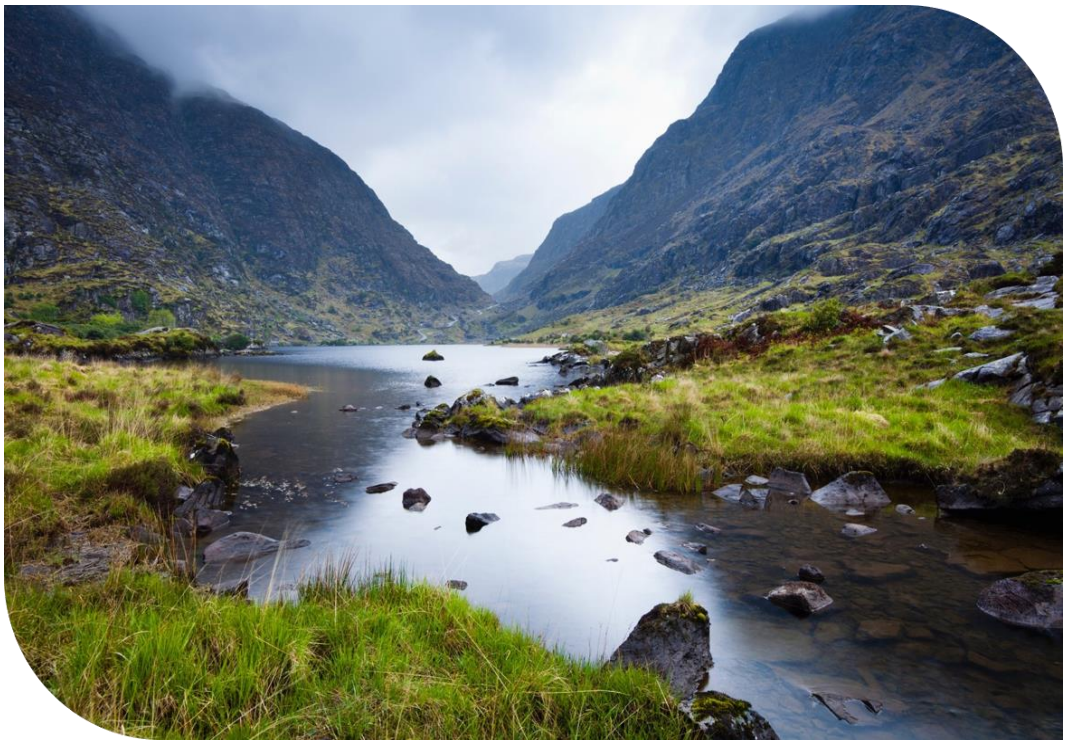
Autumn 2022

Regional Water Resources Plan – Eastern and Midlands

Appendix 8 Study Area 8 Technical Report



Tionscadal Éireann
Project Ireland
2040

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

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

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1

Introduction and Background

1 Introduction – Study Area 8

This is the Technical Report for Study Area 8 which applies the Options Assessment Methodology, as set out in the Framework Plan and the Regional Water Resource Plan - Eastern and Midlands (RWRP-EM), the final version of which was reviewed by the authors of this Technical Report prior to finalisation of this Technical Report. This document should be reviewed in conjunction with the Framework Plan and the RWPRP – EM, which explain key concepts and terminology used throughout the report.

This Study Area includes 31 water resource zones located in Counties Limerick,Clare, Tipperary, Galway and Cork, and outlined in Table 2.3. This Technical Report includes:

- The summary of Identified Need in this Study Area including Quality, Quantity, Reliability and Sustainability
- Options considered within the Study Area
- The range of approaches to resolve Identified Need
- Development of an Outline Preferred Approach for the Study Area; and
- The adaptability of our Preferred Approach.

The Preferred Approach for this Study Area feeds into the regional Preferred Approach detailed in the RWRP-EM.

1.1 Summary of Our Options Assessment Methodology

In Chapter 8 of the Framework Plan, we described the Option Assessment Methodology that will be used to develop a national programme of proposed solutions for all of our water supplies. The objective of these solutions is to resolve the needs identified through the Supply Demand Balance (SDB), Water Quality, Reliability and Sustainability assessments. These needs will be discussed in further detail in this report. In the RWRP-EM, we apply this methodology to the Eastern Midlands Region shown in Figure 1.1.

As outlined in Section 1.9.4 of the Framework Plan, the regional boundaries have been delineated for the purpose of delivering the National Water Resources Plan. As a national plan sources outside the delivery region may be considered to meet need within a particular region.

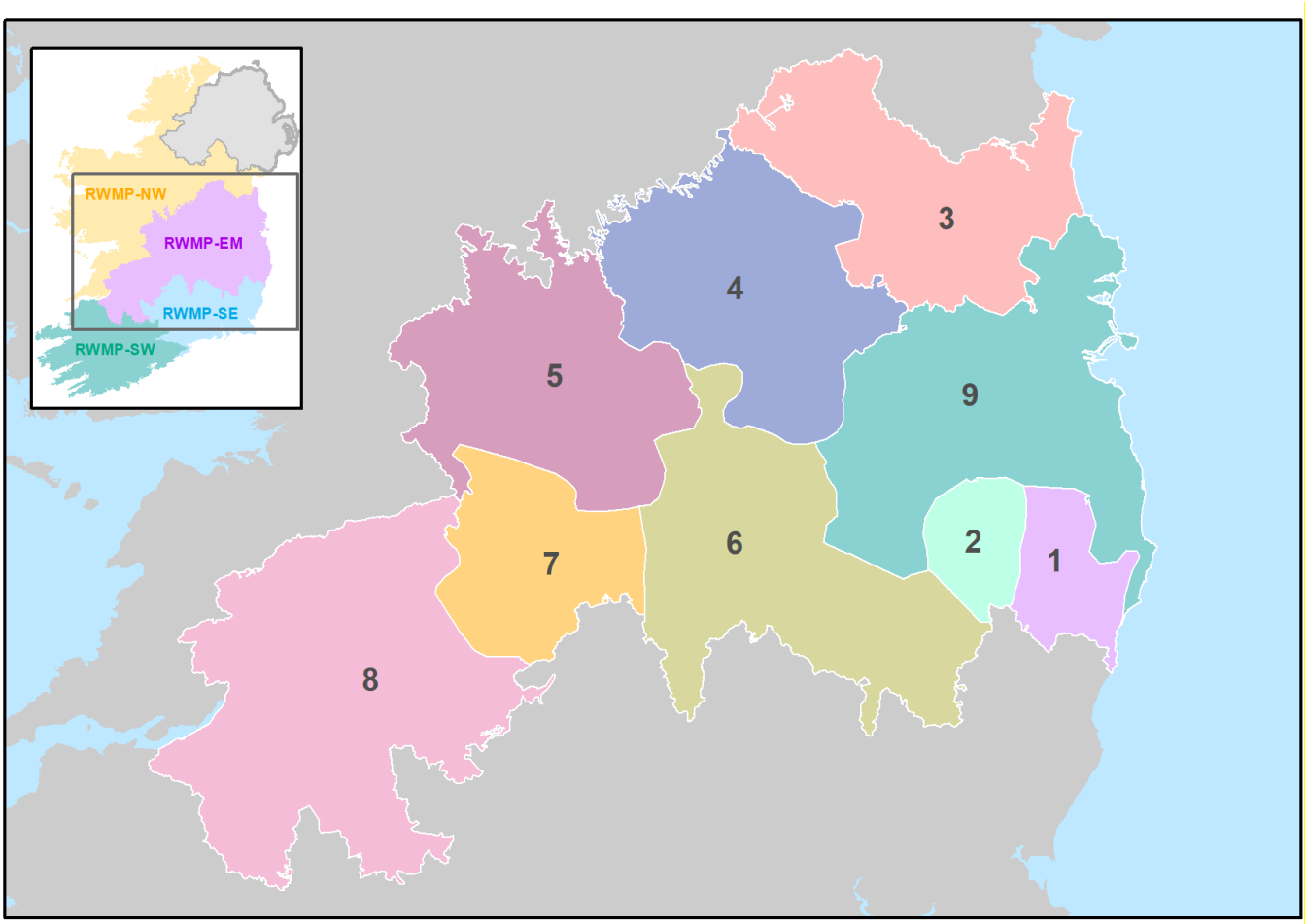


Figure 1.1 Overview of Study Areas within the Eastern and Midlands Region.

This Technical Report is for Study Area 8 (SA8), which consists of 31 individual water resource zones (WRZs).within this Study Area, the Preferred Approach has been developed following the process shown in Figure 1.2 and as outlined in Section 8.3 of the Framework Plan.

In this document, Option codes are labelled using the following naming convention: SAX-00X

- SAX refers to the Study Area within which the option is located.
- 00X refers to the individual option number.
- Any references to TG4 refers the Eastern and Midlands Region (Regional Group 4).

It should be noted that assessments and proposed solutions at this stage are at a plan level. Environmental impacts and costing of projects are further reviewed at project level. No statutory consent or funding consent is conferred by inclusion in the NWRP (National Water Resource Plan). Any projects 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 (where a project requires planning permission) or in support of licencing applications (for example, for new abstractions). Any such applications will also be subject to public consultation.

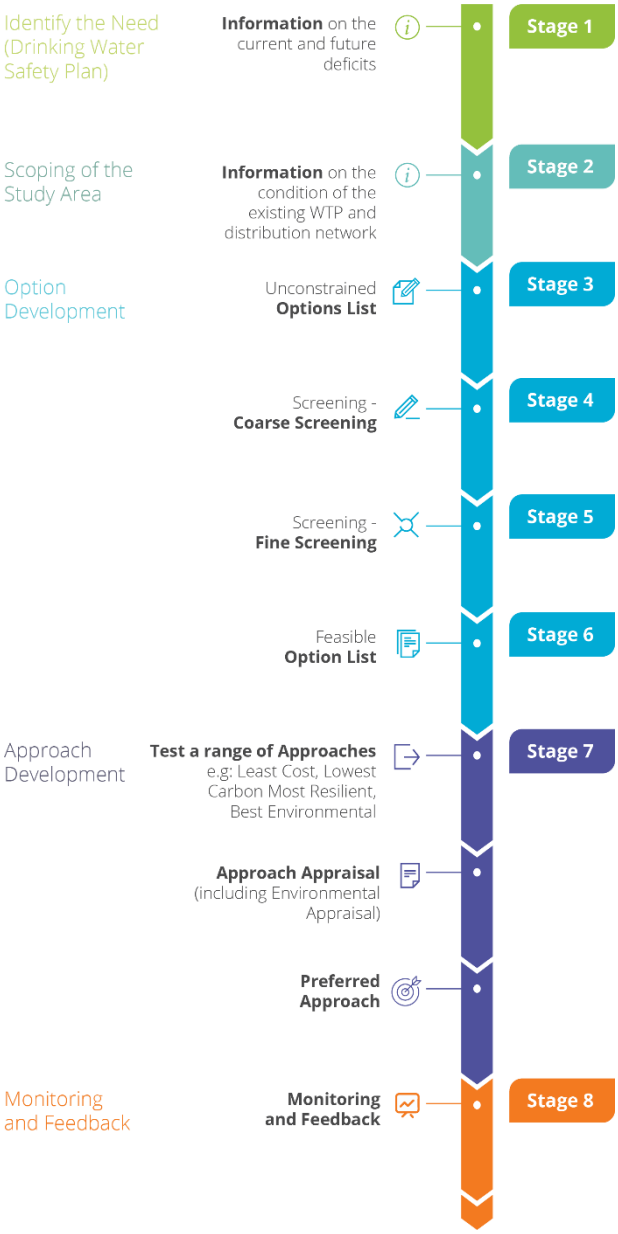


Figure 1.2: Option Assessment Methodology Process

1.2 Introduction to the Study Area

Study Area 8 consists of 31 WRZs, located to the North and South of Shannon Estuary, including areas as far east as Ardnacrusha dam on the River Shannon. The population of the area is approximately 233,560 people, supplied via approximately 3,200 kilometres of distribution network. The Study Area is summarised in Figure 1.3 and Table 1.1.

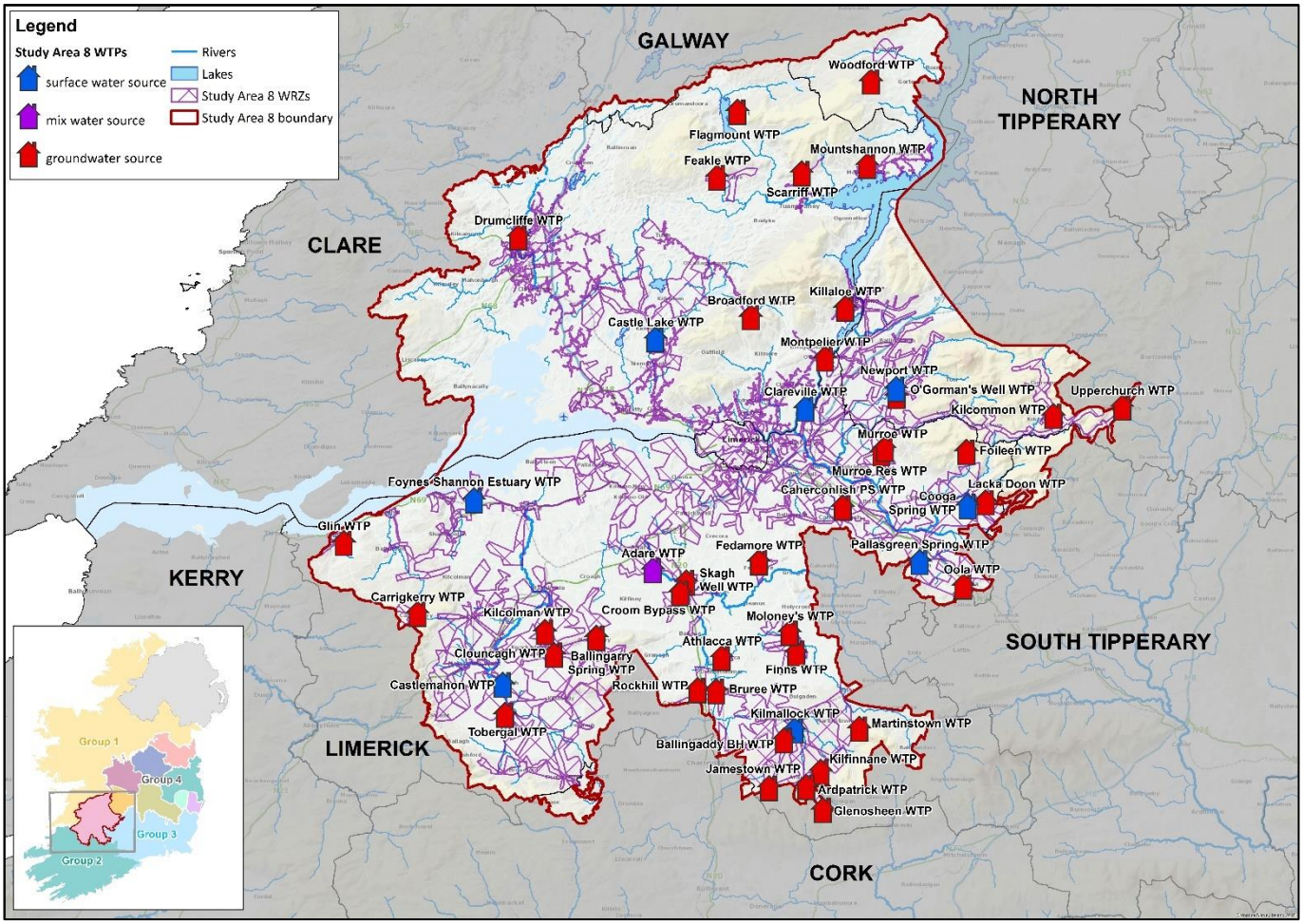


Figure 1.3 SA8 Overview

The area consists of 3 large settlements, namely Limerick City, Ennis and Shannon, and 61 smaller towns and villages. The larger supplies in the area are surface water supplies and abstract water from the River Shannon, River Deeland Castle Lake. The remaining towns and villages utilise a mix of smaller surface water abstractions or localised groundwater sources including springs and boreholes.

SA8 Limerick Clare is spread across the Lower River Shannon, Shannon Estuary North and Shannon Estuary South catchment basins, which form the lower reaches of the River Shannon catchment, the largest catchment on the island of Ireland. Parts of the River Shannon are regulated by the ESB who control releases at Parteen Basin and maintain water levels in Lough Derg in accordance within an operational band. This enables the ESB to divert flows to the Hydro Station at Ardnacrusha for power generation, to maintain the safety and integrity of the dam structures, to fulfil its obligations under the Floods Directive (2007/60/EC), and to maintain statutory compensations flows down the Lower Reaches of the River Shannon. The largest existing water supply in the region abstracts water from both the headrace canal for Ardnacrusha and the main channel of the River Shannon. The water is treated at Clareville WTP for onward supply into Limerick City and environs.

A large proportion of SA8 waterbodies are designated European Sites under the Habitats Regulations (Conservation of Natural Habitats and of Wild Fauna and Flora 92/43/EEC) and Birds Regulations (Conservation of Wild Birds79/409/EEC) including the Lower River Shannon SAC and the River Shannon and River Fergus Estuaries SPA.

There is variable natural geology across the area, centrally a regionally important karst aquifer sits as a large basin south of Limerick city and a less productive aquifer lies to the north east towards Nenagh.

41 groundwater abstractions have been developed in the area for public water supply, centred on the clean regional karstic limestone bedrock areas in the Limerick basin, in the Adare/Croom/Rathkeale/Charleville vicinity. There are large abstractions in the area ranging between 100m^3/d to 3,500m^3/d, with an average daily production of 625m^3/d.

Table 1.1 also provides an overview of the risk of failure against the Quality, Quantity, Reliability, Potential Sustainability criteria. A further breakdown of these scores is provided in Section 2.

Table 1.1 SA8 Study Area Summary

Limerick	Total Population	233,560	Total Network Length (km)	3,205	Number of Water Resource Zones	31
Counties in Study Area	Clare, Cork, Galway, Limerick, Tipperary					
Principal Settlements	Limerick city and suburbs, Ennis, Shannon. South West Regional,Annacotty, Sixmilebridge, Ardnacrusha or Castlebank,Mungret,Newport,Ballina,Caherconlish,Adare,Clonlara,Foynes					
Number of Water Sources	48	Surface Water Sources	7	Groundwater Sources	41	

Water Treatment Plant	Source	Population	WTP Capacity (m^3/day)	Quality	Quantity	Reliability	Potential Sustainability
Upperchurch WTP	Groundwater	96	60	●	○	○	○
O'Gorman's Well	Groundwater	7,248	1,200	●	○	○	○
Newport WTP	Mulkear River		3,000	●	○	○	●
Kilcommon WTP	Groundwater	1,242	650	●	●	○	●
Murroe (Reservoir) WTP	Groundwater	2,376	300	●	●	○	●
Murroe WTP	Groundwater		300	●	●	○	●

Foileen WTP	Spring	2,368	1,200	●	●	●	○
Kilcolman WTP	Spring	2,777	900	●	●	●	○
Clouncagh WTP	Groundwater		1,000	○	●	○	○
Ballingarry Spring WTP	Spring	1,013	400	○	●	○	●
Ardpatrick WTP	Spring	1,312	136	●	●	●	○
Kilfinnane WTP	Groundwater		500	●	●	●	○
Adare WTP	River Maigue & BH	2,272	1,800	●	○	○	○
Skagh Well WTP	Spring	1,730	120	●	●	○	○
Croom Bypass WTP	Groundwater		550	●	●	●	●
Foynes (Aughinish) WTP	River Deel	7,155	22,320	●	●	●	●
Glin WTP	Groundwater	671	300	●	●	○	○

Carrigkerry WTP	Spring	258	91	●	●	○	○
Castlemahon WTP	Castlemahon River Abstraction	9,743	3,120	●	●	●	○
Tobergal WTP	Spring	4,218	3,300	●	●	○	○
Athlacca WTP	Groundwater	97	50	●	○	○	○
Bruree WTP	Groundwater	737	400	●	●	○	○
Rockhill WTP	Groundwater	303	800	●	●	○	○
Ballygaddy WTP	Groundwater	2,590	100	●	○	○	○
Glenosheen WTP	Groundwater	142	200	●	○	○	○
Kilmallock WTP	Loobagh River	2,590	1,850	●	○	●	○
Jamestown WTP	Spring	929	3,000	●	○	○	○
Martinstown WTP	Groundwater	838	800	●	○	○	○
Finn's Well WTP	Groundwater	1,436	400	○	●	○	○
Moloney's WTP	Groundwater		400	●	●	○	○
Fedamore WTP	Groundwater	501	250	●	●	●	●
Oola WTP	Spring	807	300	●	●	●	●

Caherconlish WTP	Spring	444	375	●	●	○	●
Pallasgreen WTP	Spring	1,150	450	●	●	●	○
Cooga Spring WTP	Spring	875	140	●	●	●	●
Lacka Doon Borehole WTP	Groundwater		260	○	●	●	○
Clareville WTP	River Shannon (Clareville)	121,169	87,000	●	○	○	○
Woodford WTW	Groundwater	375	154	●	○	○	○
Creeveroe WTP	Groundwater	1,814	1,560	●	○	○	○
Drumcliffe WTP	Spring	28,963	16,000	●	●	●	○
Montpellier (Ardataggle) WTP	Groundwater	987	500	○	●	○	●
Cloonmirran WTP	Groundwater	817	500	●	●	●	●
Scarriff WTP	Groundwater	888	756	●	●	○	○
Bauragegaun WTP	Groundwater	280	260	●	●	○	○
Flagmount WTP	Groundwater	30	60	●	●	○	●
Crean WTP	Groundwater	1,545	800	●	●	●	●
Castle Lake WTP	Castlelake	23,739	15,000	●	●	●	○

Score	Irish Water Asset Standard Assessment
	Low Risk
	Medium Risk
	High Risk

2

Scoping the Study Area 8

2 Scoping the Study Area

In this chapter we summarise the current and future issues with water supplies in Study Area 8, in terms of water quality, quantity, reliability and sustainability.

To identify the issues and corresponding need with the water supplies in this Study Area, and to inform the nature, scale and scope of the solutions that we need to consider to meet them, we have assessed:

The **water quality** that we can supply;
The **water quantity** that we can supply;
The **reliability** of our existing supplies; and
Additional information that impacts the long-term **sustainability** of our sources or infrastructure.

