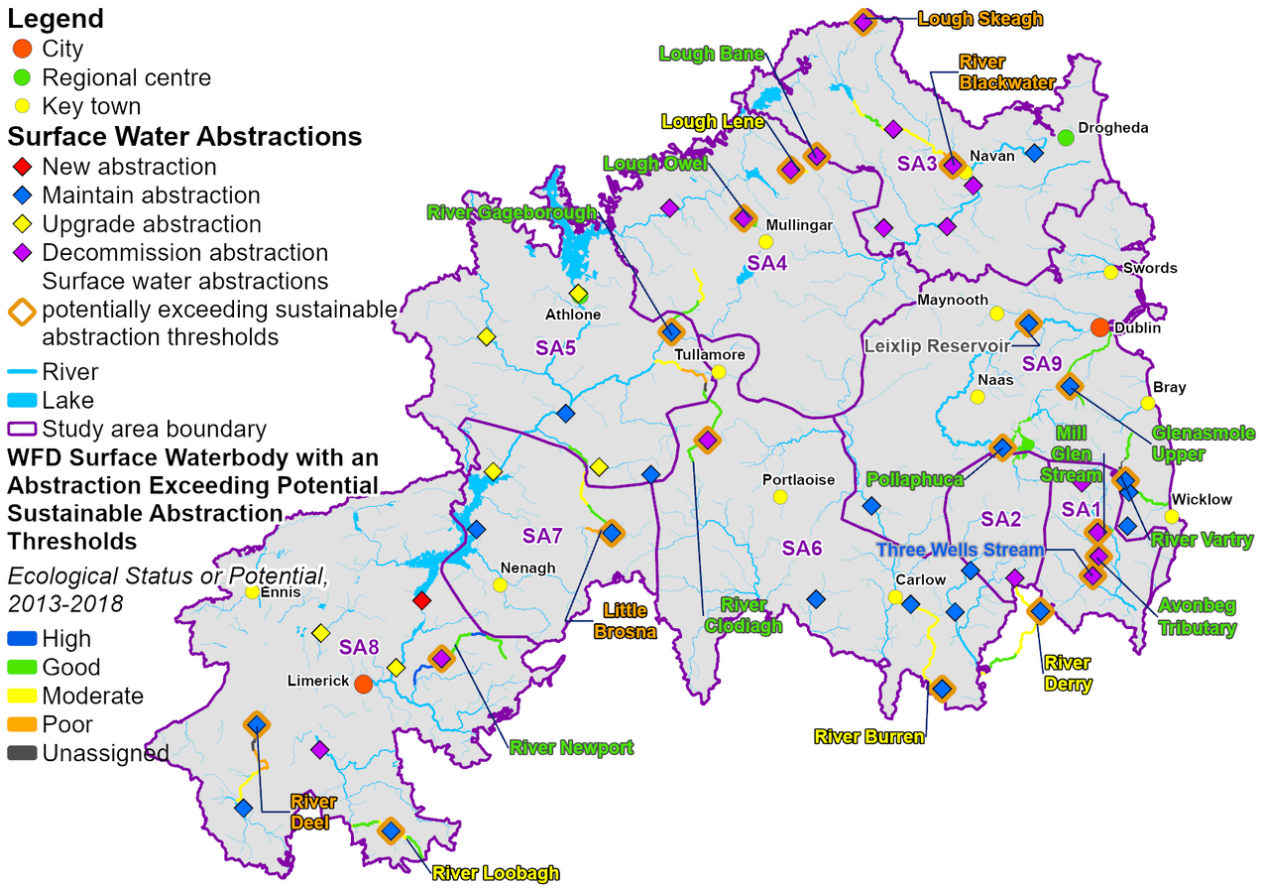

Figure 7.16 Preferred Approach – Surface Water Abstractions

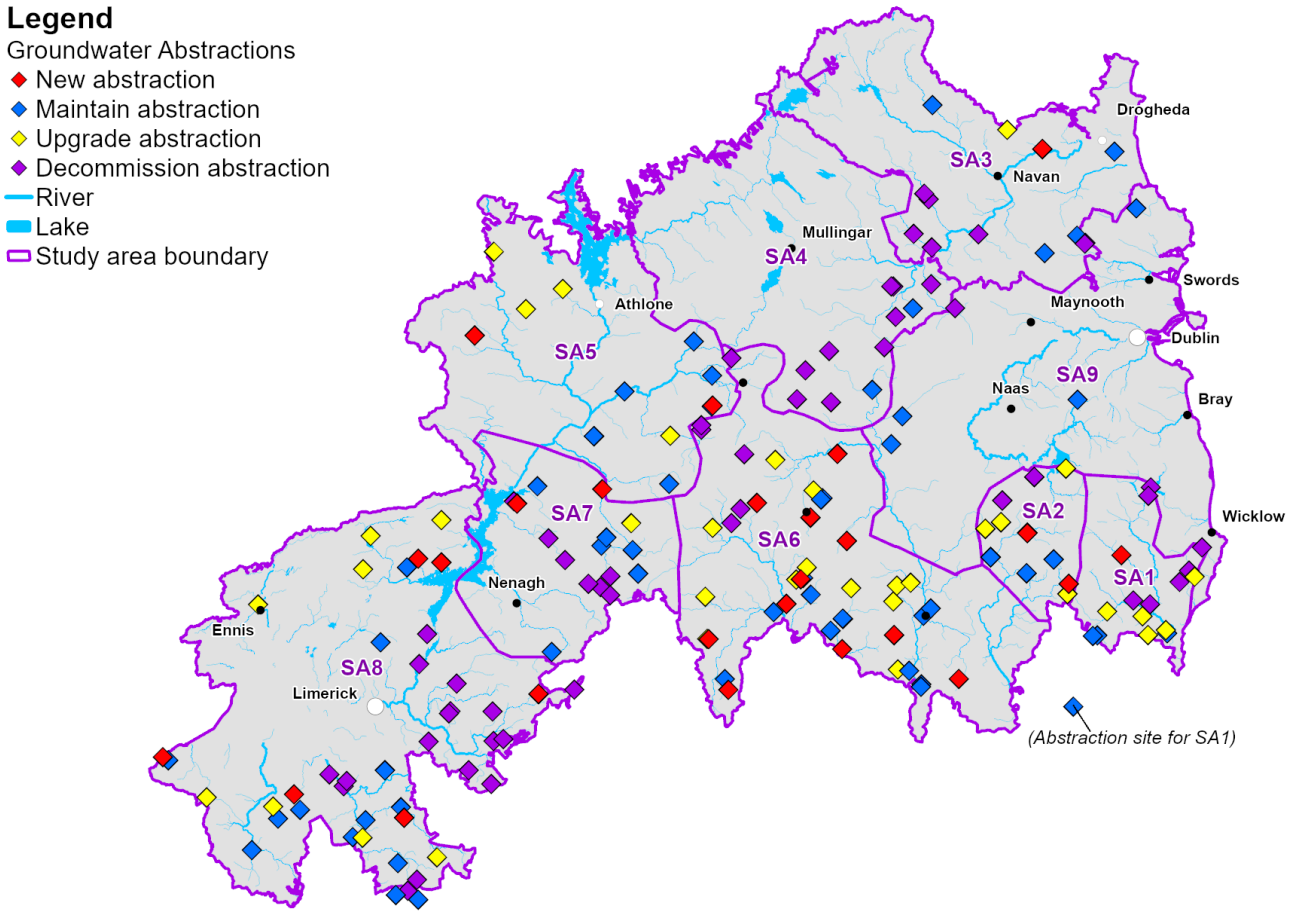

Figure 7.17 Preferred Approach – Groundwater Abstractions

7.5 SA Preferred Approach Summaries

The following sections provide a summary of the Preferred Approaches for each Study Area. Further details are contained in the Study Area Technical Reports in Appendices 1-9.