2.1 Water Quality

We assess the water quality investment needs of our water supplies by assessing the performance of our assets against the barriers set out in Chapter 5 of the Framework Plan. As set out in Chapter 5 of the Framework Plan, Irish Water is developing scientifically robust datasets to assign risk. Irish Water are utilising the well-established 'Failure Mode Effect Analysis' which provides a step-by-step approach for identifying all possible failure modes that can result in a hazardous event. Once identified, we assess risk against the existing controls (Barriers), which we have in place for source protection within our water treatment plants and networks. This Barrier Assessment process highlights where there is a deficit [or potential for future deficit] in these controls or treatment process elements.

The barriers are an internal gauge and the initial desktop assessments of barrier performance for SA8 are summarised in Table 2.1.

Table 2.1 Quality: Barrier Scores

Quality: Barrier Scores				
Water Treatment Plants	**Barrier 1: Bacteria & Virus**	**Barrier 2.1: Maintain chlorine Residual in the Network**	**Barrier 3 Protozoa (Crypto) Asset Potential**	**Barrier 6b THM's Leading Indicator**
Upperchurch WTP	●	○	○	○
O'Gorman's Well	●	○	●	○
Newport WTP	●	○	●	○
Kilcommon WTP	●	○	●	○
Murroe (Reservoir) WTP	●	○	●	○

Quality: Barrier Scores				
Water Treatment Plants	**Barrier 1: Bacteria & Virus**	**Barrier 2.1: Maintain chlorine Residual in the Network**	**Barrier 3 Protozoa (Crypto) Asset Potential**	**Barrier 6b THM's Leading Indicator**
Murroe WTP	●	●	●	●
Foileen WTP	●	●	●	●
Kilcolman WTP	●	●	●	●
Clouncagh WTP	●	●	●	●
Ballingarry Spring WTP	●	●	●	●
Ardpatrick WTP	●	●	●	●
Kilfinnane WTP	●	●	●	●
Adare WTP	●	●	●	●
Skagh Well WTP	●	●	●	●
Croom Bypass WTP	●	●	●	●
Foynes (Aughinish) WTP	●	●	●	●
Glin WTP	●	●	●	●
Carrigkerry WTP	●	●	●	●
Castlemahon WTP	●	●	●	●

Quality: Barrier Scores				
Water Treatment Plants	**Barrier 1: Bacteria & Virus**	**Barrier 2.1: Maintain chlorine Residual in the Network**	**Barrier 3 Protozoa (Crypto) Asset Potential**	**Barrier 6b THM's Leading Indicator**
Tobergal WTP	●	○	●	○
Athlacca WTP	●	○	●	○
Bruree WTP	○	○	●	○
Rockhill WTP	○	○	●	○
Ballygaddy WTP	◐	○	●	○
Glenosheen WTP	○	○	●	○
Kilmallock WTP	●	○	○	○
Jamestown WTP	●	●	●	○
Martinstown WTP	●	○	●	○
Finn's Well WTP	○	○	○	○
Moloney's WTP	●	○	○	○
Fedamore WTP	○	○	◐	○
Oola WTP	●	○	○	○
Caherconlish WTP	◐	○	○	○
Pallasgreen WTP	◐	○	●	○
Cooga Spring WTP	○	○	●	○
Lacka Doon Borehole WTP	○	○	○	○
Clareville WTP	◐	●	◐	●
Woodford WTW	◐	○	○	○
Creeveroe WTP	●	○	●	○

Quality: Barrier Scores				
Water Treatment Plants	**Barrier 1: Bacteria & Virus**	**Barrier 2.1: Maintain chlorine Residual in the Network**	**Barrier 3 Protozoa (Crypto) Asset Potential**	**Barrier 6b THM's Leading Indicator**
Drumcliffe WTP	●	●	○	○
Montpellier (Ardataggle) WTP	○	○	○	○
Cloonmirran WTP	●	●	●	○
Scarriff WTP	○	○	●	○
Bauragegaun WTP	●	○	●	○
Flagmount WTP	○	○	●	○
Crean WTP	●	○	●	○
Castle Lake WTP	○	●	○	●

Score	Irish Water Asset Standard Assessment
○	Low Risk
●	Medium Risk
●	
●	High Risk

The colour coding within the outline assessment indicates the severity of the potential risk of barrier failure. It should be noted that the table is not an indicator of non-compliance with the European Union (Drinking Water) Regulations 2014 as amended (Drinking Water Regulations), but an internal Irish Water assessment of the asset capability standard compared with the asset standard set out in Section 5.7 of the Framework Plan.

Based on the desktop assessment, 39 of the 47 Water Treatment Plants in the Study Area are considered to be at high risk of failing to achieve the required IW standards in relation to maintaining chlorine residual in the network (Barrier 2.1) and the effectiveness of Irish Water's protozoa removal

processes (Barrier 3). 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 (2020), are developed for each water supply, the barrier scores for all of our supplies will be updated and become more reliable.

It should be noted that the "quality need" identified through the Barrier Assessment is not an indicator of compliance with the Drinking Water Regulations. It is an assessment 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.

At present there are 3 WRZs in SA8 on the EPA Remedial Action List, namely Castlemahon WTP (South West Regional) Fedamore WTP and Foynes WTP.

Irish Water is currently progressing immediate corrective action for a number of supplies within SA8. A national programme to improve disinfection standards (Barrier 1) at water treatment facilities across Ireland was initiated by Irish Water in 2016. Examples of works undertaken and in progress to address water quality issues in SA8 are included in Table 2.2. Details of the 'in progress' projects to address critical water quality requirements are included in Table 2.2.

Table 2.2 Critical Water Quality Requirements SA8 Limerick Clare

Critical Water Quality Requirements	Progress
1. **Clareville WTP**: As part of the Lead Mitigation Programme Irish Water selected the Clareville Water Treatment Plant as the pilot project for the roll out of Orthophosphate Treatment. This reduces the Plumbosolvency of the water (The ability of water to dissolve lead). The Orthophosphate treatment started in Nov 2016 and has resulted in the compliance rate for the lead limit increasing from 94.8% to 97.6%. (See box 5.1 below for further information).	**Completed Nov 2016**
2. **Clareville WTP**: As one of our key WTPs the Drinking Water Safety Plan (DWSP) has recently been completed for the Limerick City & Environs Water Supply. The resulting DWSP Improvement Plan has identified a number of interventions (operational & capital) which will be implemented in the future.	**Ongoing**
3. **Castlemahon WTP (South West Regional):** This WTP is on the RAL for pesticides in the water. Therefore catchment management measures are required to remove the WTP from the RAL. Capital maintenance upgrades at the WTP are also ongoing.	**Ongoing**
4. **Fedamore WTP:** An upgrade to the existing trail well to a G1 standard production well is now complete. A full disinfection upgrade including UV was installed at this WTP in 2019. The required information and data to demonstrate the effectiveness of the works was submitted to the EPA for consideration for RAL removal in Q3 2021.	**Complete**
5. **Foynes WTP:** This WTP is on the RAL for pesticides in the water. Therefore catchment management measures are required to remove the WTP from the RAL. Capital maintenance upgrades at the WTP are proposed for 2022.	**Ongoing**
6. **Source Protection Programme**: Works are currently in progress to develop/upgrade Groundwater sources for a number of schemes in SA8, including: Adare, Croom (further details above), Rathkeale and Pallasgreen.	**Ongoing**

Critical Water Quality Requirements	Progress
7. **Reservoir Cleaning Programme:** There are 58 treated water storage reservoirs within SA8. Of these 32 or 55% have had inspections undertaken and 11 have been cleaned. Inspections are ongoing and based on the results of the inspections, a prioritised works (cleaning/repair) schedule is updated on an ongoing basis with works undertaken as part of the National Reservoir Programme.	**Ongoing**
8. **Disinfection Programme:** Disinfection upgrades consisting of Chlorination Upgrades and/or UV installations/upgrades have been progressed at 35 sites in Study Area 8. The Disinfection Programme is in progress with a further 11 sites to be upgraded under the current programme cycle. Any requirements within the remaining supplies will be identified via Drinking Water Safety Plans with solutions developed as part of the NWRP	**Ongoing**

Box 5.1 Lead Mitigation in Limerick City

The Lead Mitigation Programme is currently progressing in Limerick City, having been prioritised by Irish Water.

The reason for this prioritisation is due to the high proportion of older housing in parts of Limerick City which have lead connections. This has resulted in lead exceedances in the water supply, higher than the EU Drinking Water Regulations limits.

The long term solution is to replace all the Lead Pipework through a combination of Targeted Lead Service Replacement (Irish Water in partnership with Limerick County Council) on the public side and getting home owners to replace private side lead connections under the Government's National lead Strategy (Grant available to home owners).

A lead pipe, a corroded pipe and a pipe with protective orthophosphate coating. Photo: USEPA

As the lead pipe replacement will take many years to complete Irish Water selected the Clareville Water Treatment Plant as the pilot plant for the roll out of the Orthophosphate Treatment Programme. Orthophosphate reduces the Plumbosolvency of the water which is the ability of water to dissolve lead. Orthophosphate is added to drinking water in the form of an additive called phosphoric acid. This is a clear, odourless liquid and is entirely safe for human consumption. Phosphoric acid as a food additive is approved for use in food products, such as dairy, cereals, soft drinks, meat and cheese products.

Benefits:
Since the introduction of Orthophosphate in November 2016, compliance with the EU parametric limit for lead of 10µg/l has increased from 94.8% to 97.6%.
There has been no change in water quality for the end user (Domestic or Commercial)

In summary, in relation to water quality, Irish Water will:

- Continually update Barrier Performance issues in the WRZ which have the potential to impact on drinking water quality in the region;

- Improve these assessments through the development of DWSPs for all of our supplies;
- Address the priority risks identified on the EPA Remedial Action List (noting that steps have already been taken, and are ongoing, to address these risks); and
- All residual need (grey dots) in Table 2.1 in relation to water quality will be brought through our options assessment process.

2.2 Water Quantity – Supply Demand Balance

Irish Water assesses the water quantity investment needs of our supplies by developing SDB calculations for each of our water supplies as outlined in Chapter 3, 4 and 6 of the Framework Plan. The calculations are used to assess the amount of water available in our supplies and compare that to the current and forecast demand for water in accordance with Figure 2.1.

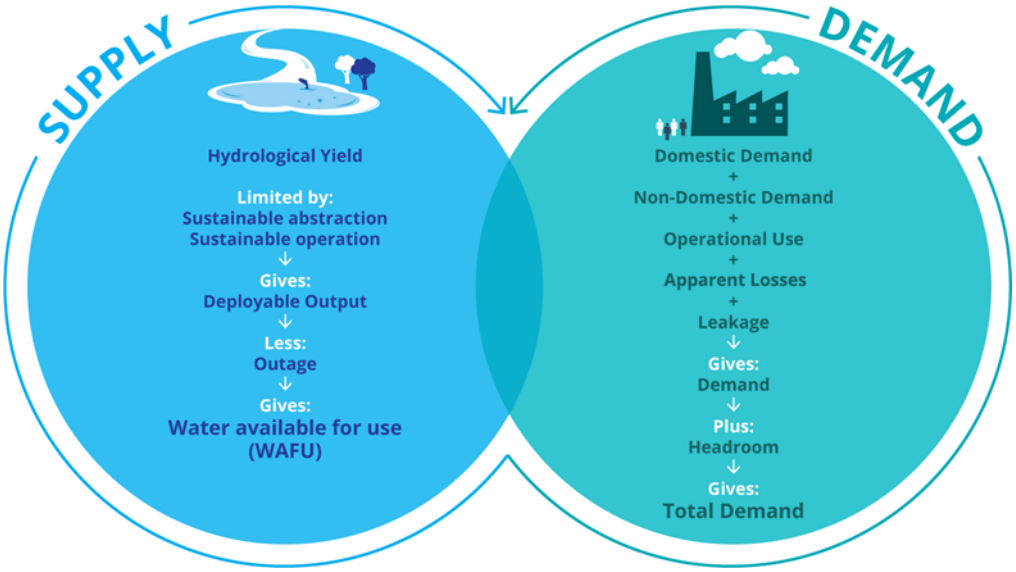


Figure 2.1 Supply Demand Balance

For each of the 31 WRZs in this Study Area, we assessed the baseline SDB and developed 25-year forecasts of supply and demand, in accordance with Figure 2.1.

The SDB assessments were carried out for each of the weather event planning scenarios (Normal Year Annual Average, Dry Year Annual Average, Dry Year Critical Period, Winter Critical Period) which described in Chapter 2 of the Framework Plan. The SDB deficits in SA8 manifest in the following ways:

1. **Inappropriate standards and levels of risk for a strategic water supply:** As water supply is essential for public health, regulated water service providers must ensure appropriate standards of water supply which are able to endure drought conditions, peak events, and maintenance of our assets. This requires adequate reserve capacity in our supplies to provide a 1 in 50 Level of service.. At present, not all supplies within this Study Area meet the required levels of reserve capacity. However, due to the lack of historical monitoring, particularly in relation to groundwater supplies, some of the deficits may be data driven.
2. **Day to day operations:** Currently for day to day operations, 22 out of 31 of the WRZs in Study Area 8 have a current SDB deficit and 25 out of 31 have a projected SDB deficit. However, under normal weather and demand conditions they do not all contribute to interruptions to supply.

During the drought in summer 2018, all of our groundwater supplies were monitored on a daily basis due to falling levels in the groundwater bodies.

For the duration of the 2018 drought, a number of the supplies in SA8 were significantly impacted including Pallasgreen, Oola and Hospital, where water had to be supplemented via tankard supplies. During the same period, significant reduction in surface water flow was also recorded on the River Maigue, supplying Adare and low flow interventions were required on the River Deel, supplying Foynes Shannon Estuary WRZ.

A summary of the SDB deficit across all 31 Water Resource Zones is summarised in Table 2.3. The water resources zones are detailed in Appendix L of the Framework Plan - Supply Demand Balance Summaries.

Table 2.3 WRZ SDB Dry Year Critical Period Deficits

Water Resource Zone Name	Water Resource Zone code	Population	Estimated Maximum Deficit m^3/day					
			2019	2025	2030	2035	2040	2044
Upperchurch	2900SC0068	96	No Deficit	No Deficit	-1	-1	-2	-2
Newport RWSS	2900SC0066	7,248	-182	-235	-282	-329	-375	-412
Kilcommon/Rearcross	2900SC0005	1,242	-407	-419	-428	-437	-445	-452
Murroe / Cappamore /Foileen	1900SC0037	4,743	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Rathkeale	1900SC0036	2,777	-1,892	-1,938	-1,967	-1,996	-2,024	-2,047
Ballingarry	1900SC0035	1,013	-389	-397	-404	-411	-418	-423
KilfinnaneArdpatrick Water Supply	1900SC0034	1,312	-568	-580	-589	-599	-608	-616
Adare	1900SC0029	2,272	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Croom Water Supply	1900SC0028	1,730	-446	-464	-481	-494	-506	-516
Shannon Estuary Water Supply	1900SC0024	7,155	-8,197	-8,508	-10,271	-10,525	-10,759	-10,945
Glin Water Supply	1900SC0022	671	-142	-146	-152	-157	-162	-167
Carrigkerry Water Supply	1900SC0020	258	-49	-50	-52	-53	-55	-56

Water Resource Zone Name	Water Resource Zone code	Population	Estimated Maximum Deficit m^3/day					
			2019	2025	2030	2035	2040	2044
South West Regional	1900SC0019	13,960	-1,555	-1,672	-1,794	-1,917	-2,039	-2,136
Athlacca Water Supply	1900SC0017	97	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Rockhill & Bruree	1900SC0016	1,039	-183	-197	-209	-217	-224	-230
Glenosheen / Jamestown / Kilmallock	1900SC0015	3,660	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Martinstown Water Supply	1900SC0014	838	No Deficit	-5	-13	-22	-30	-37
Bruff Water Supply	1900SC0009	1,436	-149	-161	-174	-184	-193	-201
Fedamore Water Supply	1900SC0007	501	-120	-125	-129	-132	-135	-137
Oola / Pallasgreen	1900SC0005	2,401	-453	-467	-480	-494	-507	-517
Doon Water Supply	1900SC0004	875	-180	-184	-190	-195	-200	-204
Limerick City	1900SC0001	121,169	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Woodford PS	1200SC0036	375	No Deficit	-1	-4	-6	-9	-11
Killaloe	0300SC0024	1,814	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit	No Deficit
Ennis	0300SC0020	28,963	-1,819	-1,850	-2,166	-2,483	-2,799	-3,051

Water Resource Zone Name	Water Resource Zone code	Population	Estimated Maximum Deficit m^3/day					
			2019	2025	2030	2035	2040	2044
Obriens Bridge PWS	0300SC0019	987	-965	-982	-989	-997	-1,004	-1,010
Mountshannon PWS	0300SC0017	817	-326	-333	-341	-348	-355	-361
Scarriff PWS	0300SC0016	888	-263	-275	-284	-293	-301	-308
Feakle PWS	0300SC0015	280	-76	-80	-83	-86	-89	-92
Flagmount PWS	0300SC0014	30	-28	-29	-29	-29	-29	-30
Ennis / Shannon/Sixmilebridge	0300SC0006	25,284	-3,618	-3,631	-3,775	-3,920	-4,062	-4,176

As outlined in Chapter 4 of the Framework Plan, the estimated population currently living in each WRZ has been based on the 2016 Census data. Forecasts for future populations have been based on draft growth projections from the National Planning Framework (NPF), and updated information from the Regional Spatial and Economic Strategies (RSES) and Local Authority Planning sections (where available).

The target 1 in 50 level of service in the region were applied in each case, along with the corresponding requirements for reserves, indicating that our supplies are operating with a cumulative supply demand balance deficit for the Region of approximately 22,007 m^3/day. As a result, while we can continue to supply water, the water supplies in this area may come under pressure, particularly in drought conditions. In addition, there may be ongoing reliability issues.

This situation will further deteriorate over time due to climate change driven reductions in water resources, together with increased demand due to population growth. If we do nothing, the supply demand balance deficit will increase to approximately 28,137 m^3/day by 2044.

Our ongoing activities to improve the Supply Demand Balance are prioritised as:

- Ongoing leakage management including active leakage control, pressure management and find and fix activities to meet target levels of Leakage.
- Water Conservation measures, including information campaigns and initiatives, and Water Conservation Orders during drought periods.

2.3 Water Supply Reliability

The benefits of having sufficient water supplies in terms of quality and quantity are negated if we cannot distribute the water we produce effectively around our networks. We also need sufficient treated water storage to enable us to respond to planned or unplanned outages on our trunk main network and appropriately manage our water production.

There are a number of problematic distribution and trunk mains throughout SA8. Irish Water & the Local Authority Water Services sections will continue to monitor the performance of all water mains in the network to ensure that the most problematic mains are replaced as required.

To date, a significant amount of watermain rehabilitation has been carried out across Study Area 8. This provides for a more reliable water supply, reducing instances of bursts and water outages. The works also improve water quality by replacing old cast iron and lead watermains, whilst reducing leakage and improving overall operation and maintenance of our supply system.

During our needs assessment for the SA, Irish Water identified a number of critical requirements for upgrades to the existing asset base, including storage and trunk main requirements. Progress to date on these projects is summarised in Table 2.4.

Table 2.4 SA8 Critical Infrastructure Projects and Need Identification

Critical Water Supply Reliability Requirement	Progress
1. **West Limerick Link Main, Southern ring main and reconfiguration of network, Ennis Road Trunk Main**: Approx. 900m was installed along the Ennis Road to the Coonagh roundabout. The Southern Ring main is fully commissioned and in operation. The 800mm section from Rossbrien to Patrickswell has been tested and repaired but is not yet commissioned. Approximately 1.6km of mains rehabilitation along the Ennis Road has been completed to assist in the transfer of water from the Southern Ring Main at Ivan's Cross to the western side of the city (O' Callaghan's Strand/North Circular Road areas).	**Complete 2019**
2. **Croom**: In order to address supply issues on the Croom PWS, Irish Water undertook a project to develop a new groundwater source. Works commenced in late 2018, however, further to site testing it was determined that the required supply could not be obtained from the Groundwater source. Therefore IW will be looking to advance the Preferred Approach for Croom in the immediate future.	**Design Stage**
3. **Critical network upgrades and controls:** Identification of priority network upgrades, new control valves and pressure controls required across the region.	**Detailed Design**
4. **Distribution Network Repairs and Upgrades:** Rolling programme of active leakage control, pressure management, find and fix and network upgrades.	**Construction**
5. **Clareville to Newcastle Trunk Mains**: 3 No. trunkmains (150mm, 400mm & 900mm) supply potable water from Clareville WTP to Newcastle Reservoir. A failure of either of the 2No. larger mains would result in significant disruption to a population in excess of 100,000 in Limerick City and Environs.	**Need Identified**
6. **Trunk mains from Newcastle Reservoir to Limerick City** From Newcastle reservoir in Limerick, 3No. trunkmains supply the city, including a 1000/800mm that supplies the southern part of the city and a 700mm that supplies the north & western parts. These two trunk mains in particular are critical as there is little to no interconnectivity with other means to supply these areas. A burst on either main would likely significantly impact the supply level of a third to half of Limerick city and a population of approx. of 30-50,000. Upstream and downstream on the river crossing on the 700mm main (the dual 600mm crossing itself appears satisfactory) has been prone to bursting and requires replacement of min 1.5km of main. It is also recommended to "close the loop" by joining the north and south mains into a full ring main for the city. This would require approx. 2.5km of new large diameter pipework.	**Need Identified**
7. **Ennis PWS, Cappamore Foileen WRZ and Croom WRZ:** Based on the latest NWRP demand figures these 3 WRZ, Ennis, Cappamore Foileen and Croom have less than the recommended requirement of 24hours of potable water storage.(Currently between 8 and 17 hours storage) This issue is further exacerbated in Cappamore by the fact that this is a single (spring) sourced WRZ.	**Need Identified**
8. **Pallasgreen WRZ** This WRZ which supplies a population of approx. of 1200 has less than the recommended requirement of 24hours of potable water storage. This issue is exacerbated by the fact that this is a single (spring) sourced WRZ.	**Need Identified**
9. **O'Briens Bridge WRZ** This WRZ which supplies a population of approx. of 1,000 has less than the recommended requirement of 24hrs of potable water storage. This issue is exacerbated by the fact that this is a single sourced WRZ.	**Need Identified**

In summary, there are some asset reliability issues across the distribution network within the SA. Some critical infrastructural projects, outlined in Table 2.4, to address these issues have been identified and are in progress. In addition to this, a continuous programme of repairs, upgrades and leakage reduction is being progressed as part of Irish Waters National Leakage Reduction Programme across all Study Areas.

2.4 Water Supply Sustainability

The water supplies within the region were developed over time to address the needs of the local populations and to support growth and development. Most of these supplies predate most modern environmental legislation and none of our current abstractions in this area were developed through any formalised abstraction process.

As outlined at Section 3.7.2 of the Framework Plan, the Government is currently developing new legislation dealing with water abstractions. As this legislation is still being developed, we do not have full visibility of the future regulatory regime. We have therefore not progressed through a theoretical licencing process on a site by site basis and cannot reliably include an estimation of sustainable abstraction within the SDB calculations. Instead, we use the hydrological yield, water treatment capacity and bulk transfer limitations in our calculation of DO. This assessment procedure is set out at Appendix C of the Framework Plan, and in line with a precautionary approach.

To understand the potential impact of the abstraction legalisation on the supplies in Study Area 8, Irish Water has used the procedure set out at Appendix C of the Framework Plan have assessed our surface water abstractions from the River Shannon (Clareville), River Deel (Foynes and Castlemahon), River Mulkear (Newport WTP), River Maigue (Adare), Loobagh River (Kilmallock), and Castle Lake (Shannon/ Sixmilebridge) sources.

Table 2.5 presents the findings of this assessment in order to indicate the potential reductions to abstraction that may be required at our existing surface water supplies. These reductions are based on estimates of the level of reductions that a potential future regulatory regime may require, taking a conservative and precautionary approach. The table presents our current abstraction levels[1], our source hydrological yield[2], and our estimated sustainable abstraction amount which the source may be limited to in the future.

Based on this initial assessment, the volumes of water abstracted at River Deel (Foynes), River Mulkear (Newport), and Loobagh River (Kilmallock) 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. We have assumed, given the need to maintain supplies, that a transition to new abstraction quantities would likely take place in the medium term.

[1] Based on WTP 22hr (DYCP) capacity
[2] Our hydrological yield estimate is the ‘safe’ yield calculated to be available during a 1 in 50 year drought event. We use this figure in the SDB calculations to determine whether a WRZ is projected to be in deficit or surplus

Table 2.5 Comparison of Current Abstraction, Hydrological Yield and Potential Future Abstraction

Description	River Shannon (Clareville)	River Deel (Foynes)	River Deel (Castlemahon)	River Mulkear (Newport)	Castle Lake	River Maigue (Adare)	Loobagh River (Kilmallock)
Current abstraction (m3/d)	79,750	20,460	2,860	2,750	13,750	1,650	1,690
Hydrological yield (m3/d)	398,200	22,300	11,300	6,800	23,900	50,100	4,500
PotentialFuture abstraction (m3/d)	86,400	7,200	3,600	1,700	23,900	13,200	1,200

The potential change to the SDB for each WRZ, as a result of these potential reductions in abstraction during Dry Weather Flow are summarised in Table 2.6.

Table 2.6 Potential Change to the SDB Based on Potential Abstraction Reductions

Description	River Shannon (Clareville)	River Deel (Foynes)	River Deel (Castlemahon)	River Mulkear (Newport)	Castle Lake	River Maigue (Adare)	Loobagh River (Kilmallock)
Potential Change in SDB[3] (m^3/d)	None	-11,660	None	-1,400	None	None	-705

The net impact of these potential minimum environmental flow requirements has been assessed using the outline assessment methodology described in Appendix C of the Framework Plan.

Groundwater abstractions will need to conform to the proposed new abstraction licencing regime. These abstractions will be assessed in two ways:

- Impacts on the groundwater bodies from which they abstract; and
- Impact of the groundwater abstraction on the base flow in surface waterbodies.

As noted in Section 3.2.2 of the Framework Plan, producing robust desktop assessments of water availability from our existing groundwater abstractions is very difficult. Ideally, yield estimates would be based on a three-dimensional assessment of the geology within the vicinity of the supply, supplemented with long term records on pumping and drawdown of water levels over many years. Irish Water does not have this type of information available for most of our groundwater supplies and while we will aim to complete site-specific studies of groundwater availability, this may take many years.

On an interim basis, Irish Water has developed an initial assessment for existing abstractions based on best available information. For more information, please see Appendix C Supply Assessment and Appendix G Regulatory and Licensing Constraints of the NWRP - Framework Plan. Over the coming years, Irish Water will work with the environmental regulator EPA and the Geological Survey of Ireland, to develop desktop and site investigation systems to better understand the sustainability of our

[3] Based on potential changes to the projected 2044 Dry Year Critical Period (DYCP) scenario

groundwater sources. We are not in a position to estimate changes to the groundwater availability until better data is available.

In summary, when considering the requirements of the Water Framework Directive (WFD), some of our schemes may be subject to reductions in abstraction, especially during drought periods. While we have developed a potential understanding of the impact of the legislation we cannot reliably include an estimation of sustainable abstraction within the SDB calculations.

However, we do use our sustainable abstraction estimations to assess the sensitivity of the Preferred Approach as set out in Chapter 7 of this Technical Report. This assessment determines whether the Preferred Approach is adaptable to change across a range of potential future scenarios and verifies our ability to adapt and increases our resilience to future changes.

When the new Legislation on abstraction of water has been enacted and regulatory assessments completed if an abstraction is confirmed to be affecting a waterbody status the Supply Demand Balance will be updated as outlined in the monitoring and feedback section of the RWRP, Section 9.2.2. All future abstractions considered through the Framework Plan options assessment are validated for sustainability, including options to increase abstraction at existing sites.

2.5 Water Resource Zone Needs Summary

Study Area 8 has issues in relation to quality, quantity, reliability and sustainability which must be addressed as part of the preferred approach to future water resources planning, summarised in Table 2.7.

Table 2.7 Summary of Need Quality, Quantity, Reliability, Sustainability

Quality	Upgrades required at all WTPs, aligned with the barrier approach
Quantity	Net leakage reduction 978 m^3/d in the region Additional Leakage Targets of 21,331 m^3/d to achieve SELL and reduce leakage levels to 21% of demand in WRZs with demand in excess of 1,500m3/d Interim additional supplies of 22Ml/d within 10 years and Total of 28Ml/d additional supplies beyond the 10 year horizon
Reliability (In addition to progressing projects)	Continued network upgrades and improvements in the bulk and distribution networks and storage.
Sustainability	Based on our initial desktop assessment, the volumes of water abstracted at River Deel (Foynes), River Mulkear (Newport), and Loobagh River (Kilmallock) may not meet sustainability guidelines during dry weather flows. However, under the proposed regulatory regime, this will be adjudicated by the EPA. Over the coming years, Irish Water will work with the environmental regulator EPA and the Geological Survey of Ireland, to develop desktop and site investigation systems to better understand the sustainability of our groundwater sources.

All of these needs will be considered within our options assessment process and in the development of the Preferred Approach.

Further details of planned, live and recently completed projects are available on our website see: https://www.water.ie/projects-plans/our-projects/

3 Solution Types Considered in Study Area 8

3 Solution Types Considered in Study Area 8

In this section, we summarise the type of solutions we have considered to address identified need for treated drinking water supply in Study Area 8.

As outlined in Chapter 7 of the Framework Plan, we consider measures across the following three pillars: **Lose Less**, **Use Less** and **Supply Smarter** in forming our list of unconstrained options, which are assessed for short, medium and long-term solutions. For the SA8 as part of our unconstrained options, the following options have been reviewed.

3.1 Leakage Reduction

The Leakage reduction measures across the public water supply considered for SA8 are based on what we assess to be both achievable and sustainable and include:

- Ongoing leakage management, including active leakage control, pressure management and Find and Fix activities, to offset Natural Rate of Leakage Rise (NRR); and
- et leakage reductions targets listed in Table 3.1 have been applied to SDB deficit to move towards achieving the national Sustainable Economic Level of Leakage (SELL) target prioritised based on
    - Supply demand deficit;
    - Existing abstractions with sustainability issues; and
    - Drought impacts.
- Additional leakage Targets to achieve SELL and reduce leakage levels to 21% of demand in WRZs with demand in excess of 1,500m^3/d, see Table 3.1.

Table 3.1 SELL Targets for WRZ in SA8

WRZ	Net Leakage Reduction applied to SDB (m^3)	Additional leakage Targets to achieve SELL and reduce leakage levels to 21% of demand in WRZs with demand in excess of 1,500m^3/d (m^3)	Total Leakage Targets (m^3)
Ennis / Shannon/Sixmilebridge	116	5,142	5,258
Flagmount PWS		33	33
Feakle PWS		57	57
Scarriff PWS		169	169
Mountshannon PWS		94	94
Obriens Bridge PWS		632	632
Ennis	231	3,656	3,887
Doon Water Supply		1	1
Oola / Pallasgreen		74	74
Fedamore Water Supply		52	52
Bruff Water Supply		51	51

WRZ	Net Leakage Reduction applied to SDB (m^3)	Additional leakage Targets to achieve SELL and reduce leakage levels to 21% of demand in WRZs with demand in excess of 1,500m^3/d (m^3)	Total Leakage Targets (m^3)
Rockhill & Bruree		76	76
Shannon Estuary Water Supply		2,097	2,097
Croom Water Supply		1	1
Kilfinnane Ardpatrick Water Supply		120	120
Ballingarry		97	97
Rathkeale		1,389	1,389
Newport RWSS		1,075	1,075
Limerick City	631	5,415	6,046
South West Regional		436	436
Murroe / Cappamore /Foileen		663	663

3.2 Water Conservation

At present, Irish Water is conducting pilot studies in relation to water conservation stewardship in businesses and is actively pursuing Conservation Education Awareness Campaigns and partnerships. During drought conditions in 2018 and 2020, a Water Conservation Order was implemented in order to protect our water supplies and reduce pressure on the natural environment during this period. We 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, we have not applied reductions to the SDB deficit for unquantifiable water conservation gains. However, we do assume that any gain will offset consumer usage growth factors.

3.3 Supply Smarter

The supply options considered as part of the options assessment are unconstrained by distance from the Study Area 8 and include:

- 79 stand-alone groundwater options across the Study Area
- 26 stand-alone surface water options across the Study Area
- Upgrades to our existing treatment plants
- Network connectivity and transfers from other Study Areas
- Rationalisation[4] and interconnection of WRZs within the Study Area

[4] Rationalisation of a WRZ includes providing part or full supply to the WRZ from another WRZ. Often some or all of the WTPs in the WRZ obtaining supply are decommissioned as part of this process.

4 Option Development SA8

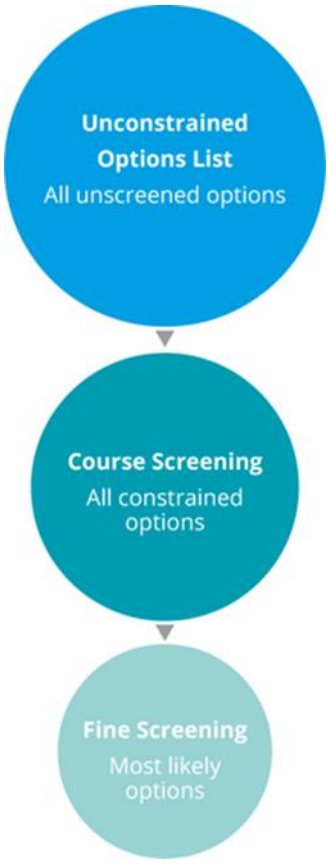
4 Option Development for Study Area 8

This chapter describes how our options assessment methodology was applied to produce a Feasible Options list to meet the identified needs.

The purpose of our options assessment process, as outlined in Chapter 8 of the Framework Plan and Chapter 6 of the RWRP, is to consider the widest practicable range of solutions to resolve identified need within a given area. A suitable screening criterion is then applied to filter out any options that are not feasible, based on sustainability (environmental and social impacts), resilience or deliverability. As sustainability is at the heart of our plan, 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 even before screening begins to ensure the protection of the environment. For example, having regard to WFD objectives, Irish Water does not allow for any inter-catchment raw water transfers due to the high risk of transferring invasive non-native species (INNS) between catchments and non-compliance with WFD objectives.

The options assessment screening process involves the following:

- Developing a long list of unconstrained options – Unconstrained Options constitute all of the possible solutions, which either fully or partly resolve a water supply deficit, regardless of any cost, environmental or social constraints. In developing the Unconstrained List, we identify options that are applicable to meet the needs of the study area;
- Coarse Screening – We filter the unconstrained options using a coarse screening assessment where we remove any options that fail to meet desktop assessment criteria under: Resilience, Deliverability and Flexibility or Sustainability (Environmental and Social Impacts); and
- Fine Screening – We filter the remaining options from the coarse screening exercise through a fine screening assessment, which includes 33 detailed questions, related to environmental objectives identified for the SEA (including biodiversity, the water environment and requirements under climate change adaptation) as well as Resilience, Deliverability and Progressibility.



The coarse screening and fine screening questions, and the associated scoring criteria, are included in Chapter 3 and of the Study Area Environmental Report.

4.1 Developing a List of Unconstrained Options

At the start of our screening process, we conduct a specialist desktop review of groundwater bodies and surface water catchments. This allows us to understand potential additional availability at existing water abstractions or to identify any potential new water sources within the Study Area; as summarised in Table 4.1.

Table 4.1 Desktop Assessments for Unconstrained Options

Existing and New Ground Water sources	A Hydrogeologist conducts a desktop groundwater availability assessment of all potential aquifers and aquitards within, and within a reasonable distance of, the study area.
Existing and New Surface Water sources and Conjunctive Use Options	A Hydrologist carries out a desktop surface water availability assessment of all potential catchments and waterbodies within, and within a reasonable distance of, the study area.
Water Treatment upgrades, Desalination, Rationalisation and Effluent Reuse Options	An Engineer reviews any potential increases in capacity at existing water treatment sites and any potential conjunctive use or effluent reuse options.

Based on these desktop assessments, Irish Water developed an initial list of unconstrained options for new supplies and increases and upgrades to existing supplies and assets. An unconstrained options review workshop was then held with our Local Authority Partners to identify any additional unconstrained options that may be available based on local knowledge. A total list of unconstrained options was then compiled.

For SA8, 214 Unconstrained Options were identified to address need. These unconstrained options were not limited by cost, distance from the area or feasibility. These options are summarised in Table 4.2 and shown spatially in Figure 4.1.

Table 4.2 SA8 Unconstrained Options

No. of Options	Option Type
79	Groundwater
26	Surface water
4	Transfer from scheme in surplus
14	Transfer from Group Water Scheme
10	Interconnection (GW)
11	Interconnection (SW)
10	Cross Study Area Supply
52	Rationalise to another supply
1	Advanced leakage reductions
6	Upgrade Water Treatment Plant
1	Tankering

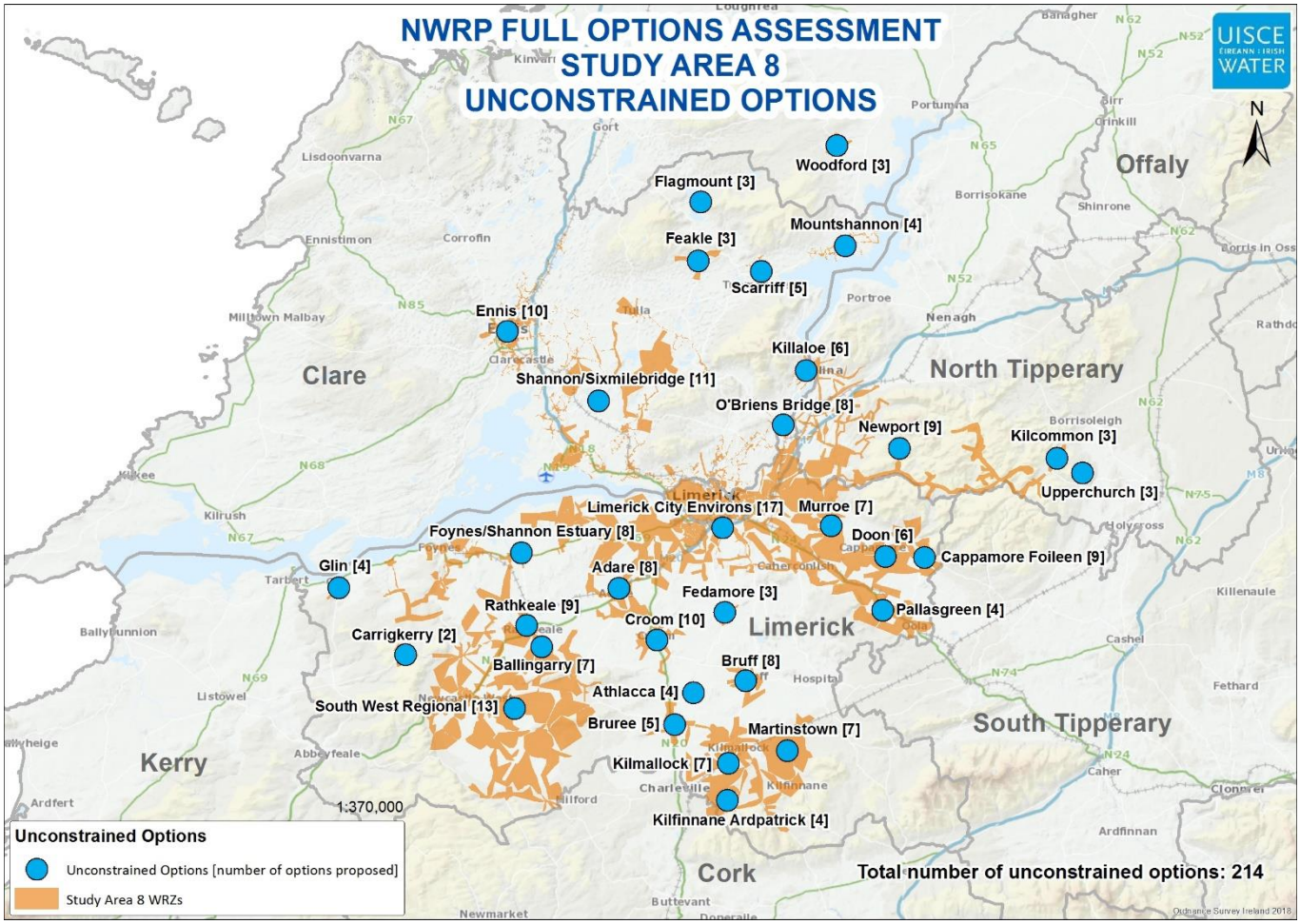


Figure 4.1 SA8 Unconstrained Options

The 214 options were filtered through our screening process to eliminate those with potentially unviable environmental impacts or feasibility issues.

4.2 Coarse Screening

The 214 identified Unconstrained Options were assessed through Coarse Screening against the criteria of:

- Resilience;
- Deliverability and Flexibility; and
- Sustainability (Environmental and Social Impacts).

The Coarse Screening process is summarised in Chapter 8 of the Framework Plan. The coarse screening assessments were conducted by a specialist team, including Engineers, Hydrologists and, Hydrogeologists, Ecologists, and Environmental Scientists.

93 Unconstrained Options were rejected at this stage as they were found to be unviable in relation to one or more assessment criteria. Details of these options and the justification for their rejection are outlined in the rejection summary, Annex B of this report. The rejection summary records the criteria against which the rejected options were assessed as having a 'red' score for the purposes of the coarse screening exercise (as explained in more detail in Chapter 8 of the Framework Plan), and accordingly

were not brought forward at the coarse screening phase. The box below provides an example of a rejection justification for an option considered for Ennis WRZ.

Example Rejected Option

Option SA8-03

New SW abstraction from Lough Inchicronan and new WTP to partly supply deficit

Rejection Reason

This option requires a new SW source and a new WTP. This option will meet only 70% of the deficit while abstracting the full limit of calculated allowable abstraction and as a result is not considered feasible at coarse screening stage and is not taken forward to fine screening stage. Additionally, 6km of new watermain would be required for a relatively small volume. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was not considered feasible at coarse screening stage.

The remaining 121 options were progressed to further assessment through the Fine Screening process. The rejected options are summarised in Annex A of this technical report. Annex A records the criteria against which the rejected options were assessed as having a “red” score for the purposes of the coarse screening exercise (as explained in more detail in Chapter 8 of the Framework Plan), and accordingly were not brought forward at the coarse screening stage. The remaining options are summarised in Table 4.3.

Table 4.3 SA8 Remaining Options after Coarse Screening

No. of Options	Option Type
60	Groundwater
11	Surface water
1	Transfer from scheme in surplus
2	Transfer from Group Water Scheme
0	Interconnection (GW)
5	Interconnection (SW)
8	Cross Study Area Supply
28	Rationalise to another supply
1	Advanced leakage reductions
5	Upgrade Water Treatment Plant
0	Tankering

4.3 Fine Screening

The 121 remaining options were subject to a more detailed multi-criteria assessment (MCA) at the Fine Screening Stage using desktop assessments of performance against 33 specified questions relating to Sustainability (Environmental and Social Impacts), Resilience, Deliverability and Progressibility. These questions are set out in Appendix N of the Framework Plan. The assessment for each option was based on an objective assessment with uniform scoring criteria, based on best publicly available datasets.

At Fine Screening stage, no further options were rejected, with the remaining 121 options considered to be feasible and brought forward to desktop outline design and costing. These are summarised in Table 4.4 and shown spatially in Figure 4.2

Figure 4.2 Feasible Options

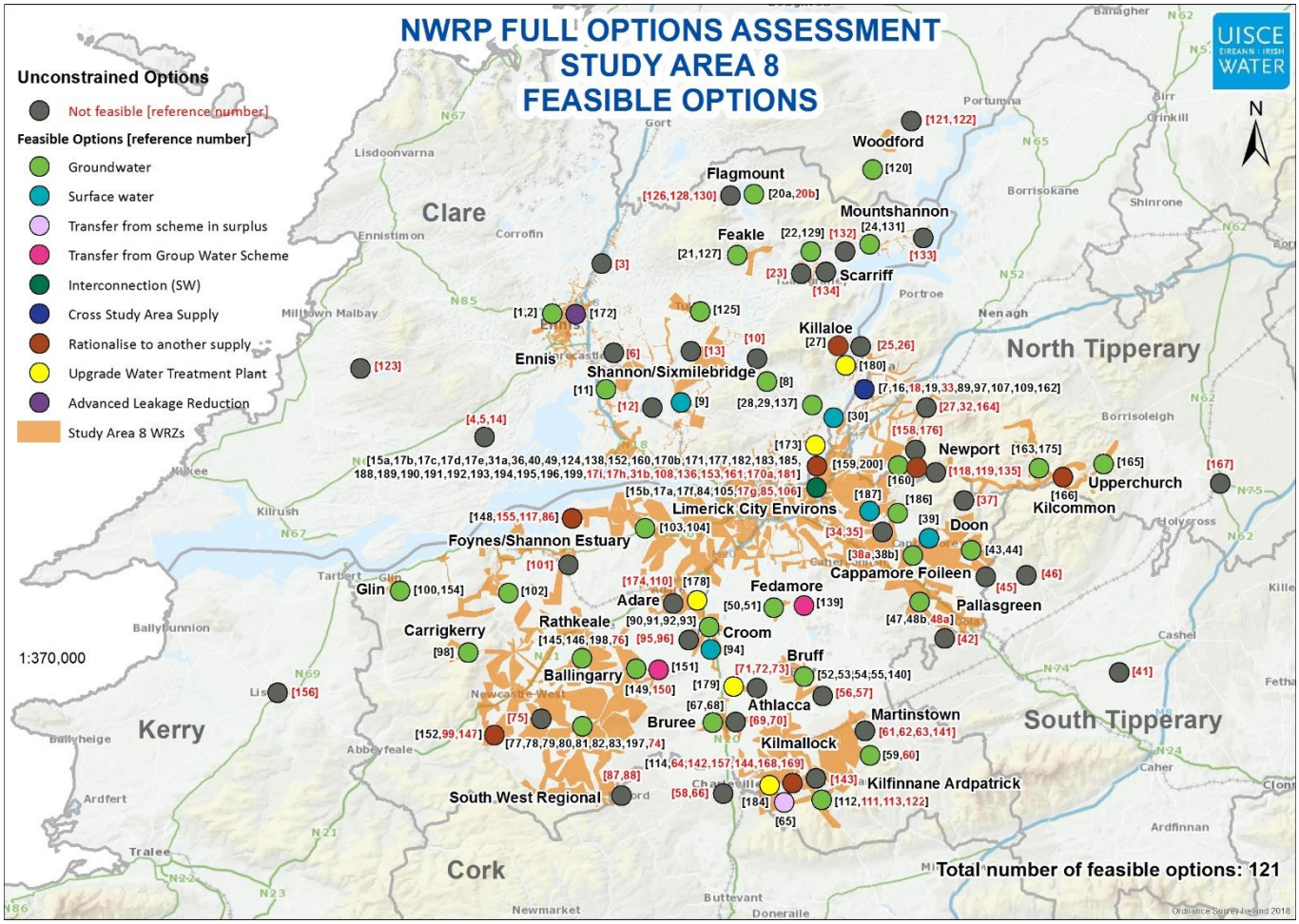


Table 4.4 SA8 Remaining Options after Fine Screening (Feasible Options)

No. of Options	Option Type
60	Groundwater
11	Surface water
1	Transfer from scheme in surplus
2	Transfer from Group Water Scheme

No. of Options	Option Type
0	Interconnection (GW)
5	Interconnection (SW)
8	Cross Study Area Supply
28	Rationalise to another supply
1	Advanced leakage reductions
5	Upgrade Water Treatment Plant
0	Tankering

For the purposes of the NWRP, outline designs have been prepared at a desktop level for each feasible option (for use as part of comparative assessments between options). The outline designs include a high level inventory of option requirements, including capacities of plants, pipelines, pumps and treatment requirements. They include comparative budget costs estimates for required site level studies (including site level environmental assessments), Capital (CAPEX), Operational (OPEX), Environmental and Social (E&S) costs and Carbon Costs for use in the next stage of the assessment process.

4.4 Options Assessment Summary

The estimated SDB deficit in the region ranges between approximately 22,007 m^3/d in 2019 during dry conditions, to a maximum of approximately 28,121 m^3/d in 2044 during dry conditions. During the options assessment stage, a total of 214 unconstrained options were assessed. Of these 93 options were screened out for the reasons summarised in Table 4.5 and recorded in Annex B.

Table 4.5 Rejected Options Summary

No. of Options	Reason for Rejection
59	Deliverability & Flexibility
2	Deliverability & Flexibility and Resilience
11	Deliverability & Flexibility, Resilience and Sustainability
21	Other reasons such as repeat options or operational options which did not provide additional supply

The remaining 121 feasible options are categorised into options that resolve the need for one WRZ only “WRZ options” and options that resolved the need for more than one WRZ “Study Area options”. Table 4.6 provides an overview of the number of WRZ options and Study Area options for the WRZs in Study Area 8. From this table it can be noted that there are 71 WRZ Options and 48 options which can be merged to form 14 Study Area Options.

A summary of the number of options and whether they are WRZ or SA options is contained in Table 4.6

Table 4.6 SA8 Feasible Options Summary

Water Resource Zone Name	Option Type	
	WRZ Option	Study Area Option
Adare	1	4
Athlacca Water Supply	1	0
Ballingarry	4	1
Bruff Water Supply	5	0
Bruree Water Supply	2	0
Carrigkerry Water Supply	1	0
Croom PWS	5	2
Doon Water Supply	2	2
Ennis	3	2
Feakle PWS	2	0
Fedamore Water Supply	3	0
Flagmount PWS	1	0
Foynes/Shannon Estuary PWS	3	3
Glenosheen/Jamestown/Kilmallock	1	1
Glin Water Supply	2	0
Kilcommon	1	1
Kilfinnane Ardpatrick Water Supply	1	1
Killaloe PWS	1	1
Limerick City Environs PWS	1	11
Martinstown Water Supply	1	0
Mountshannon PWS	2	0
Murroe / Cappamore /Foileen	6	4
Newport RWSS	3	2
O'Briensbridge PWS	5	0

Water Resource Zone Name	Option Type	
	WRZ Option	Study Area Option
Pallasgreen Water Supply	2	1
Rathkeale	4	3
Scarriff PWS	2	0
Shannon/Sixmilebridge	4	3
South West Regional	3	4
Upperchurch	1	1
Woodford	1	0

5 Approach Development

5 Approach Development

This chapter describes how we tested different combinations of the Feasible Options to develop a Preferred Approach to meet the needs we identified for the WRZ in Study Area 8.

5.1 Approach Development

5.1.1 Introduction to Approach Development

The purpose of the NWRP is to examine all potential options that could be used to resolve issues within the water resource zone (unconstrained options) and then to eliminate those that are not feasible or that have identifiable environmental issues at a desktop level (options assessment screening). Of the remaining feasible options Irish Water's next step is to assess a number of approaches to resolve need across the Study Area. An approach is a way of configuring an option or options to meet the deficit focused on a particular outcome. For example, a "Least Carbon" approach would be the option or combination of options that would involve the least embodied and operational carbon load over the lifetime of the option. As part of the NWRP, Irish Water considers six approaches, as summarised in Table 5.1.

These six approaches have been outlined at Section 8.3.7 of the Framework Plan and were consulted on as part of the SEA Scoping consultation conducted between 9th November 2017 and 22nd December 2017. These approaches have been specifically chosen to ensure that the NWRP aligns with all the relevant Government Policies outlined in Table 5.1.

Table 5.1 The Six Approaches

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

Approaches Tested	Description	Policy Driver
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 Environmental	This is the option or combination of options with the highest total score across the 19 No. SEA MCA sub-criteria questions	SEA Directive and Water Framework Directive
Most Resilient	This is the option or combination of options with the highest total score against the resilience criteria.	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

We then compare the options identified as the best performing within each of the six approach criteria (Least Cost, Best AA, Lowest Carbon etc.) against each other as outlined in Figure 5.1 to come up with a Preferred Approach that meets the objectives of the Framework Plan and aligns with all relevant Government Policy.

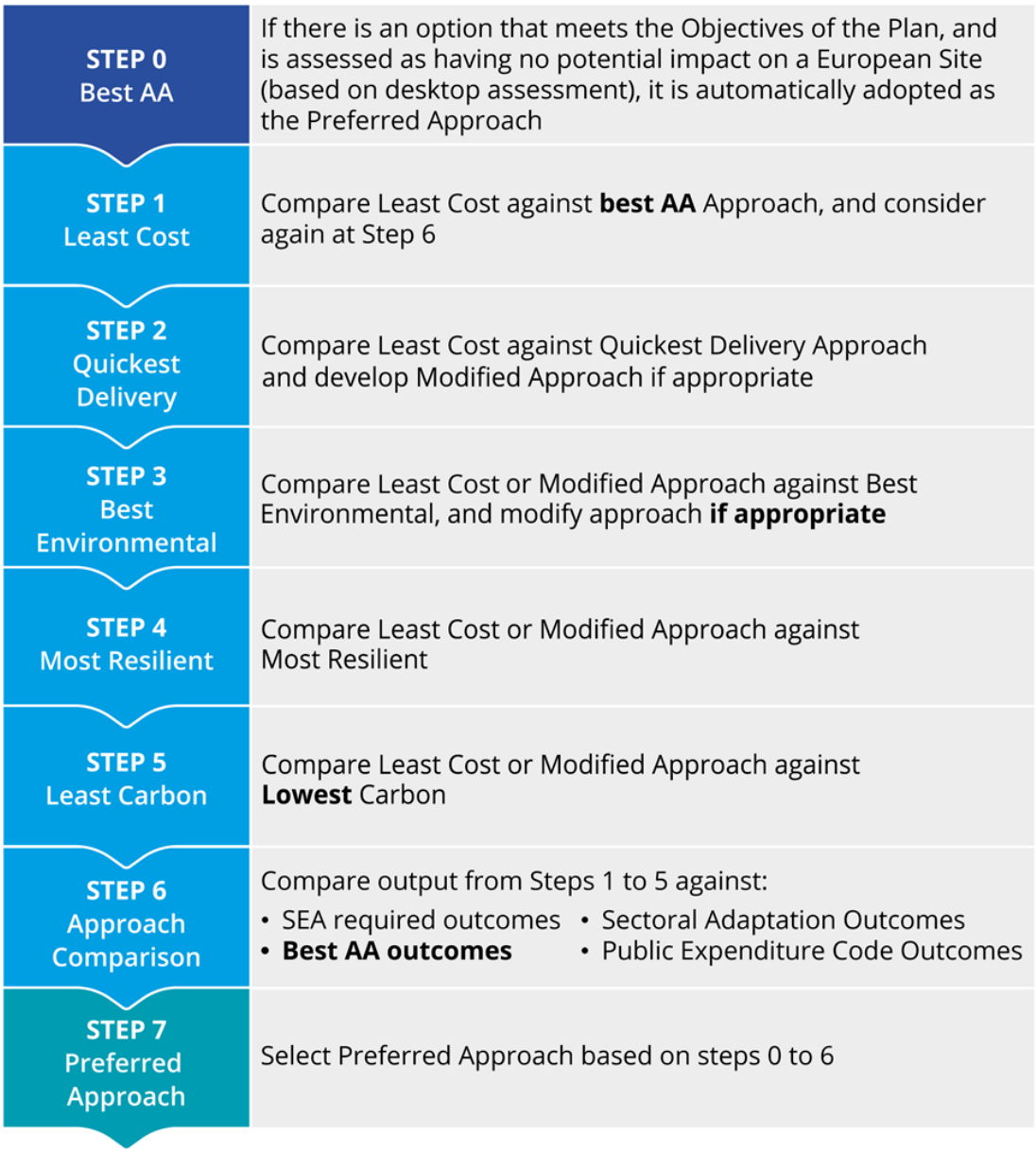


Figure 5.1 Figure of the 7 step assessment process

This methodology which is futured detailed in Chapter 7 of the RWRP -EM follows a process to develop the Preferred Approach for a Study Area across three stages;

- **Stage 1** – We assess the water resource zones individually to develop an initial Preferred Approach, the **WRZ Preferred Approach** for all of the supplies in the Study Area
- **Stage 2** – We assess whether there are any larger options that might resolve deficits across multiple WRZs within a 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. This is known as the Preferred Approach at SA Level.

At each stage of assessment as detailed above, we carry out an assessment of the cumulative and in-combination effects of the Preferred Approach as detailed in the SEA Environmental Report for the RWRP-EM and the Environmental Review for this Study Area.

Within the Regional Plan, we will examine the Preferred Approach at a third spatial level for the entire Eastern Midlands Strategic Study Areas and will make any required changes in order to develop a Preferred Approach across the entire Region.

Further details on these three stages is provided in Chapter 7 of the RWRP -EM. Section 5.2 provides an overview of the application of this process to SA 8.

5.2 Preferred Approach Development

5.2.1 Stage 1 – WRZ Level Approach

As outlined in Section 4.4 of this technical report there are 119 feasible options. 71 of these options are WRZ Options while 48 options are merged to form 41 Study Area Options. Table 5.2 outlines the 71 WRZ options for SA8, providing option reference numbers and detailing the WRZs they provide a solution to. These solutions are presented as “Options” for the purposes of this plan; however, will be subject to their own regulatory, timing and budgetary constraints.

Table 5.2 SA8 WRZ Options

Water Resource Zone Name	Feasible Options SA8	
	Option Code	Option Description
Ennis	SA8-001	Increase GW abstraction at Drumcliffe Springs (Ennis groundwater body - karstic bedrock) and upgrade Drumcliffe WTP to partly supply deficit
Ennis	SA8-002	New GW abstraction/wellfield from Ennis groundwater body (karstic bedrock) and upgrade/new WTP
Shannon/Sixmilebridge	SA8-008	Increase GW abstraction at Crean BH (poorly productive aquifer) and upgrade Broadford WTP to partly supply deficit
Shannon/Sixmilebridge	SA8-009	Increase abstraction at Castle Lake and upgrade Castle Lake WTP to supply deficit
Shannon/Sixmilebridge	SA8-011	New GW abstraction from Kilkishen groundwater body (karstic bedrock) and new WTP to partly supply deficit
Flagmount PWS	SA8-020a	Increase GW abstraction from Flagmount BH (poorly productive aquifer) and upgrade existing Flagmount Reservoir Site WTP
Feakle PWS	SA8-021	Increase GW abstraction from Feakle public supply new BH (poorly productive aquifer) and upgrade existing Bauragegaun Pump Station WTP
Scarriff PWS	SA8-022	Increase GW abstraction from existing BHs (poorly productive aquifer) and upgrade Scarriff WTP
Mountshannon PWS	SA8-024	Increase GW abstraction from existing Mountshannon BH (poorly productive aquifer) and upgrade Cloonmirran Pumphouse WTP
O'Briensbridge PWS	SA8-028	Increase GW abstraction from existing BH and upgrade Montpelier WTP
O'Briensbridge PWS	SA8-029	New GW abstraction from O'Briensbridge Gravels groundwater body and upgrade Montpelier WTP

Water Resource Zone Name	Feasible Options SA8	
	Option Code	Option Description
O'Briensbridge PWS	SA8-030	New SW abstraction from River Shannon
O'Briensbridge PWS	SA8-504	Rationalise O'Briensbridge WRZ to Limerick City WRZ (approx. distance 2.5km, new watermains and network upgrades required)
Woodford	SA8-120	Increase existing GW
Shannon/Sixmilebridge	SA8-125	Bring back old BH at Tulla reservoir site (poorly productive bedrock) and new WTP to partly supply deficit
Feakle PWS	SA8-127	Bring back to use old spring source in Feakle
Scarriff PWS	SA8-129	Bring back old BH at Scarriff Reservoir site (previously in use - recommission)
Mountshannon PWS	SA8-131	New GW abstraction at reservoir site (poorly productive aquifer)
O'Briensbridge PWS	SA8-137	Bring back to production old BH at Ardnataggle Reservoir site
Adare	SA8-178	Not in deficit - Upgrade WTP only
Athlacca Water Supply	SA8-179	Not in deficit - Upgrade WTP only
Killaloe PWS	SA8-180	Not in deficit - Upgrade WTP only
Doon Water Supply	SA8-043	Increase abstraction at Lacka BH (poorly productive aquifer) and upgrade Lacka WTP supply deficit (part/full)
Doon Water Supply	SA8-044	Increase abstraction at Cooga Spring (poorly productive aquifer) and upgrade Cooga Spring WTP supply deficit (part/full)
Pallasgreen Water Supply	SA8-047	Increase GW abstraction at Pallasgreen Spring (poorly productive aquifer) and upgrade Pallasgreen WTP
Pallasgreen Water Supply	SA8-048b	New GW abstraction from Pallas Grean groundwater body (productive fissured bedrock) - abstraction point TBC
Fedamore Water Supply	SA8-050	Increase GW abstraction at Fedamore BH (Fedamore groundwater body - karstic) and upgrade Fedamore WTP
Fedamore Water Supply	SA8-051	New GW abstraction from Fedamore groundwater body (karstic) and upgrade Fedamore WTP/new WTP
Bruff Water Supply	SA8-052	Increase GW abstraction at Finn's Well (poorly productive aquifer) and upgrade Finn's Well WTP
Bruff Water Supply	SA8-053	Increase abstraction at Moloney's BH (poortly productive aquifer) and upgrade Moloney's Pump Station WTP
Bruff Water Supply	SA8-054	New GW abstraction from Fedamore groundwater body (karstic bedrock) and upgrade GW WTP
Bruff Water Supply	SA8-055	New GW abstraction from Bruree groundwater body (productive fissured bedrock) and upgrade GW WTP
Martinstown Water Supply	SA8-059	Increase GW abstraction at Martinstown BH (poorly productive aquifer) and upgrade Martinstown WTP
Bruree Water Supply	SA8-067	Increase GW abstraction at Ballyfookeen BH (Bruree groundwater body - productive fissured bedrock) and upgrade Rockhill PS WTP

Water Resource Zone Name	Feasible Options SA8	
	Option Code	Option Description
Bruree Water Supply	SA8-068	Increase GW abstraction at Bruree BH (Bruree groundwater body - productive fissured bedrock) and upgrade Bruree PS WTP
Rathkeale	SA8-077	New GW abstraction from Knockaderry groundwater body (productive fissured bedrock) in the vicinity of existing Kilcolman WTP and upgrade WTP to partly supply deficit
Rathkeale	SA8-078	Increase GW abstraction at Clouncagh BH (Knockaderry groundwater body, productive fissured bedrock) and upgrade existing Clouncagh WTP to partly supply deficit
South West Regional	SA8-079	Increase GW abstraction from Tobergal Springs (Newcastl West groundwater body - karstic bedrock) and upgrade existing Tobergal WTP to partly supply deficit
South West Regional	SA8-080	New GW abstraction/wellfield from Newcastle West groundwater body (karstic bedrock)
Ballingarry	SA8-081	New GW abstraction/wellfield from Fedamore groundwater body (karstic bedrock) - abstraction point TBC to partly supply deficit, new WTP
Ballingarry	SA8-082	New GW abstraction/wellfield from Ballingarry groundwater body (productive fissured bedrock) - abstraction point TBC to partly supply deficit, new WTP
South West Regional	SA8-083	New GW abstraction/wellfield from Kilmeedy groundwater body (productive fissured bedrock) - abstraction point TBC to partly supply deficit, new WTP
Croom PWS	SA8-090	Increase abstraction at Skagh Well (Tory Hill Fen groundwater body - karstic bedrock) to partly supply deficit and upgrade existing Skagh Well WTP
Croom PWS	SA8-091	Increase abstraction at Croom Bypass Well (Tory Hill Fen groundwater body - karstic bedrock) to partly supply deficit and upgrade existing Croom Bypass WTP
Croom PWS	SA8-092	New GW abstraction/wellfield from Tory Hill Fen groundwater body (karstic bedrock). New WTP/upgrade existing WTP to supply deficit
Croom PWS	SA8-093	New GW abstraction/well field from Ballingarry groundwater body (productive fissured bedrock) and new WTP to supply deficit
Croom PWS	SA8-094	New SW abstraction from River Maigue - abstraction point TBC to supply deficit, upgrade existing WTP/new WTP
Carrigkerry Water Supply	SA8-098	Increase GW abstraction from Carrigkerry Spring (poorly productive aquifer) and upgrade Carrigkerry WTP
Glin Water Supply	SA8-100	Increase GW abstraction from Glin BH (poorly productive bedrock) and upgrade existing Glin WTP
Foynes/Shannon Estuary PWS	SA8-102	New GW abstraction/wellfield from Askeaton groundwater body (karstic bedrock) to partly supply deficit. Abstraction point TBC, new WTP

Water Resource Zone Name	Feasible Options SA8	
	Option Code	Option Description
Foynes/Shannon Estuary PWS	SA8-103	New GW abstraction/wellfield from Askeaton North Fens groundwater body (karstic bedrock) to partly supply deficit. Abstraction point TBC, new WTP
Foynes/Shannon Estuary PWS	SA8-104	New GW abstraction/wellfield from Kildimo groundwater body (karstic bedrock) to partly supply deficit. Abstraction point TBC, new WTP
Kilfinnane Ardpatrick Water Supply	SA8-112	Increase abstraction at Kilfinnane BH (poorly productive aquifer) and upgrade Kilfannane WTP to supply deficit. Better potential for new TW c. 700m north in Rf aquifer
Fedamore Water Supply	SA8-139	Supply deficit from neighbouring Carnane GWS (network upgrades required)
Bruff Water Supply	SA8-140	Increase GW abstraction from Ballywilliam BHs (poorly productive groundwater body) and upgrade Ballygrennan WTP to supply deficit
Rathkeale	SA8-145	Increase GW abstraction at Kilcolman Spring and upgrade existing Kilcolman WTP to supply deficit (new artesian well)
Rathkeale	SA8-146	New GW abstraction/wellfield to supply deficit
Ballingarry	SA8-149	Increase GW abstraction at Ballingarry Spring (Ballingarry groundwater body - productive fissured bedrock) and upgrade existing Ballingarry Spring WTP to partly supply deficit
Ballingarry	SA8-151	Supply deficit from nearby Kilfinny GWS (approx. distance 2km, new watermains and network upgrades required)
Glin Water Supply	SA8-154	New GW abstraction (poorly productive aquifer), new WTP, abandon existing sources and WTP
Newport RWSS	SA8-159	Increase GW abstraction from O'Gorman's Well or drill new PW close to the existing site. Purchase from existing landowner.
Newport RWSS	SA8-162	Supply Newport from NSS
Upperchurch	SA8-165	Increase GW abstraction at Upperchurch (poorly productive aquifer) and upgrade WTP
Ennis	SA8-172	Advanced leakage reduction. This leakage option needs implemented in conjunction with a local GW option -SA8-01 or -SA8-02 in order to meet full deficit.
Limerick City Environs PWS	SA8-173	Not in deficit - Upgrade WTP only
Kilcommon	SA8-175	Local GW for Kilcommon
Croom PWS	SA8-177	Rationalise to Limerick City
Glenosheen/Jamestown/Kilmallock	SA8-184	Not in deficit - Upgrade WTP only
Newport RWSS	SA8-200	New GW abstraction to supply deficit and rationalise O Gorman's well.
Murroe / Cappamore /Foileen	SA8-527	New GW abstraction and new WTP for Cappamore Foileen WRZ and rationalise Murroe WRZ.
Murroe / Cappamore /Foileen	SA8-528	New SW abstraction from River Bilboa and new WTP to supply Cappamore and Murroe WRZs.

Water Resource Zone Name	Feasible Options SA8	
	Option Code	Option Description
Murroe / Cappamore /Foileen	SA8-505	Rationalise Murroe and Cappamore Foileen WRZs to Limerick City WRZ

The WRZ options are then assessed against the six approach types, outlined in Table 5.1 and the result of this process is provided in Table 5.3.

Table 5.3 SA8 Alignment of WRZ Option/s with Approach Categories

Water Resource Zone Name	Feasible Options SA8			Approach					
	No. of WRZ Options	Option Code	Option Description	Least Cost	Quickest Delivery	Best AA	Best Environmental	Lowest Carbon	Most Resilient
Ennis	3	SA8-001	Increase GW abstraction at Drumcliffe Springs (Ennis groundwater body - karstic bedrock) and upgrade Drumcliffe WTP to partly supply deficit	✓	✓	✓	✓	✓	✓
		SA8-002	New GW abstraction/wellfield from Ennis groundwater body (karstic bedrock) and upgrade/new WTP	-	-	-	-	-	-
		SA8-172	Advanced leakage reduction. This leakage option needs implemented in conjunction with a local GW option -SA8-01 or -SA8-02 in order to meet full deficit.	✓	✓	✓	✓	✓	✓
Shannon/ Sixmilebridge	4	SA8-008	Increase GW abstraction at Crean BH (poorly productive aquifer) and upgrade Broadford WTP to partly supply deficit	-	-	-	-	-	-
		SA8-009	Increase abstraction at Castle Lake and upgrade Castle Lake WTP to supply deficit	✓	✓	-	✓	✓	-
		SA8-011	New GW abstraction from Kilkishen groundwater body (karstic bedrock) and new WTP to partly supply deficit	-	-	-	-	-	✓
		SA8-125	Bring back old BH at Tulla reservoir site (poorly productive bedrock) and new WTP to partly supply deficit	-	-	-	-	-	-
Flagmount PWS	1	SA8-020a	Increase GW abstraction from Flagmount BH (poorly productive aquifer) and upgrade existing Flagmount Reservoir Site WTP	✓	✓	✓	✓	✓	✓
Murroe / Cappamore /Foileen	3	SA8-527	New GW abstraction and new WTP for Cappamore Foileen WRZ and rationalise Murroe WRZ.	✓				✓	✓
		SA8-528	New SW abstraction from River Bilboa and new WTP to supply Cappamore and Murroe WRZs.						
		SA8-505	Rationalise Murroe and Cappamore Foileen WRZs to Limerick City WRZ		✓	✓	✓		
Feakle PWS	2	SA8-021	Increase GW abstraction from Feakle public supply new BH (poorly productive aquifer) and upgrade existing Bauragegaun Pump Station WTP	-	-	✓	✓	-	-

Water Resource Zone Name	Feasible Options SA8			Approach					
	No. of WRZ Options	Option Code	Option Description	Least Cost	Quickest Delivery	Best AA	Best Environmental	Lowest Carbon	Most Resilient
		SA8-127	Bring back to use old spring source in Feakle	✓	✓	-	-	✓	✓
Scarriff PWS	2	SA8-022	Increase GW abstraction from existing BHs (poorly productive aquifer) and upgrade Scarriff WTP	-	-	-	✓	-	-
		SA8-129	Bring back old BH at Scarriff Reservoir site (previously in use - recommission)	✓	✓	✓	-	✓	✓
Mountshannon PWS	2	SA8-024	Increase GW abstraction from existing Mountshannon BH (poorly productive aquifer) and upgrade Cloonmirran Pumphouse WTP	✓	✓	-	✓	✓	-
		SA8-131	New GW abstraction at reservoir site (poorly productive aquifer)	-	-	✓	-	-	✓
O'Briensbridge PWS	4	SA8-028	Increase GW abstraction from existing BH and upgrade Montpelier WTP	-	-	-	-	-	-
		SA8-029	New GW abstraction from O'Briensbridge Gravels groundwater body and upgrade Montpelier WTP	-	-	-	-	-	
		SA8-030	New SW abstraction from River Shannon	-	-	-	-	-	-
		SA8-137	Bring back to production old BH at Ardnataggle Reservoir site	-	✓	✓	✓	-	-
		SA8-504	Rationalise O'Briensbridge WRZ to Limerick City WRZ (approx. distance 2.5km, new watermains and network upgrades required)	✓				✓	✓
Woodford	1	SA8-120	Increase existing GW	✓	✓	✓	✓	✓	✓
Adare	1	SA8-178	Not in deficit - Upgrade WTP only	✓	-	✓	✓	✓	✓
Athlacca Water Supply	1	SA8-179	Not in deficit - Upgrade WTP only	✓	✓	✓	✓	✓	✓
Killaloe PWS	1	SA8-180	Not in deficit - Upgrade WTP only	✓	✓	✓	✓	✓	✓
Doon Water Supply	2	SA8-043	Increase abstraction at Lacka BH (poorly productive aquifer) and upgrade Lacka WTP supply deficit (part/full)	✓	✓	✓	✓	✓	✓
		SA8-044	Increase abstraction at Cooga Spring (poorly productive aquifer) and upgrade Cooga Spring WTP supply deficit (part/full)	-	-	-	-	-	-
Pallasgreen Water Supply	2	SA8-047	Increase GW abstraction at Pallasgreen Spring (poorly	✓	✓	✓	✓	✓	✓

Water Resource Zone Name	Feasible Options SA8			Approach					
	No. of WRZ Options	Option Code	Option Description	Least Cost	Quickest Delivery	Best AA	Best Environmental	Lowest Carbon	Most Resilient
			productive aquifer) and upgrade Pallasgreen WTP						
		SA8-048b	New GW abstraction from Pallas Grean groundwater body (productive fissured bedrock) - abstraction point TBC	-	-	-	-	-	-
Fedamore Water Supply	3	SA8-050	Increase GW abstraction at Fedamore BH (Fedamore groundwater body - karstic) and upgrade Fedamore WTP	✓	✓	✓	-	✓	-
		SA8-051	New GW abstraction from Fedamore groundwater body (karstic) and upgrade Fedamore WTP/new WTP	-	-	-	✓	-	-
		SA8-139	Supply deficit from neighbouring Carnane GWS (network upgrades required)	-	-	-	-	-	✓
Bruff Water Supply	5	SA8-052	Increase GW abstraction at Finn's Well (poorly productive aquifer) and upgrade Finn's Well WTP	✓	-	✓	✓	✓	-
		SA8-053	Increase abstraction at Moloney's BH (poorly productive aquifer) and upgrade Moloney's Pump Station WTP	-	-	-	-	-	-
		SA8-054	New GW abstraction from Fedamore groundwater body (karstic bedrock) and upgrade GW WTP	-	✓	-	-	-	✓
		SA8-055	New GW abstraction from Bruree groundwater body (productive fissured bedrock) and upgrade GW WTP	-	-	-	-	-	-
		SA8-140	Increase GW abstraction from Ballywilliam BHs (poorly productive groundwater body) and upgrade Ballygrennan WTP to supply deficit	-	-	-	-	-	-
Martinstown Water Supply	1	SA8-059	Increase GW abstraction at Martinstown BH (poorly productive aquifer) and upgrade Martinstown WTP	✓	✓	✓	✓	✓	✓
Bruree Water Supply	2	SA8-067	Increase GW abstraction at Ballyfookeen BH (Bruree groundwater body - productive fissured bedrock) and upgrade Rockhill PS WTP	-	-	-	✓	-	✓
		SA8-068	Increase GW abstraction at Bruree BH (Bruree groundwater body - productive fissured bedrock) and upgrade Bruree PS WTP	✓	✓	✓		✓	

Water Resource Zone Name	Feasible Options SA8			Approach					
	No. of WRZ Options	Option Code	Option Description	Least Cost	Quickest Delivery	Best AA	Best Environmental	Lowest Carbon	Most Resilient
Rathkeale	4	SA8-077	New GW abstraction from Knockaderry groundwater body (productive fissured bedrock) in the vicinity of existing Kilcolman WTP and upgrade WTP to partly supply deficit	-	-	-	-	-	✓
		SA8-078	Increase GW abstraction at Clouncagh BH (Knockaderry groundwater body, productive fissured bedrock) and upgrade existing Clouncagh WTP to partly supply deficit	-	✓	-	-	-	✓
		SA8-145	Increase GW abstraction at Kilcolman Spring and upgrade existing Kilcolman WTP to supply deficit (new artesian well)	-	-	✓	✓	✓	✓
		SA8-146	New GW abstraction/wellfield to supply deficit	-	-	-	-	-	✓
South West Regional	3	SA8-079	Increase GW abstraction from Tobergal Springs (Newcastle West groundwater body - karstic bedrock) and upgrade existing Tobergal WTP to partly supply deficit	-	✓	-	✓	✓	-
		SA8-080	New GW abstraction/wellfield from Newcastle West groundwater body (karstic bedrock)	-	-	-	-	-	✓
		SA8-082	New GW abstraction/wellfield from Ballingarry groundwater body (productive fissured bedrock) - abstraction point TBC to partly supply deficit, new WTP	-	-	-	-	-	-
Ballingarry	3	SA8-081	New GW abstraction/wellfield from Fedamore groundwater body (karstic bedrock) - abstraction point TBC to partly supply deficit, new WTP	-	-	-	-	-	-
		SA8-149	Increase GW abstraction at Ballingarry Spring (Ballingarry groundwater body - productive fissured bedrock) and upgrade existing Ballingarry Spring WTP to partly supply deficit	✓	✓	✓	-	-	✓
		SA8-151	Supply deficit from nearby Kilfinny GWS (approx. distance 2km, new watermains and network upgrades required)	-	-	-	✓	✓	-
Croom	7	SA8-083	New GW abstraction/wellfield from Kilmeedy groundwater body (productive fissured bedrock) - abstraction point	✓	-	✓	-	-	-

Water Resource Zone Name	Feasible Options SA8			Approach					
	No. of WRZ Options	Option Code	Option Description	Least Cost	Quickest Delivery	Best AA	Best Environmental	Lowest Carbon	Most Resilient
			TBC to partly supply deficit, new WTP						
		SA8-090	Increase abstraction at Skagh Well (Tory Hill Fen groundwater body - karstic bedrock) to partly supply deficit and upgrade existing Skagh Well WTP	-	✓	-	-	-	✓
		SA8-091	Increase abstraction at Croom Bypass Well (Tory Hill Fen groundwater body - karstic bedrock) to partly supply deficit and upgrade existing Croom Bypass WTP	-	-	-	-	-	-
		SA8-092	New GW abstraction/wellfield from Tory Hill Fen groundwater body (karstic bedrock). New WTP/upgrade existing WTP to supply deficit	-	-	-	-	-	-
		SA8-093	New GW abstraction/well field from Ballingarry groundwater body (productive fissured bedrock) and new WTP to supply deficit	-	-	-	-	-	-
		SA8-094	New SW abstraction from River Maigue - abstraction point TBC to supply deficit, upgrade existing WTP/new WTP	-	-	-	-	-	-
		SA8-177	Rationalise to Limerick City	✓	-	✓	✓	✓	-
Carrigkerry Water Supply	1	SA8-098	Increase GW abstraction from Carrigkerry Spring (poorly productive aquifer) and upgrade Carrigkerry WTP	✓	✓	✓	✓	✓	✓
Glin Water Supply	2	SA8-100	Increase GW abstraction from Glin BH (poorly productive bedrock) and upgrade existing Glin WTP	-	✓	-	✓	✓	✓
		SA8-154	New GW abstraction (poorly productive aquifer), new WTP, abandon existing sources and WTP	✓	-	✓	-	-	-
Foynes/ Shannon Estuary PWS	3	SA8-102	New GW abstraction/wellfield from Askeaton groundwater body (karstic bedrock) to partly supply deficit. Abstraction point TBC, new WTP	-	-	✓	-	-	✓
		SA8-103	New GW abstraction/wellfield from Askeaton North Fens groundwater body (karstic bedrock) to partly supply deficit. Abstraction point TBC, new WTP	-	-	-	-	-	✓
		SA8-104	New GW abstraction/wellfield from Kildimo groundwater body	✓	✓	-	✓	✓	✓

Water Resource Zone Name	Feasible Options SA8			Approach					
	No. of WRZ Options	Option Code	Option Description	Least Cost	Quickest Delivery	Best AA	Best Environmental	Lowest Carbon	Most Resilient
			(karstic bedrock) to partly supply deficit. Abstraction point TBC, new WTP						
Kilfinnane Ardpatrick Water Supply	1	SA8-112	Increase abstraction at Kilfinnane BH (poorly productive aquifer) and upgrade Kilfannane WTP to supply deficit. Better potential for new TW c. 700m north in Rf aquifer	✓	✓	✓	✓	✓	✓
Newport RWSS	3	SA8-159	Increase GW abstraction from O'Gorman's Well or drill new PW close to the existing site. Purchase from existing landowner.	-	✓	✓	✓	✓	-
		SA8-162	Supply Newport from NSS	✓	-	-	-	-	✓
		SA8-200	New GW abstraction to supply deficit and rationalise O Gorman's well.	-	-	-	-	-	-
Upperchurch	1	SA8-165	Increase GW abstraction at Upperchurch (poorly productive aquifer) and upgrade WTP	✓	✓	✓	✓	✓	✓
Limerick City Environs PWS	1	SA8-173	Not in deficit - Upgrade WTP only	✓	✓	✓	✓	✓	✓
Kilcommon	1	SA8-175	Local GW for Kilcommon	✓	✓	✓	✓	✓	✓
Glenosheen/Jamestown/ Kilmallock	1	SA8-184	Not in deficit - Upgrade WTP only	✓	✓	✓	✓	✓	✓

The 7 Step Process outlined in Figure 3.1 was then applied to each WRZ in SA8, in order to develop a Preferred Approach for each WRZ. A summary of the outcome of this assessment at WRZ level (i.e. WRZ options only) is shown in Table 5.4

The findings of the WRZ Level Approach development for SA8 at WRZ level, include the following:

- In 24 of the 31 No. Water Resource Zones, the WRZ level Approach coincides with the Best AA score. In 24 of the 31 Water Resource Zones, the Preferred Approach coincides with the Best Environmental Approaches (overall SEA score), when assessed at WRZ level.
- 1 option in the WRZ level Approach have a -3 score against biodiversity. A -3 Score against biodiversity indicates a potential high risk (without mitigation measures) under the biodiversity criterion for a European Site.

The WRZ level Approach is outlined in Table 5.4.

Table 5.4 SA8 WRZ Level Approach

Water Resource Zone Name	Feasible Options SA8 Limerick Clare		Approach							
	Option Code	Option Description	Zero AA	Least Cost	Quickest Delivery	Best AA	Best Environmental	Lowest Carbon	Most Resilient	Preferred Approach
Ennis	SA8-001	Increase GW abstraction at Drumcliffe Springs (Ennis groundwater body - karstic bedrock) and upgrade Drumcliffe WTP to partly supply deficit	-	✓	✓	✓	✓	✓	-	✓
	SA8-172	Advanced leakage reduction. This leakage option needs implemented in conjunction with a local GW option -SA8-01 or -SA8-02 in order to meet full deficit.	-	✓	✓	✓	✓	✓	-	✓
Shannon/Sixmilebridge	SA8-009	Increase abstraction at Castle Lake and upgrade Castle Lake WTP to supply deficit	-	✓	✓	✓	✓	✓	-	✓
Flagmount PWS	SA8-020a	Increase GW abstraction from Flagmount BH (poorly productive aquifer) and upgrade existing Flagmount Reservoir Site WTP	-	✓	✓	✓	✓	✓	✓	✓
Feakle PWS	SA8-021	Increase GW abstraction from Feakle public supply new BH (poorly productive aquifer) and upgrade existing Bauragegaun Pump Station WTP	-	-	-	-	-	-	-	✓
Scarriff PWS	SA8-022	Increase GW abstraction from existing BHs (poorly productive aquifer) and upgrade Scarriff WTP	-	-	-	-	-	-	-	✓
Mountshannon PWS	SA8-024	Increase GW abstraction from existing Mountshannon BH (poorly productive aquifer) and upgrade Cloonmirran Pumphouse WTP	-	✓	✓	✓	✓	✓	-	✓
Woodford	SA8-120	Increase existing GW	-	✓	✓	✓	✓	✓	✓	✓
Adare	SA8-178	Not in deficit - Upgrade WTP only	-	✓	✓	✓	✓	✓	✓	✓
Athlacca Water Supply	SA8-179	Not in deficit - Upgrade WTP only	-	✓	✓	✓	✓	✓	✓	✓
Killaloe PWS	SA8-180	Not in deficit - Upgrade WTP only	✓	✓	✓	✓	✓	✓	✓	✓
Murroe / Cappamore /Foileen	SA8-505	Rationalise Murroe and Cappamore Foileen WRZs to Limerick City WRZ			✓	✓	✓			✓

Water Resource Zone Name	Feasible Options SA8 Limerick Clare		Approach							
	Option Code	Option Description	Zero AA	Least Cost	Quickest Delivery	Best AA	Best Environmental	Lowest Carbon	Most Resilient	Preferred Approach
Doon Water Supply	SA8-043	Increase abstraction at Lacka BH (poorly productive aquifer) and upgrade Lacka WTP supply deficit (part/full)	-	✓	✓	✓	✓	✓	✓	✓
Pallasgreen Water Supply	SA8-047	Increase GW abstraction at Pallasgreen Spring (poorly productive aquifer) and upgrade Pallasgreen WTP	-	✓	✓	✓	✓	✓	✓	✓
Fedamore Water Supply	SA8-051	New GW abstraction from Fedamore groundwater body (karstic) and upgrade Fedamore WTP/new WTP	-	-	-	-	-	-	-	✓
Bruff Water Supply	SA8-052	Increase GW abstraction at Finn's Well (poorly productive aquifer) and upgrade Finn's Well WTP	-	✓	✓	✓	✓	✓	-	✓
Martinstown Water Supply	SA8-059	Increase GW abstraction at Martinstown BH (poorly productive aquifer) and upgrade Martinstown WTP	-	✓	✓	✓	✓	✓	✓	✓
Bruree Water Supply	SA8-068	Increase GW abstraction at Bruree BH (Bruree groundwater body - productive fissured bedrock) and upgrade Bruree PS WTP	-	✓	✓	✓	✓	✓	-	✓
South West Regional	SA8-079	Increase GW abstraction from Tobergal Springs (Newcastle West groundwater body - karstic bedrock) and upgrade existing Tobergal WTP to partly supply deficit	-	-	-	-	-	-	-	✓
Carrigkerry Water Supply	SA8-098	Increase GW abstraction from Carrigkerry Spring (poorly productive aquifer) and upgrade Carrigkerry WTP	-	✓	✓	✓	✓	✓	✓	✓
Glin Water Supply	SA8-100	Increase GW abstraction from Glin BH (poorly productive bedrock) and upgrade existing Glin WTP	-	-	-	-	-	-	✓	✓
Foynes/Shannon Estuary PWS	SA8-102	New GW abstraction/wellfield from Askeaton groundwater body (karstic bedrock) to partly supply deficit. Abstraction point TBC, new WTP	-	-	-	-	-	-	✓	✓
Kilfinnane Ardpatrick Water Supply	SA8-112	Increase abstraction at Kilfinnane BH (poorly productive aquifer) and upgrade Kilfinnane WTP to supply deficit. Better potential for new TW c. 700m north in Rf aquifer	-	✓	✓	✓	✓	✓	✓	✓
Rathkeale	SA8-145	Increase GW abstraction at Kilcolman Spring and upgrade existing Kilcolman WTP to supply deficit (new artesian well)	-	✓	✓	✓	✓	✓	✓	✓
Ballingarry	SA8-149	Increase GW abstraction at Ballingarry Spring (Ballingarry groundwater body - productive fissured bedrock) and upgrade existing Ballingarry Spring WTP to partly supply deficit	-	✓	✓	✓	✓	✓	✓	✓

Water Resource Zone Name	Feasible Options SA8 Limerick Clare		Approach							
	Option Code	Option Description	Zero AA	Least Cost	Quickest Delivery	Best AA	Best Environmental	Lowest Carbon	Most Resilient	Preferred Approach
Newport RWSS	-SA8-162	Supply Newport from the proposed Birdhill WTP as part of the NSS project	-	✓	✓	✓	✓	✓	✓	✓
Upperchurch	SA8-165	Increase GW abstraction at Upperchurch (poorly productive aquifer) and upgrade WTP	-	✓	✓	✓	✓	✓	✓	✓
Limerick City Environs PWS	SA8-173	Not in deficit - Upgrade WTP only	-	✓	✓	✓	✓	✓	✓	✓
Kilcommon	SA8-175	Local GW for Kilcommon	-	✓	✓	✓	✓	✓	✓	✓
Croom PWS	SA8-177	Rationalise to Limerick City	-	✓	✓	✓	✓	✓	-	✓
O'Briensbridge PWS	SA8-504	Rationalise O'Briensbridge WRZ to Limerick City WRZ (approx. distance 2.5km, new watermains and network upgrades required)		✓				✓	✓	✓
Glenosheen/Jamestown/ Kilmallock	SA8-184	Not in deficit - Upgrade WTP only	-	✓	✓	✓	✓	✓	✓	✓

5.2.2 Stage 2 – Creation of the Study Area Combinations

The Second Stage of our Approach Development Process involves identifying the Study Area options that can address Need in more than one WRZ within the Study Area, and then develop various combinations which contain elements of the different options. These are called SA Combinations SA Combinations will consist of a number of different projects or options. Looking at a wider, more holistic, spatial scale benefits the plan level assessment in considering what options might work across multiple WRZ's.

For each Study Area, one of the SA Combinations will always be the WRZ Level Approach. The WRZ Level Approach is the combination of all of the individual the Preferred Approach at WRZ level for the entire Study Area. Table 5.5 below provides a summary of the 18 Study Area options.

Table 5.5 SA8 Grouped options

Water Resource Zone Name	Feasible Options SA8		
	Option Code	Option Description	SA Grouped Option
Ennis Shannon/Sixmilebridge	SA8-501a	Supply Ennis and Shannon/Sixmilebridge from NSS via Limerick City	Group 1a
Ennis Shannon/Sixmilebridge	SA8-501b	Supply Ennis and Shannon/Sixmilebridge from NSS via Limerick City	Group 1b
Shannon/Sixmilebridge Limerick City Environs PWS Ennis	SA8-502	Rationalise Shannon/Sixmilebridge and Ennis to Limerick City WRZ	Group 2
Shannon/Sixmilebridge Limerick City Environs PWS	SA8-503	Interconnect Shannon/Sixmilebridge and Limerick City WRZ and supply deficit from Limerick City.	Group 3
Cappamore Foileen Water Supply Limerick City Environs PWS Murroe PWS	SA8-505	Rationalise Murroe and Cappamore Foileen WRZs to Limerick City WRZ	Group 5
Murroe PWS Limerick City Environs PWS Cappamore Foileen Water Supply Pallasgreen Water Supply Doon Water Supply	SA8-508	Rationalise Cappamore Foileen, Murroe, Pallasgreen and Doon WRZ to Limerick City WRZ	Group 8
Limerick City Environs PWS South West Regional Foynes/Shannon Estuary PWS Adare	SA8-510	Interconnect South West Regional, Foynes/Shannon and rationalise Adare to Limerick City WRZ.	Group 10
Killaloe PWS Newport RWSS	SA8-512	Rationalise Killaloe and Newport to the New Shannon Source scheme	Group 12
Limerick City Environs PWS South West Regional Croom PWS Foynes/Shannon Estuary PWS Adare	SA8-514	Supply Limerick City from NSS and offset Clareville WTP to supply South West Regional, Foynes/Shannon Estuary, Croom Adare and Newport WRZs.	Group 14

Water Resource Zone Name	Feasible Options SA8		
	Option Code	Option Description	SA Grouped Option
Newport RWSS			
Glenosheen/ Jamestown/Kilmallock Kilfinnane Ardpatrick Water Supply	SA8-516	Rationalise Kilfinnane Ardpatrick to Glenosheen/Jamestown/Kilmallock WRZ	Group 16
Kilcommon Upperchurch	SA8-523	Increase GW abstraction at Kilcommon and upgrade WTP, Rationalise Upperchurch to Kilcommon WRZ.	Group 23
Ballingarry South West Regional Limerick City Environs PWS Adare Rathkeale	SA8-525	Upgrade Clareville WTP and rationalise Adare, Rathkeale, Ballingarry and South West Regional WRZs to Limerick City.	Group 25
Rathkeale Foynes/Shannon Estuary PWS Limerick City Environs PWS	SA8-526	Rationalise Rathkeale to Foynes/Shannon Estuary WRZ, Connect Foynes/Shannon Estuary to Limerick City WRZ and increase Shannon abstraction.	Group 26
Cappamore Foileen Water Supply Murroe PWS	SA8-527	New GW abstraction and new WTP for Cappamore Foileen WRZ and rationalise Murroe WRZ.	Group 27
Cappamore Foileen Water Supply Murroe PWS	SA8-528	New SW abstraction from River Bilboa and new WTP to supply Cappamore and Murroe WRZs.	Group 28
Murroe PWS Cappamore Water Supply Doon Water Supply Limerick City Environs PWS	SA8-529	Rationalise Murroe Cappamore Foileen and Doon WRZs to Limerick City	Group 29
Adare Limerick City Environs PWS	SA8-530	Rationalise Adare to Limerick City WRZ.	Group 30
South West Regional Rathkeale	SA8-531	Increase GW abstraction at Kilcolman Spring and upgrade existing Kilcolman WTP to supply deficit (new artesian well) and connect to South West Regional	Group 31

The 18 Study Area options result in 21 SA Combinations including the WRZ level Approach. The 21 SA Combinations in terms of the types of options within each combination are summarised in Table 5.6 below.

Table 5.6 SA Combinations

Key	WRZ Approach Option	○	SA Grouped Option	□

WRZ	SA combination 1 WRZ Level Approach	SA combination 2 (SA grouped option 1a)	SA combination 3 (SA grouped option 1b)	SA combination 4 (SA grouped option 2)	SA combination 5 (SA grouped option 3)	SA combination 6 (SA grouped option 8)	SA combination 7 (SA grouped option 10)	SA combination 8 (SA grouped option 14)	SA combination 9 (SA grouped option 16)	SA combination 10 (SA grouped option 23)	SA combination 11 (SA grouped option 25)	SA combination 12 (SA grouped option 26)	SA combination 13 (SA grouped option 27)	SA combination 14 (SA grouped option 28)	SA combination 15 (SA grouped option 29)	SA combination 16 (SA grouped option 30)	SA combination 17 (SA grouped option 31)	SA combination 18 (SA grouped option 8 & 16)	SA combination 19 (SA grouped option 8, 16 & 31)	SA combination 20 (SA grouped option 8, 10 & 16)	SA combination 21 (SA grouped option 8, 10, 12, 16 & 23) - **Preferred Approach**
Adare	○	○	○	○	○	○	□	□	○	○	□	○	○	○	○	□	○	○	○	□	□
Athlacca Water Supply	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Ballingarry	○	○	○	○	○	○	○	○	○	○	□	○	○	○	○	○	○	○	○	○	○
Bruff Water Supply	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Bruree Water Supply	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Carrigkerry Water Supply	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Croom PWS	○	○	○	○	○	○	○	□	○	○	○	○	○	○	○	○	○	○	○	○	○
Doon Water Supply	○	○	○	○	○	□	○	○	○	○	○	○	○	○	□	○	○	□	□	□	□
Ennis	○	□	□	□	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Feakle PWS	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Fedamore Water Supply	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Flagmount PWS	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

WRZ	SA combination 1 WRZ Level Approach	SA combination 2 (SA grouped option 1a)	SA combination 3 (SA grouped option 1b)	SA combination 4 (SA grouped option 2)	SA combination 5 (SA grouped option 3)	SA combination 6 (SA grouped option 8)	SA combination 7 (SA grouped option 10)	SA combination 8 (SA grouped option 14)	SA combination 9 (SA grouped option 16)	SA combination 10 (SA grouped option 23)	SA combination 11 (SA grouped option 25)	SA combination 12 (SA grouped option 26)	SA combination 13 (SA grouped option 27)	SA combination 14 (SA grouped option 28)	SA combination 15 (SA grouped option 29)	SA combination 16 (SA grouped option 30)	SA combination 17 (SA grouped option 31)	SA combination 18 (SA grouped option 8 & 16)	SA combination 19 (SA grouped option 8, 16 & 31)	SA combination 20 (SA grouped option 8, 10 & 16)	SA combination 21 (SA grouped option 8, 10, 12, 16 & 23) - **Preferred Approach**
Foynes/ Shannon Estuary PWS	○	○	○	○	○	○	□	□	○	○	○	□	○	○	○	○	○	○	○	□	□
Glenosheen/ Jamestown/ Kilmallock	○	○	○	○	○	○	○	○	□	○	○	○	○	○	○	○	○	□	□	□	□
Glin Water Supply	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Kilcommon	○	○	○	○	○	○	○	○	○	□	○	○	○	○	○	○	○	○	○	○	□
Kilfinnane Ardpatrick Water Supply	○	○	○	○	○	○	○	○	□	○	○	○	○	○	○	○	○	□	□	□	□
Killaloe PWS	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	□
Limerick City Environs PWS	○	○	○	□	○	○	□	□	○	○	□	□	○	○	○	□	○	○	○	□	□
Martinstown Water Supply	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Mountshannon PWS	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Murroe / Cappamore /Foileen	○	○	○	○	○	□	○	○	○	○	○	○	□	□	□	○	○	□	□	□	□
Newport RWSS	○	○	○	○	○	○	○	□	○	○	○	○	○	○	○	○	○	○	○	○	□

WRZ	SA combination 1 WRZ Level Approach	SA combination 2 (SA grouped option 1a)	SA combination 3 (SA grouped option 1b)	SA combination 4 (SA grouped option 2)	SA combination 5 (SA grouped option 3)	SA combination 6 (SA grouped option 8)	SA combination 7 (SA grouped option 10)	SA combination 8 (SA grouped option 14)	SA combination 9 (SA grouped option 16)	SA combination 10 (SA grouped option 23)	SA combination 11 (SA grouped option 25)	SA combination 12 (SA grouped option 26)	SA combination 13 (SA grouped option 27)	SA combination 14 (SA grouped option 28)	SA combination 15 (SA grouped option 29)	SA combination 16 (SA grouped option 30)	SA combination 17 (SA grouped option 31)	SA combination 18 (SA grouped option 8 & 16)	SA combination 19 (SA grouped option 8, 16 & 31)	SA combination 20 (SA grouped option 8, 10 & 16)	SA combination 21 (SA grouped option 8, 10, 12, 16 & 23) - **Preferred Approach**
O'Briensbridge PWS	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Pallasgreen Water Supply	○	○	○	○	○	□	○	○	○	○	○	○	○	○	○	○	○	□	□	□	□
Rathkeale	○	○	○	○	○	○	○	○	○	○	□	□	○	○	○	○	□	○	□	○	○
Scarriff PWS	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Shannon/ Sixmilebridge	○	□	□	□	□	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
South West Regional	○	○	○	○	○	○	□	□	○	○	□	○	○	○	○	○	□	○	□	□	□
Upperchurch	○	○	○	○	○	○	○	○	○	□	○	○	○	○	○	○	○	○	○	○	□
Woodford	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

5.2.1 Stage 3 – Preferred Approach at Study Area Level

As part of stage three, we compare the WRZ Level Approach and the SA Combinations to determine the Preferred Approach that provides the best outcome for the Study Area.

We use the EBSD tool to rank the combinations against the assessment criteria and we then compare the best performing SA Combinations under each of the six approach types, using the 7 step process set out in Fig 7.1, to establish the Preferred Approach at Study Area level. The results of this process are provided in Table 5.7.

Table 5.7 SA8 Summary of SA Combination of Performance against Approach Type

Ranked order (best to worst)	Best													Worst

WRZ	WRZ approach options	SA combination 2 (SA grouped option 1a)	SA combination 3 (SA grouped option 1b)	SA combination 4 (SA grouped option 2)	SA combination 5 (SA grouped option 3)	SA combination 6 (SA grouped option 8)	SA combination 7 (SA grouped option 10)	SA combination 8 (SA grouped option 14)	SA combination 9 (SA grouped option 16)	SA combination 10 (SA grouped option 23)	SA combination 11 (SA grouped option 25)	SA combination 12 (SA grouped option 26)	SA combination 13 (SA grouped option 27)	SA combination 14 (SA grouped option 28)	SA combination 15 (SA grouped option 29)	SA combination 16 (SA grouped option 30)	SA combination 17 (SA grouped option 31)	SA combination 18 (SA grouped option 8 & 16)	SA combination 19 (SA grouped option 8, 16 & 31)	SA combination 20 (SA grouped option 8, 10 & 16)	SA combination 20 (SA grouped option 8, 10 , 12, 16 & 23) - Preferred Approach
Least Cost				Worst																	Best
Quickest Delivery			Worst					Best													
Best AA *no. of -3 scores against biodiversity	1 No. -3 scores	1 No. -3 scores	1 No. -3 scores	2 No. -3 scores	1 No. -3 scores	1 No. -3 scores	1 No. -3 scores	1 No. -3 scores	1 No. -3 scores	1 No. -3 scores	1 No. -3 scores	1 No. -3 scores	2 No. -3 scores	2 No. -3 scores	1 No. -3 scores	1 No. -3 scores	1 No. -3 scores	1 No. -3 scores	1 No. -3 scores	1 No. -3 scores	1 No. -3 scores
Lowest Carbon				Worst					Best												
Most Resilient				Worst									Best								
Best Environmental														Worst							Best

The SA Combinations in Table 5.7 are assessed to determine the approach categories as summarised in Table 5.8.

Table 5.8 Best Combinations

Approach Categories	Best Performing Combination
Least Cost (LCo)	Group 8, 10, 12, 16 & 23
Best Environmental (BE)	Group 8, 10, 12, 16 & 23
Quickest Delivery (QD)	Group 14
Most Resilient (MR)	Group 27
Lowest Carbon (LC)	Group 16
Best AA (BA)	Group 16

The MCA assessment included the following assessment criteria:

- Resilience;
- Deliverability and Flexibility;
- Progressibility; and
- Sustainability (Environmental and Social Impacts).

The NPV Costs are based on four criteria:

- Capital Costs – the cost to construct the option, including all overheads, consent and land acquisition costs;
- Operational Costs – the whole life cost to operate the option, including operators, chemical requirements and energy requirements including pumping;
- Carbon Costs – the whole life embodied and operational Carbon costs of the option; and
- Environmental and Social – the whole life Environmental and Social cost of the option covering climate regulation, traffic disruption and food production (carbon emissions are covered separately in the bullet point above).

The wider range of costs used in the estimation of the NPV aligns our Plan with any future Project Level Cost Benefit Analysis, in accordance with the Public Spending Code.

In terms of NPV Cost, Group 8, 10, 12, 16 & 23 has the lowest NPV Cost, as shown in Figure 5.2 with the lowest total costs (CAPEX and OPEX) over the solutions lifetime.

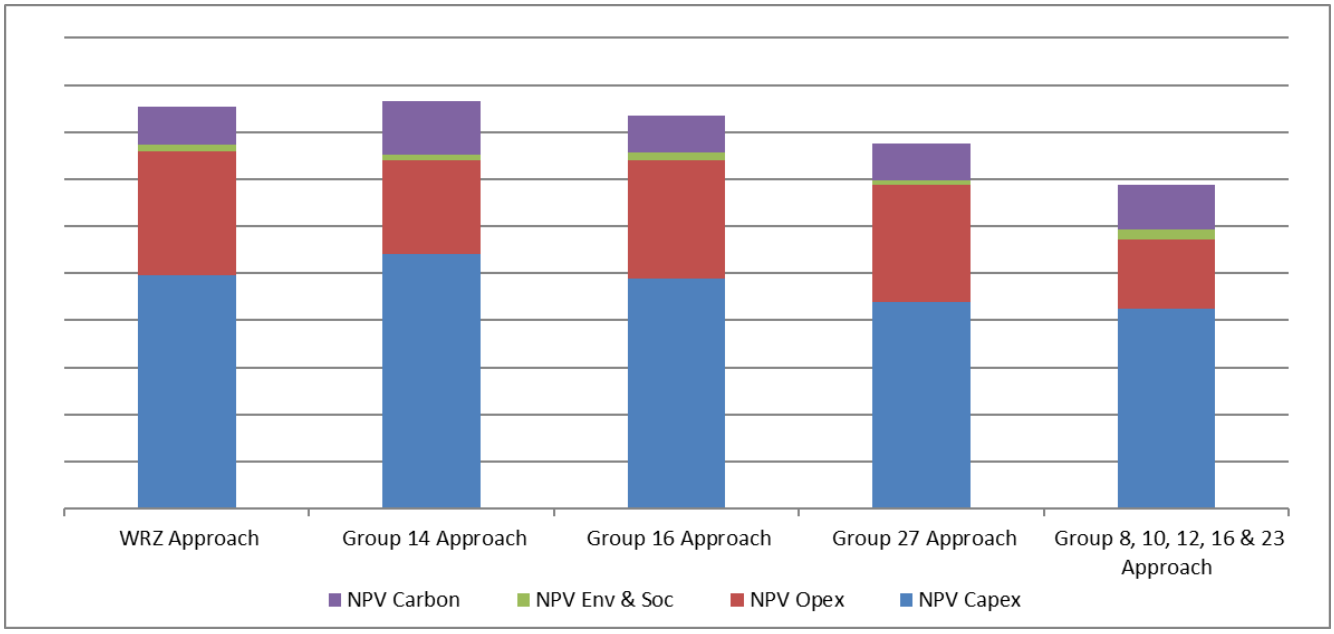


Figure 5.2 SA8 NPV Costs for WRZ and SA approaches

In accordance with the Options Methodology, these approaches are then compared against each other using the 7-Step process in Figure 5.1 to generate the best value combination of options at the Study Area level. The best value combination of options at the Study Area level results in the SA Preferred Approach. The outputs from the assessment were as follows:

- Step 1 – We compared the Least Cost Approach against the Best AA approach. The Least Cost Approach contained one option 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 – We compared the Quickest Delivery Approach against the Least Cost Approach. The Quickest Delivery approach does not deliver significantly better scores against the Quickest Delivery criteria and performs poorly against the Lowest carbon and resilience criteria compared to the Least Cost Approach. The Least Cost approach was therefore retained at this stage.
- Step 3 - We compared the Least Cost Approach against the Best Environmental Approach. The Least Cost Approach is the Best Environmental therefore the Least Cost approach was retained at this stage.
- Step 4 – We compared the Least Cost Approach against the Most Resilient Approach. The Most Resilient approach does not deliver significantly better scores against the resilience criteria and preforms poorly against the environmental criteria. The Least Cost Approach was therefore retained at this stage.
- Step 5 - We compared the Least Cost Approach against the Lowest Carbon Approach. There is not a significant difference between the carbon costs for both approaches and the Least cost Approach performs better against the Quickest Delivery and environmental criteria than the Lowest Carbon Approach. The Least Cost approach was therefore retained at this stage.
- Step 6 – A final assessment of the Least Cost Approach was completed against the Least Carbon, Best AA, Best Environmental and Most Resilient Approaches. The Least Cost Approach is also the Best Environmental Approach and does not have significantly lower

scores across any of the other criteria. The Least Cost Approach was therefore retained at this stage.

- Step 7 – The Least Cost Approach was selected as the Preferred Approach for the Water Resource and Study Area Levels.

5.3 Study Area Preferred Approach Summary

Study Area level, Group 8, 10, 12, 16 & 23 has the best score in terms of cost and MCA scores. On the basis of this initial assessment at Plan level, Group 8, 10, 12, 16 & 23 represents the Preferred Approach for Study Area 9.

The Preferred Approach comprised the options listed in listed in Table 5.9.

Table 5.9 Preferred Approach for Study Area 8

WRZ Name	Option Description
Shannon/Sixmilebridge	SA8-09: Increase abstraction at Castle Lake and upgrade Castle Lake WTP to supply deficit
Flagmount PWS	SA8-20a: Increase GW abstraction from Flagmount BH (poorly productive aquifer) and upgrade existing Flagmount Reservoir Site WTP
Feakle PWS	SA8-21: Increase GW abstraction from Feakle public supply new BH and upgrade existing Bauragegaun Pump Station WTP
Scarriff PWS	SA8-22: Increase GW abstraction from exisitng BHs and upgrade Scarriff WTP
Mountshannon PWS	SA8-24: Increase GW abstraction from existing Mountshannon BH (poorly productive aquifer) and upgrade Cloonmirran Pumphouse WTP
O'Briensbridge PWS	SA8-504: Rationalise O'Briensbridge WRZ to Limerick City WRZ (approx. distance 2.5km, new watermains and network upgrades required)
Ennis	SA8-01: Increase GW abstraction at Drumcliffe Springs (Ennis groundwater body - karstic bedrock) and upgrade Drumcliffe WTP to partly supply deficit SA8--172: Advanced leakage reduction. This leakage option needs implemented in conjunction with a local GW option TG4-SA8-01 or TG4-SA8-02 in order to meet full deficit.
Killaloe PWS Newport RWSS	Group 12 Rationalise to the New Shannon Source
Woodford	SA8-120: Increase existing GW
Murroe/ Cappamore/ Foileen	Group 8 Supply from Limerick
Doon Water Supply	
Pallasgreen Water Supply	

WRZ Name	Option Description
Fedamore Water Supply	SA8-51: New GW abstraction from Fedamore groundwater body (karstic) and upgrade Fedamore WTP/new WTP
Bruff Water Supply	SA8-52: Increase GW abstraction at Finn's Well (poortly productive aquifer) and upgrade Finn's Well WTP
Martinstown Water Supply	SA8-59: Increase GW abstraction at Martinstown BH (poorly productive aquifer) and upgrade Martinstown WTP
Glenosheen/Jamestown/Kilmallock	Group 16 Rationalise Kilfinnane Ardpatrick to Glenosheen/Jamestown/Kilmallock WRZ
Kilfinnane Ardpatrick Water Supply	
Bruree Water Supply	SA8-68: Increase GW abstraction at Bruee BH (Bruree groundwater body - productive fissured bedrock) and upgrade Bruree PS WTP
Athlacca Water Supply	SA8-179: Not in deficit - Upgrade WTP only
Carrigkerry Water Supply	SA8-98: Increase GW abstraction from Carrigkerry Spring (poorly productive aquifer) and upgrade Carrigkerry WTP
Glin Water Supply	SA8-100: Increase GW abstraction from Glin BH (poorly productive bedrock) and upgrade exisitng Glin WTP
Foynes/Shannon Estuary PWS	SA8-105: Connect Foynes/Shannon Estuary to Limerick City WRZ (approx. distance 2km, new watermains and network upgrades required)
Croom PWS	SA8-177: Rationalise Croom to Limerick City
Adare	Group 10 Rationalise to Limerick
South West Regional	
Limerick City Environs PWS	
Kilfinnane Ardpatrick Water Supply	Supply spare capacity to neighbouring WRZs and upgrade Rationalise to Jamestown WTP
Ballingarry	SA8-149: Increase GW abstraction at Ballingarry Spring (Ballingarry groundwater body - productive fissured bedrock) and upgrade exisitng Ballingarry Spring WTP to partly supply deficit
Rathkeale	SA8-145: Increase GW abstraction at Kilcolman Spring (Knockaderry groundwater body - productive fissured bedrock) and upgrade existing Kilcolman WTP to partly supply deficit
Kilcommon Upperchurch	Group 23 Increase GW for Kilcommon and upgrade WTP and rationalise Upperchurch to Kilcommon WRZ

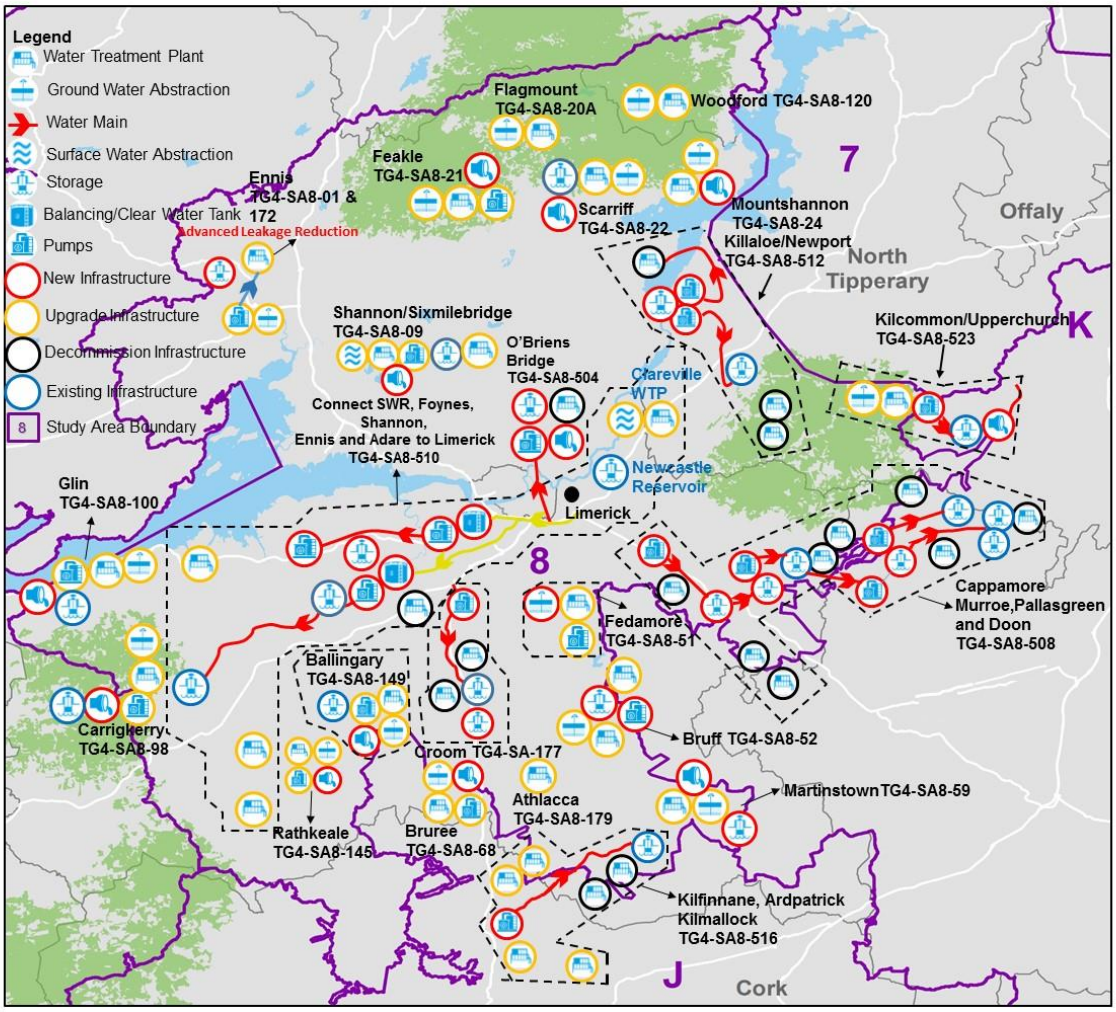


Figure 5.3 SA8 Preferred Approach

The Preferred Approach (Group approach 8, 10, 12, 16 & 23) is shown schematically in Figure 5.3.

As noted in Section 7 of the RWRP the PA for the Upperchurch WRZ and the Killaloe WRZ was modified further to information obtained during the consultation period.

The Preferred Approach for SA8 also includes for demand side (**Lose Less** and **Use Less**) measures, including:

- Ongoing leakage management including active leakage control, pressure management and find and fix activities to offset Natural Rate of Leakage Rise (NRR)
- 978 m³ of net leakage reduction across 17 WRZs (applied to SDB deficit)
- Continuation of IW household and business water conservation campaigns, initiatives and education programmes
- The option to implement legally enforceable Water Conservation Orders in drought periods in order to protect the environment and our public water supplies

Before we adopt this approach at Plan level for SA8, we must give consideration to the following:

- **Interim Solutions**: Based on scale of investment required across the entire country it is likely that it may take 5-10 investment cycles before we address all issues with the existing water supplies. Therefore, small localised options may be required on an interim basis to secure priority need in existing supplies until the SA Preferred Approach can be delivered;

- **Sensitivity Analysis**: When planning for water supplies over a medium to long term horizon, we must give consideration to adaptability of our plan to change across a range of future scenarios (for example, what if population growth rates are lower than expected or what if we are unable to secure a licence in the medium term to abstract the quantity water currently allowed for at a given location);and
- **Alternative options for WRZs dependent on another SA option:** The Preferred Approach for Newport WRZ and Killaloe is to obtain supply from the proposed Birdhill WTP which forms part of the Preferred Approach for SA9, therefore an alternative option is required for consideration as an alternative at Regional level and in the event the Preferred Approach for SA9 cannot advance. The alternative approach considered for the Newport WRZ is option number SA8-200 New GW abstraction to supply deficit and decommissioning of the existing O Gorman's well WTP and groundwater source. The alternative approach considered for the Killaloe WRZ is option number SA8-180 which looks at local upgrades for water quality improvements.

6 Preferred Plan Constraints – Interim Solutions

6 Interim Solutions

As outlined in more detail in Section 8.3.7.6 of the Framework Plan, the NWRP provides for an “interim solution” approach, which allows shorter term interventions to be identified and prioritised, when needed. The Preferred Approach for each WRZ, Study Area and Region will be delivered on a phased basis subject to budget and regulatory constraints. It will take many investment cycles to deliver the Preferred Approach across all WRZs, therefore, Irish Water must have a means to continue delivering safe, secure and reliable water supplies (on a short to medium term basis) while we deliver our Preferred Approach.

On this basis, interim, short term capital maintenance solutions have been identified for all WTPs and will be utilised when needed. These solutions will allow IW time to deliver the Preferred Approach, while at the same time, maintaining a sustainable water supply. These interim solutions are generally smaller in scale and rely on making best use of already existing infrastructure.

Examples of general interim measures for different water sources include the following:

- For groundwater sites, where the Preferred Approach requires that the existing WTP is to be maintained, the interim solution would typically provide for refurbishment of the existing or development of new boreholes and borehole pumps, and an upgrade of the treatment process in line with proposed growth predictions. This may require a staged upgrade of the WTP. For example, the interim solution would typically include an upgrade of the WTP to provide supply to existing customers with consideration given to a further required expansion of the WTP at a later date.
- For surface water sites, where the Preferred Approach requires that the existing WTP is to be maintained, the interim option would typically involve the upgrade of the existing WTP in line with proposed growth predictions. As for groundwater sites this may require a staged upgrade of the WTP where the interim solution would typically include an upgrade of the WTP to provide supply to existing customers with consideration given to a further required expansion of the WTP at a later date.
- For groundwater and surface water sites where the Preferred Approach involves the decommissioning of the WTP by providing supply to the customers from another WTP within the WRZ or from another WRZ/Study Area/Region, the interim solution would involve the advancement of the rationalisation of the WTP, by provision of part supply or full supply if possible. If rationalisation is not feasible at that point in time due to dependencies on Study Area or Regional options, containerised WTP upgrade solutions would be considered for the WTP. This involves the provision of a package WTP within a containerised unit. These package plants can be modified for use on other sites in the future therefore are considered “no regrets” infrastructure investment

A decision to progress any interim solution will be based on urgent or priority need to address water quality risk or supply reliability e.g. RAL, drought issues or critical need for example. The Regional Plan does not confer funding availability for any project and any interim measures will be subject to budget availability, relevant environmental assessment and other required consents in the normal way.

These solutions, in most cases, will only be used to allow time to deliver the longer-term solution. The interim solutions are determined in line with the Preferred Approach and as such, they are considered “no regrets” infrastructure investment.

Table 6.1 SA8 Interim Options

WTP Name	Interim Option
Castle Lake WTP	Upgrade WTP to IW Standards
Crean WTP	Refurb existing Borehole, and upgrade WTP to IW Standards – Potential site for a containerised solution
Flagmount WTP	Refurb existing Borehole, and upgrade WTP to IW Standards
Bauragegaun WTP	Refurb existing Borehole, and upgrade WTP to IW Standards
Scarriff WTP	Refurb existing Borehole, and upgrade WTP to IW Standards
Cloonmirran WTP	Refurb existing Borehole, and upgrade WTP to IW Standards
Montpellier (Ardataggle) WTP	Refurb existing Borehole, and upgrade WTP to IW Standards – Potential site for a containerised solution
Drumcliffe WTP	Upgrade WTP to IW Standards
Creeveroe WTP	Refurb existing Borehole, and upgrade WTP to IW Standards
Woodford WTW	Refurb existing Borehole, and upgrade WTP to IW Standards
Clareville WTP	Upgrade WTP to IW Standards
Lacka Doon Borehole WTP	Refurb existing Borehole, and upgrade WTP to IW Standards – Potential site for a containerised solution
Cooga Spring WTP	Refurb existing Borehole, and upgrade WTP to IW Standards – Potential site for a containerised solution
Pallasgreen WTP	Refurb existing Borehole, and upgrade WTP to IW Standards – Potential site for a containerised solution
Caherconlish WTP	Refurb existing Borehole, and upgrade WTP to IW Standards – Potential site for a containerised solution
Oola WTP	Refurb existing Borehole, and upgrade WTP to IW Standards – Potential site for a containerised solution
Fedamore WTP	Upgrade WTP to IW Standards
Moloney's WTP	Refurb existing Borehole, and upgrade WTP to IW Standards
Finn's Well WTP	Refurb existing Borehole, and upgrade WTP to IW Standards
Martinstown WTP	Refurb existing Borehole, and upgrade WTP to IW Standards
Jamestown WTP	Refurb existing Borehole, and upgrade WTP to IW Standards
Kilmallock WTP	Upgrade WTP to IW Standards
Glenosheen WTP	Refurb existing Borehole, and upgrade WTP to IW Standards
Ballygaddy WTP	Refurb existing Borehole, and upgrade WTP to IW Standards

WTP Name	Interim Option
Rockhill WTP	Refurb existing Borehole, and upgrade WTP to IW Standards – Potential site for a containerised solution
Bruree WTP	Refurb existing Borehole, and upgrade WTP to IW Standards
Athlacca WTP	Refurb existing Borehole, and upgrade WTP to IW Standards
Tobergal WTP	Refurb existing Borehole, and upgrade WTP to IW Standards – Potential site for a containerised solution
Castlemahon WTP	Upgrade WTP to IW Standards – Potential site for a containerised solution
Carrigkerry WTP	Refurb existing Borehole, and upgrade WTP to IW Standards
Glin WTP	Develop New Borehole, and upgrade WTP to IW Standards
Foynes (Aughinish) WTP	Upgrade WTP to IW Standards – Potential site for a containerised solution
Croom Bypass WTP	Refurb existing Borehole, and upgrade WTP to IW Standards – Potential site for a containerised solution
Skagh Well WTP	Refurb existing Borehole, and upgrade WTP to IW Standards – Potential site for a containerised solution
Adare WTP	Upgrade WTP to IW Standards – Potential site for a containerised solution
Kilfinnane WTP	Rationalise Glenosheen/Jamestown/Kilmallock WRZ
Ardpatrick WTP	Rationalise Glenosheen/Jamestown/Kilmallock WRZ
Ballingarry Spring WTP	Refurb existing Borehole, and upgrade WTP to IW Standards
Clouncagh WTP	Refurb existing Borehole, and upgrade WTP to IW Standards
Kilcolman WTP	Refurb existing Borehole, and upgrade WTP to IW Standards
Foileen WTP	Refurb existing Borehole, and upgrade WTP to IW Standards
Murroe WTP	Refurb existing Borehole, and upgrade WTP to IW Standards
Murroe (Reservoir) WTP	Refurb existing Borehole, and upgrade WTP to IW Standards
Newport WTP	Upgrade WTP to IW Standards – Potential site for a containerised solution
O'Gorman's Well	Refurb existing Borehole, and upgrade WTP to IW Standards – Potential site for a containerised solution
Kilcommon WTP	Refurb existing Borehole, and upgrade WTP to IW Standards
Upperchurch WTP	Refurb existing Borehole, and upgrade WTP to IW Standards

Small Towns and Villages Growth Programme Irish Water's Investment Plan 2020-2024 includes a number of programmes and projects targeted at providing for growth. One such programme is the Small Towns and Villages Growth Programme (STVGP) which will provide funding for Water and Waste Water

Treatment Plant growth capacity in smaller settlements which are not otherwise provided for in the Capital Investment Plan 2020 to 2024. The STVGP is focused on supporting growth in areas already served by IW infrastructure but where current or future capacity deficits have been identified. Irish Water have engaged with Local Authorities across the country to ensure that the investment is made appropriately in accordance with the relevant county development plan. Under this programme interim options works will be considered in the Adare, Rathkeale, Kilfinane and Murroe areas.

7

Preferred Approach – Sensitivity Analysis

7 Preferred Approach – Sensitivity Analysis

Our supply demand forecast and water quality barrier deficit assessments have been developed using the application of best practice methods within the data available. We have identified areas where we will focus improvements in data to improve the certainty of our forecasts. However, all long-term forecasts are subject to uncertainty. We have explored the sensitivity of our supply and demand forecasts to some of the key factors which influence them through a range of scenarios. This enables us to test the sensitivity of the Preferred Approach to changes in need, in order to ensure that our decision making is robust and that the approach is adaptable. We describe the factors which have been considered in Chapter 8 of the Framework Plan. In summary we test our Preferred Approach against the following questions:

1) What if the deployable output across our supplies is reduced based on sustainability limits within the new legislation on abstraction resulting in a larger supply demand balance deficit?
2) What if climate change impacts on our existing supplies are greater than anticipated?
3) What if our forecasts are too great and expected demand growth does not materialise resulting in a smaller supply demand balance deficit?
4) What if we are able to reduce leakage below SELL within the timeframe of the plan resulting in lower Needs?
5) What if we fail to achieve our leakage targets?

A summary of the adaptability criteria and analysis we have undertaken for SA8 is shown in Table 7.1.

Table 7.1 Sensitivity Analysis for SA8

Uncertainty	Likelihood	Increase/Decrease in Deficit	Impact on Preferred Approach
Sustainability	Moderate/High (as our current abstractions are large compared to the water bodies from which they abstract)	+ 13.7 Ml/d	**The impact of sustainability reductions could reduce the volumes that can be abstracted from our existing sources therefore increasing the supply demand balance deficit.** Our outline sustainability assessments would mean a potential increase in deficit for SA8 based on reductions in the sustainable abstraction amounts from the River Deel (Foynes Shannon), the River Mulkear (Newport), and the Loobagh River (Kilmallock). The proposed option for Foynes Shannon looks to connect to Limerick City WRZ, currently abstracting form the River Shannon therefore relieve stress on the River Deel source. The Newport (River Mulkear) preferred option is to rationalise to supply from NSS. The Loobagh River (Kilmallock) is not projected to be in deficit even with sustainability reductions. Groundwater sustainability is more difficult to assess at desktop level and will require project level assessments.
			Based on this scenario, the Preferred Approach remains the optimal solution.

Uncertainty	Likelihood	Increase/Decrease in Deficit	Impact on Preferred Approach
Climate Change	High (international climate change targets have not been met)	+4 Ml/d	**Higher climate change targets would impact our 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 optimizing our operations on a more environmentally sustainable basis across the range of supplies.
			Based on this scenario, the Preferred Approach remains the optimal solution.
Demand Growth	Low/Moderate (growth has been based on policy)	-200 m^3/d	**The impact of lower than expected growth would reduce the supply demand balance deficit and the overall need requirement.** The supply demand balance deficit is spread across 31 individual water resource zones and is driven by quality as well as quantity issues. Many of the WRZs in this area are rural where growth is relatively low. However, Limerick City, Shannon and Ennis are high growth areas. The preferred options for these areas are within the calculated sustainable limits and the most resilient options at Group 4 level.
			Based on this scenario, the Preferred Approach remains the optimal solution.
Leakage Targets	Low (Irish Water is focused on sustainability and aggressive leakage reduction)	978 m^3/d	**The impact of lower than expected leakage savings would increase the supply demand balance deficit and the overall need requirement.** 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.
			Based on this scenario, the Preferred Approach remains the optimal solution.
	Moderate/High (Irish Water is focused on sustainability and aggressive leakage reduction)	21,330 m^3/d	**The impact of achieving SELL and 21% leakage targets in our larger WRZs would reduce the supply demand balance deficit and the overall need requirement.** The need drivers in SA8 are across all 31 water resource zones and are driven by quality as well as availability issues. Therefore, the Preferred Approach is required, even accounting for increased leakage savings.
			Based on this scenario, the Preferred Approach remains as the optimal solution.

In reality, a combination of these scenarios may occur together. For example, growth in demand might be lower if we achieve greater leakage reductions. However, if this coincided with a reduction in permitted abstraction volume under the abstraction licensing regime, the reduction in demand may offset some or all of the loss in supply availability due to abstraction sustainability reductions.

Based on the adaptability assessment, the Interim and Preferred Approaches perform as follows:

- Interim Approach – As the purpose of the Interim Approach is to allow for priority Quality and Quantity issues, the solutions will have a limited design life (usually less than 10 years). They allow time to assess the Preferred Approach and improve adaptability within our Plan
- Preferred Approach – The supplies in SA8 vary in size with a large number of small WRZs <1Ml/d as well as larger growth areas such as Limerick City, Shannon and Ennis. Many of the options within the Preferred Approach look to expand existing groundwater and surface water supplies. Some of the options within the Preferred Approach increase supply to a number of WRZs by increasing the abstraction from the Old River Shannon. Further supply is potentially available from this source and this option may allow for other future connections. Therefore, the Preferred Approach is adaptable to changing needs in the Study Area, over time.

In summary, our sensitivity assessment of the Interim and Preferred Approaches demonstrates that they are both highly adaptable to a broad range of futures, and therefore represent ‘no regrets’ infrastructure.

8

Summary of Study Area 8

8 Summary of Study Area 8

The Preferred Approach for SA8 (summarised in Table 5.8 and Figure 5.5 of Section 5.3.3) consists of WRZ Options for 18 of the 31 WRZ in the Study Area, primarily driven by the small scale of the supplies and difficulties in transporting small volumes of water over long distances. The Preferred Approach for these WRZ involve new and increased groundwater abstractions, along with increased surface water abstractions and WTP upgrades. The Preferred Approach for the remaining WRZs involves increased abstraction from the Old River Shannon to supply Limerick City, O'Briensbridge, Murroe, Cappamore and Foileen, Doon, Pallasgreen, South West Regional, Foynes/ Shannon Estuary and Adare.

Delivery of the Preferred Approach will secure all of the supplies in the area in terms of Quality, Quantity, Sustainability and Resilience.

Delivery of the Preferred Approach will secure all of the supplies in the area in terms of Quality, Quantity, Sustainability and Resilience. The Preferred Approach for SA8 also includes for demand side (**Lose Less** and **Use Less**) measures, including:

- Ongoing leakage management including active leakage control, pressure management and find and fix activities to offset Natural Rate of Leakage Rise (NRR)
- Nett leakage reduction, amounting to 978 m^3 per day (applied to SDB Deficit) to move towards achieving the National SELL Target by 2034
- Continuation of IW household and business water conservation campaigns, initiatives and education programmes
- The option to implement legally enforceable Water Conservation Orders in drought periods in order to protect the environment and our public water supplies

As part of our Preferred Approach we have also identified a range of interim solutions for SA8, as summarised in Table 6.1. The measures will only be progressed in the event of critical need to allow time for delivery of the required Preferred Approach solutions in the Study Area.

Annex A Study Area 8 Water Treatment Plants

WTP Asset Name	Local Plant Names
Drumcliffe WTP	Drumcliffe WTP
Castle Lake WTP	Castle Lake WTP
Creeveroe WTP	Killaloe WTP
Crean WTP	Broadford WTP
Scarriff WTP	Scarriff WTP
Cloonmirran WTP	Mountshannon WTP
Montpellier (Ardataggle) WTP	Montpelier WTP
Bauragegaun WTP	Feakle WTP
Flagmount WTP	Flagmount WTP
Woodford WTW	Woodford WTP
Clareville WTP	Clareville WTP
Foynes (Aughinish) WTP	Foynes Shannon Estuary WTP
Tobergal WTP	Tobergal WTP
Castlemahon WTP	Castlemahon WTP
Jamestown WTP	Jamestown (Limerick) WTP
Kilmallock WTP	Kilmallock WTP
Adare WTP	Adare WTP
Foileen WTP	Foileen WTP
Clouncagh WTP	Clouncagh WTP
Kilcolman WTP	Kilcolman (Limerick) WTP
Rockhill WTP	Rockhill WTP
Martinstown WTP	Martinstown WTP
Croom Bypass WTP	Croom Bypass WTP
Kilfinnane WTP	Kilfinnane WTP
Pallasgreen WTP	Pallasgreen Spring WTP
Ballingarry Spring WTP	Ballingarry Spring WTP
Moloney's WTP	Moloney's WTP
Finn's Well WTP	Finns WTP
Bruree WTP	Bruree WTP

WTP Asset Name	Local Plant Names
Caherconlish WTP	Caherconlish WTP
Glin WTP	Glin WTP
Murroe WTP	Murroe WTP
Murroe (Reservoir) WTP	Murroe Reservoir WTP
Oola WTP	Oola WTP
Lacka Doon Borehole WTP	Lacka WTP
Fedamore WTP	Fedamore WTP
Glenosheen WTP	Glenosheen WTP
Cooga Spring WTP	Cooga Spring WTP
Ardpatrick WTP	Ardpatrick WTP
Skagh Well WTP	Skagh Well WTP
Ballygaddy WTP	Ballingaddy BH WTP
Carrigkerry WTP	Carrigkerry WTP
Athlacca WTP	Athlacca WTP
Newport WTP	Newport (Tipperary) WTP
O'Gorman's Well	O'Gorman's Well WTP
Kilcommon WTP	Kilcommon WTP
Upperchurch WTP	Upperchurch WTP

Annex B Study Area 8 Rejection Register Summary

Study Area 8 - CS Rejection

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability (Environmental and Social Impacts)
TG4-SA8-03	New SW abstraction from Lough Inchicronan and new WTP to partly supply deficit in Ennis	This option requires a new SW source and a new WTP. This option will meet only approximately 70% of the deficit while abstracting the full limit of calculated allowable abstraction and as a result is not considered feasible at coarse screening stage and is not taken forward to fine screening stage. Additionally, 6km of new watermain would be required for a relatively small volume. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.	•	•	•
TG4-SA8-04	Supply part of the deficit at Ennis from neighbouring Kilmaley/Inagh GWS (network upgrades required)	This option takes supply from a very small catchment (<1km2), which would not have additional yield available to supply both current GWS supply and new Ennis WRZ supply of approximately 4MLD deficit. This option would also require significant additional mains of approximately 12km from lake to WTP. The Lake also part of bog Natural Heritage Area (NHA). For these reasons it was rejected at coarse screening stage	•	•	•
TG4-SA8-05	Supply part of the deficit at Ennis from nearby Liscasey GWS (New watermains and network upgrades required)	There is no data available on yield or infrastructure within this Group Water Scheme. This option is likely to require increasing watermain from the WTP for potentially small yield availability. Transferring the small quantity required over long distances can affect the quality of water. There are too many unknowns to progress this option at coarse screening and therefore it was taken through to fine screening		•	
TG4-SA8-06	Improve connectivity of Ennis and Shannon/Sixmilebridge WRZ for increased resilience (there is existing 400mm connection in place done as part of bypass; Newmarket to Ennis	Both of the WRZs identified in this option are in deficit and will require a new source to provide any resilience. This is addressed in other options that have advanced through to fine screening and therefore this option is not considered necessary		•	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability (Environmental and Social Impacts)
	section currently not in use)				
TG4-SA8-10	New GW abstraction from Broadford Gravels groundwater body and new WTP to partly supply deficit in Shannon/ Sixmilebridge	It is unlikely that yield would be available with this optoin to meet the full demand. Broadford gravels are approximately 8km to the network and would require new watermain for potentially small yield availability. Transferring the small quantity required over long distances can affect the quality of water. There are too many unknowns to progress this option at coarse screening and therefore this option was not taken forward to fine screening.	●	●	●
TG4-SA8-12	New SW abstraction from Rosroe Lake and new WTP to partly supply deficit in Shannon/ Sixmilebridge	The desktop assessments undertaken identified a sustainable abstraction at this location of approximately 4.35MLD. The deficit in the WRZ is approximately 4.6MLD. 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, as the proposed abstraction is calculated at 11% of Q50. Therefore, this option did not meet the requirements of the Environmental, Resilience or Deliverability criteria and was not progressed to the fine screening stage	●	●	●
TG4-SA8-13	New SW abstraction from Lough Cullaunyheeda and new WTP to partly supply deficit in Shannon/ Sixmilebridge	This option requires a new SW source and a new WTP. This option is calculated to meet less than 50% of the deficit while abstracting the estimated sustainable abstraction limit and as a result is not considered feasible at coarse screening stage and is not taken forward to fine screening stage. Additionally, 10km of new watermain would be required for a relatively small volume. Transferring small quantities of water over long distances can affect the quality of water. Therefore, as there were other viable options for these WRZs this option was not considered feasible at coarse screening stage.	●	●	●

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability (Environmental and Social Impacts)
TG4-SA8-14	Supply part of the deficit at Shannon/Sixmilebridge from nearby Liscasey GWS (approx. distance 2km, new watermains and network upgrades required)	There is no data available on yield or infrastructure within this Group Water Scheme. This option is likely to require increasing watermain from the WTP for potentially small yield availability. Transferring the small quantity required over long distances can affect the quality of water. There are too many unknowns to progress this option at coarse screening and therefore this option did not progress to the fine screening stage		•	
TG4-SA8-17h	Limerick City is not in deficit - supply spare capacity to neighbouring WRZs	This is a Regional Option. The option requires a significant length of new pipeline of over 15km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore, as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA8-17i	Limerick City is not in deficit - supply spare capacity to neighbouring WRZs	This is a Regional Option. The option requires a significant length of new pipeline of over 11km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA8-17g	Increase abstraction from River Shannon (Clareville) and supply neighbouring WRZs and upgrade WTP	Repeat of 510	**This option is a repeat and is assessed as part of a different feasible option'**		
TG4-SA8-18	Supply Limerick City from New Shannon Source and decommission Clareville WTP	There is no deficit predicted for Limerick City over the next 25 years and no non-performance water quality issues identified as part of the barrier risk assessment. Therefore, it does not make sense to rationalise Clareville WTP in this iteration and it was not brought through coarse screening.		•	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability (Environmental and Social Impacts)
TG4-SA8-20b	Increase GW abstraction from Flagmount BH (poorly productive aquifer) and upgrade existing Flagmount Reservoir Site WTP	This is a Regional Option. The option requires a significant length of new pipeline of over 15km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		●	
TG4-SA8-23	Supply part/full deficit at Scarriff from neighbouring Raheen GWS	There is no data available on yield or infrastructure within this Group Water Scheme. This option is likely to require increasing watermain from the WTP for potentially small yield availability. Transferring the small quantity required over long distances can affect the quality of water. There are too many unknowns to progress this option at coarse screening and it was not brought through to the fine screening stage		●	
TG4-SA8-25	Increase GW abstraction from existing BHs (poorly productive aquifer) and upgrade existing Creeveroe Pump Station WTP	When unconstrained options list were originally drawn up this WRZ was identified as having a deficit; however, due to an updated SDB, which takes into account data improvements, there is no longer an identified deficit in this WRZ. Therefore, no new supply option is required.	**Killaloe WRZ is no longer in deficit**		
TG4-SA8-26	New SW abstraction from Lough Derg and upgrade existing WTP to supply Killaloe	This option proposed a new surface water abstraction from Lough Derg. The existing abstraction is groundwater and increasing the existing groundwater is a viable option, therefore the new surface water abstraction was not considered necessary for such a small additional supply (<300m3/day) and as a result this option was not brought forward to the fine screening stage		●	
TG4-SA8-31b	Rationalise O'Briensbridge WRZ to Limerick City WRZ	This is a Regional Option. The option requires a significant length of new pipeline of over 15km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		●	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability (Environmental and Social Impacts)
TG4-SA8-32	Rationalise O'Briensbridge WRZ to Newport WRZ - Tipperary	This is a Regional Option. The option requires a significant length of new pipeline of over 9.5km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		●	
TG4-SA8-33	Supply O'Briendsbridge from New Shannon Source	The option requires a significant length of new pipeline of over 12km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		●	
TG4-SA8-34	Increase abstraction at Murroe BH (poorly productive aquifer) and upgrade Murroe WTP to supply deficit	This option cannot meet the full demand identified for the WRZ and therefore it was rejected at the coarse screening stage.	●	●	
TG4-SA8-35	New SW abstraction from River Mulkear and new WTP to supply deficit in Murroe	This option proposed a new surface water abstraction from River Mulkear. The existing abstraction is groundwater and increasing the existing groundwater is a viable option, therefore the new surface water abstraction was not considered necessary for such a small additional supply (<1MLD). For this reason it was not taken through to the fine screening stage.		●	
TG4-SA8-37	Increase GW abstraction from Foileen Spring (poorly productive aquifer) and upgrade Foileen WTP	This option involves increasing abstraction from the Foileen Srping. This spring is a poorly productive aquifer and the desktop assessments undertaken indicate that it is unlikely that the yield from this source can be increased since the spring is likely to be already at max capacity. For this reason this option was rejected at coarse screening.	●	●	
TG4-SA8-38a	New GW abstraction from Ballyneety groundwater body (karstic bedrock) and new WTP for Cappamore/ Foileen	The option requires a significant length of new and upgraded pipeline of over 11km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		●	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability (Environmental and Social Impacts)
TG4-SA8-41	Rationalise Cappamore Foileen WRZ to Galtee Regional WRZ	Galtee WRZ is outside Group 4. Galtee WRZ is in deficit and requires a new source in order to meet demand over the next 25 years. This will be assessed as part of the options assessment of the South East Regional Plan This option to connect Cappamore to Galtee will, therefore, be assessed as part of the South East Plan.	Option to be assessed as part of the South East Plan, as part of Study Area K		
TG4-SA8-42	Interconnect Cappamore Foileen and Pallasgreen WRZs for increased resilience	This is a Regional Option. The option requires a significant length of new pipeline of over 13km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA8-45	Rationalise Doon to Cappamore Foileen WRZ	The option requires a significant length of new and upgraded pipeline of over 11km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA8-46	Rationalise Doon WRZ to Glengar WRZ in Tipperary	Glengar WRZ is outside Group 4. Glengar WRZ is in deficit and requires a new source in order to meet demand over the next 25 years. This will be assessed as part of the options assessment of the the South East Regional Plan. This option to connect Doon to Glengar will, therefore, be assessed as part of the South East Plan.		•	
TG4-SA8-48a	New GW abstraction from Pallas Grean groundwater body for Pallasgreen	This is a Regional Option. The option requires a significant length of new pipeline of over 13km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA8-56	Supply deficit at Bruff from Lough Gur GWS	The option requires a significant length of new pipeline of over 3km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage..		•	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability (Environmental and Social Impacts)
TG4-SA8-57	Supply deficit at Bruff from Knockainey/Kilballyowen GWS	The option requires a significant length of new pipeline of between 3 and 5km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		●	
TG4-SA8-58	Rationalise Bruff to Kilmallock WRZ	This is a Regional Option. The option requires a significant length of new pipeline of over 6km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		●	
TG4-SA8-60	New GW abstraction from North Kilmallock groundwater body (karstic bedrock) and new WTP	The option requires a significant length of new pipeline of over 3km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage..		●	
TG4-SA8-61	Supply deficit at Martinstown from neighbouring Bulgaden GWS	The option requires a significant length of new and upgraded pipeline likely to be over 10km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		●	
TG4-SA8-62	Supply deficit at Martinstown from neighbouring Ballinvreena GWS	There is no data available on yield or infrastructure within this Group Water Scheme. There is likely to require increasing watermain from the WTP for potentially small yield availability. Transferring the small quantity required over long distances can affect the quality of water. There are too many unknowns to progress this option at coarse screening and therefore it was not progressed to the fine screening stage.		●	
TG4-SA8-63	Rationalise Martinstown to Knocklong/Hospital WRZ	The option requires a significant length of new pipeline of over 5km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		●	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability (Environmental and Social Impacts)
TG4-SA8-64	Glenosheen/Jamestown/Kilmallock not in deficit - supply spare capacity to neighbouring WRZs	This is a Regional Option. The option requires a significant length of new pipeline of over 6km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA8-66	Interconnect Kilmallock and Charleville WRZs for increased resilience and transfer spare capacity to Charleville WRZ	Charleville WRZ is outside Group 4. Charleville WRZ is in deficit and requires a new source in order to meet demand over the next 25 years. This will be assessed as part of the options assessment of Study Area J in the South West Regional Plan. This option will, therefore, be assessed as part of the South West Plan.	**Option to be assessed as part of the South West Plan, as part of Study Area J**		
TG4-SA8-69	Supply deficit at Bruree from Granagh GWS	There is no data available on yield or infrastructure within this Group Water Scheme. This option is likely to require increasing watermain from the WTP for potentially small yield availability. Transferring the small quantity required over long distances can affect the quality of water. There are too many unknowns to progress this option at coarse screening and therefore this option did not progress to fine screening stage		•	
TG4-SA8-70	Rationalise Bruree to Castletown Ballyagran WRZ	Castletown Ballyagran WRZ is outside Group 4. Castletown Ballyagran WRZ is in deficit and requires a new source in order to meet demand over the next 25 years. This will be assessed as part of the options assessment of Study Area J in the South West Regional Plan. This option will, therefore, be assessed as part of the South West Plan.	**Option to be assessed as part of the South West Plan, as part of Study Area J**		
TG4-SA8-71	Increase GW abstraction from Athlacca BH and upgrade Athlacca Pump Station WTP	When unconstrained options list were originally drawn up this WRZ was identified as having a deficit; however, due to an updated SDB, which takes into account data improvements, there is no longer an identified deficit in this WRZ. Therefore, no new supply option is required.	**Athlacca WRZ is no longer in deficit**		

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability (Environmental and Social Impacts)
TG4-SA8-72	New SW abstraction from River Morningstar for Athlacca. New WTP/upgrade existing Athlacca Pump Station WTP	This option proposed a new surface water abstraction from River Morningstar. The existing abstraction is groundwater and increasing the existing groundwater is a viable option, therefore the new surface water abstraction was not considered necessary for such a small additional supply (<20m3/day) and as a result this option was rejected at coarse screening stage		•	
TG4-SA8-73	Tanker water when required for Athlacca	Tankering is not a robust, resilient, long term solution for any WRZ within the region and for this reason, is not taken forward to fine screening	**This option is a tactical option and is unlikely to meet the full deficit. This will likely be implemented along with a new supply option**		
TG4-SA8-74	Increase GW abstraction at Ballingarry Spring and upgrade existing Ballingarry Spring WTP to partly supply deficit	This is a repeated option and is assessed as part of feasible option SA8-149	**This option is a repeat and is assessed as part of a different feasible option**		
TG4-SA8-75	Increase SW abstraction from River Deel and upgrade existing Castlemahon WTP to partly supply deficit	The desktop assessments undertaken identified that the estimated sustainable abstraction at this location is approximately 5.472MLD, not accounting for the existing abstraction. We are currently abstracting above the calculated sustainable limits. 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.	•	•	•
TG4-SA8-76	Increase GW abstraction at Kilcolman Spring and upgrade existing Kilcolman WTP to partly supply deficit	This is a repeated option and is assessed as part of feasible option SA8-145	**This option is a repeat and is assessed as part of a different feasible option**		
TG4-SA8-85	Connect South West Regional to Limerick	This is a repeated option and is assessed as part of feasible option Group 10	**This option is a repeat and is assessed as part of a different feasible option'**		

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability (Environmental and Social Impacts)
	City WRZ via Croagh GWS and Adare				
TG4-SA8-86	Rationalise Newcastle West to Foynes/Shannon Estuary WRZ	Both WRZs are in deficit and require a new source to provide any resilience. This is addressed in other options that have advanced through to fine screening (regional option 10 and 11).		•	
TG4-SA8-87	Interconnect Newcastle West and Allow Regional WRZs for increased resilience	Both WRZs are in deficit and require a new source to provide any resilience. This is addressed in other options that have advanced through to fine screening (regional option 10 and 11).		•	
TG4-SA8-88	Interconnect Newcastle West and Newmarket WRZs for increased resilience	Newmarket WRZ is outside Group 4. Newmarket WRZ is in deficit and requires a new source in order to meet demand over the next 25 years. This will be assessed as part of the options assessment of Study Area J in the South West Regional Plan. This option will, therefore, be assessed as part of the South West Plan.	**Option to be assessed as part of the South West Plan, as part of Study Area J**		
TG4-SA8-95	Supply deficit at Croom from nearby Kilfinny GWS	The option requires a significant length of new pipeline of over 4km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA8-96	Interconnect Croom and Adare WRZ for increased resilience and supply deficit	This is a Regional Option. The option requires a significant length of new pipeline of over 6km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA8-99	Rationalise Carrigkerry to Newcastle West WRZ	The option requires a significant length of new and upgraded pipeline of over 3km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability (Environmental and Social Impacts)
TG4-SA8-101	Increase SW abstraction from River Deel and upgrade existing Foynes Shannon Estuary WTP (Aughinish WTP) to partly supply deficit	The desktop assessments undertaken indicate that there is no scope to increase the abstraction from the River Deel, as current abstraction already above allowable abstraction limit. For this reason, this option was rejected at coarse screening stage.	•	•	•
TG4-SA8-106	Connect Foynes/Shannon Estuary to Limerick City WRZ	This is a repeated option and is assessed as part of feasible option Group 10	**This option is a repeat and is assessed as part of a different feasible option'**		
TG4-SA8-108	Rationalise Adare to Limerick City for improved resilience	This is a repeated option and is assessed as part of feasible option Group 10	**This option is a repeat and is assessed as part of a different feasible option'**		
TG4-SA8-110	Increase GW abstraction from Adare BH and connect to Croom	This is a Regional Option. The option requires a significant length of new pipeline of over 6km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA8-111	Increase abstraction at Ardpatrick Spring and upgrade Ardpatrick WTP to supply deficit	Based on the desktop assessments undertaken the yield availability from this source Is deemed to be high risk and unlikely. Other groundwater options were deemed to be viable for this WRZ and progressed through to fine screening. Therefore, this option was rejected at coarse screening stage.	•	•	•
TG4-SA8-113	New GW abstraction from Ballyhoura Kiltorcan groundwater body and new WTP to supply part/full deficit	The option requires a significant length of new and upgraded pipeline of over 4km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability (Environmental and Social Impacts)
TG4-SA8-115	Increase SW abstraction from River Allow	The desktop assessments undertaken determined that the sustainable abstraction at this location is approximately 1.2MLD, not accounting for the existing abstraction. We are currently abstracting at the sustainable limits. 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.	•	•	•
TG4-SA8-116	New GW in karstic developable resource	Based on the desktop assessments undertaken the yield availability from this source Is deemed to be unlikely. Therefore, this option was rejected at coarse screening stage.	•	•	•
TG4-SA8-117	Connect Allow to Limerick City WRZ via Foynes Shannon	The option requires a significant length of new and upgraded pipeline of over 6km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA8-119	Newport in surplus - supply other areas	This is a Regional Option. The option requires a significant length of new pipeline of over 9.5km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA8-121	Supply deficit at Woodford from Rea Woodford GWS	The option requires a significant length of new and upgraded pipeline of over 2km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA8-122	Supply deficit at Woodford from Moyglass Loughrea GWS	The option requires a significant length of new and upgraded pipeline of over 4km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability (Environmental and Social Impacts)
TG4-SA8-123	Rationalise Ennis to New Doolough WTP (West Clare) via Kilmaley/Inagh GWS	The option requires a significant length of new and upgraded pipeline of over 25km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA8-126	New SW abstraction from Lough Graney for Flagmount	This option proposed a new surface water abstraction from Lough Graney. The existing abstraction is groundwater and increasing the existing groundwater is a viable option, therefore the new surface water abstraction was not considered necessary for such a small additional supply (<60m3/day) and therefore this option was not progressed to the fine screening stage		•	
TG4-SA8-128	Rationalise Feakle to Flagmount WRZ	This is a Regional Option. The option requires a significant length of new pipeline of over 15km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA8-130	Rationalise Scarriff to Flagmount WRZ	This is a Regional Option. The option requires a significant length of new pipeline of over 15km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA8-132	Interconnect Scarriff and Mountshannon WRZ for increased resilience	The option requires a significant length of new and upgraded pipeline of over 6km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was not rejected at coarse screening stage.		•	
TG4-SA8-133	New SW abstraction from Lough Derg and new WTP supplying Scarriff and Mountshannon WRZs	This option proposed a new surface water abstraction from Lough Derg. The existing abstraction is groundwater and increasing the existing groundwater is a viable option, therefore it was not considered necessary for such a small additional supply. In addition to this, the option requires a significant length of new and upgraded pipeline of over 10km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability (Environmental and Social Impacts)
TG4-SA8-134	New SW abstraction from Lough Derg and new WTP supplying Scarriff and Mountshannon WRZs	This option proposed a new surface water abstraction from Lough Derg. The existing abstraction is groundwater and increasing the existing groundwater is a viable option, therefore it was not considered necessary for such a small additional supply. In addition to this, the option requires a significant length of new and upgraded pipeline of over 10km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		●	
TG4-SA8-135	Interconnect Killaloe and Newport WRZs and supply deficit from Newport WRZ	This is a Regional Option. The option requires a significant length of new pipeline of over 2.5km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		●	
TG4-SA8-136	Rationalise Killaloe to Limerick City WRZ - Cloonlara through O'Briensbridge (new watermains and network upgrades required)	This is a Regional Option. The option requires a significant length of new pipeline of over 15km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		●	
TG4-SA8-141	Interconnect Martinstown and Knocklong/Hospital WRZ for increased resilience	The option requires a significant length of new and upgraded pipeline of over 3km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		●	
TG4-SA8-142	Rationalise Martinstown to Kilmallock WRZ	This is a Regional Option. The option requires a significant length of new pipeline of over 3km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		●	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability (Environmental and Social Impacts)
TG4-SA8-143	Increase GW abstraction from Jamestown springs (5 springs in total, 2 springs currently in use) and supply spare capacity to neighbouring schemes	When unconstrained options list were originally drawn up this WRZ was identified as having a deficit; however, due to an updated SDB, which takes into account data improvements, there is no longer an identified deficit in this WRZ. Therefore, no new supply option is required.	**Glenosheen/Jamestown/Kilmallock WRZ is no longer in deficit**		
TG4-SA8-144	Rationalise Bruree to Kilmallock WSZ (Glenosheen/Jamestown/Kilmallock WRZ), network upgrades required	This is a Regional Option. The option requires a significant length of new pipeline of over 10km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA8-147	Rationalise Rathkeale to South West WRZ (new watermains and network upgrades required)	This is a repeated option and is assessed as part of feasible option Group 25	**This option is a repeat and is assessed as part of a different feasible option**		
TG4-SA8-150	New GW abstraction/wellfield to supply deficit at Ballingarry	This is a repeated option and is assessed as part of feasible option SA8-149	**This option is a repeat and is assessed as part of a different feasible option**		
TG4-SA8-153	Rationalise Croom to Limerick City via Adare	This is a repeated option and is assessed as part of feasible option Group 14	**This option is a repeat and is assessed as part of a different feasible option**		
TG4-SA8-155	Rationalise Glin to Foynes/Shannon Estuary WRZ	The option requires a significant length of new and upgraded pipeline of over 6km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability (Environmental and Social Impacts)
TG4-SA8-156	Rationalise Glin to Listowel Regional WRZ (Tarbert WTP)	The option requires a significant length of new and upgraded pipeline of over 6km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA8-157	Interconnect Allow Regional and Charleville for increased resilience and supply deficit	The option requires a significant length of new and upgraded pipeline of over 8km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA8-158	Increase SW abstraction from Newport River and upgrade WTP, rationalise O Gormans Well	The desktop assessments undertaken determined that the sustainable abstraction at this location is approximately 2.2MLD, which we are currently abstracting above. Abstracting an increased volume of water at this location would 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.	•	•	•
TG4-SA8-161	Rationalise Newport to Clareville WTP	This is a Regional Option. The option requires a significant length of new pipeline of over 11km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA8-164	Rationalise Kilcommon to Newport WRZ	The option requires a significant length of new and upgraded pipeline of over 2km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA8-167	Rationalise Upperchurch to Thurles WRZ	The option requires a significant length of new and upgraded pipeline of over 2km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA8-168	Glenosheen/Jamestown/Kilmallock not in deficit - supply spare	This is a Regional Option. The option requires a significant length of new pipeline of over 3km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were		•	

Option Reference	Option Description	Rejection Reasoning	Resilience	Deliverability & Flexibility	Sustainability (Environmental and Social Impacts)
	capacity to neighbouring WRZs	other viable options for these WRZs this option was rejected at coarse screening stage.			
TG4-SA8-169	Glenosheen/Jamestown/Kilmallock not in deficit - supply spare capacity to neighbouring WRZs	This is a Regional Option. The option requires a significant length of new pipeline of over 10km for a relatively small supply. Transferring small quantities of water over long distances can affect the quality of water. Therefore as there were other viable options for these WRZs this option was rejected at coarse screening stage.		•	
TG4-SA8-170a	Connect South West Regional to Limerick City WRZ	This is a repeated option and is assessed as part of feasible option Group 25	**This option is a repeat and is assessed as part of a different feasible option'**		
TG4-SA8-174	Local GW for Adare	When unconstrained options list were originally drawn up this WRZ was identified as having a deficit; however, due to an updated SDB, which takes into account data improvements, there is no longer an identified deficit in this WRZ. Therefore, no new supply option is required.	**Adare WRZ is no longer in deficit**		
TG4-SA8-176	Newport not in deficit - Upgrade WTP only	Due to an SDB update this WRZ is now projected to be in deficit in 2044 and, as such a new supply option is required to address this need. Therefore, this option which solely relates to upgrade of the WTP for Quality Need is no longer suitable and was rejected at coarse screening stage	**Newport WRZ is now in deficit**		
TG4-SA8-181	Upgrade Limerick to Supply Adare, Rathkeale and South West Regional	This is a repeated option and is assessed as part of feasible option Group 25	**This option is a repeat and is assessed as part of a different feasible option'**		