6 Option Development

6.1 Introduction

In Section 3 of the draft Regional Water Resources Plan North West (RWRP-NW), we identified that 48 of our 106 water supplies in the North West Region do not provide an appropriate Level of Service (LoS) during dry conditions. The purpose of the draft RWRP-NW is to develop a Preferred Approach to improve the LoS across all water supplies within the region, accounting for increased demands, climate change impacts, and tighter drinking water and environmental standards.

Within the National Water Resources Plan (NWRP) Framework Plan Irish Water has set the target **Level of Service** for the public water supply as being 1 in 50 years. This means the probability of a customer having a water supply outage should be less than 2% in any given year.

In this section, we summarise Stages 3 to 6 of the water resource planning process, known as the **Option Development Process.** The purpose of the Option Development Process is to investigate the full range of potential solutions that can address the identified Need of the WRZs within the region. The potential Options we have considered include new groundwater and surface water sources, dams and impoundments, improvements to existing resources, water treatment plant (WTP) upgrades, interconnectivity of supplies, bulk treated water transfers, effluent reuse and desalination. During the Option Development Process we consider all possible Options (Unconstrained Options), and then screen out those that are not feasible.

The Option Development Process involves:

- Developing a list of Unconstrained Options
- Coarse Screening, to remove Options that do not meet high-level assessment criteria
- Fine Screening, to produce a final Feasible Option list
- Feasible Option development (including whole life costing)

Before summarising the Option Development Process for the North West Region, we will firstly consider the scale and types of Options available.

6.1.1 Option Scale

During the Option Development Process, we review potential solutions at three (3) scales (Figure 6.1):

WRZ Level Options – We review each WRZ individually and assess Options that might address Need in that supply.

Study Area Level Options (Grouped Options) – We assess whether there are any larger Options that might be able to address the Need for multiple WRZs, generally within the same Study Area (SA); although in some circumstances the solution at this level may involve a transfer from outside the SA in which the relevant WRZs are located.

Regional Level - We assess the Feasible Options at the Regional Area level to see if there are any Options that can be applied across the entire region.

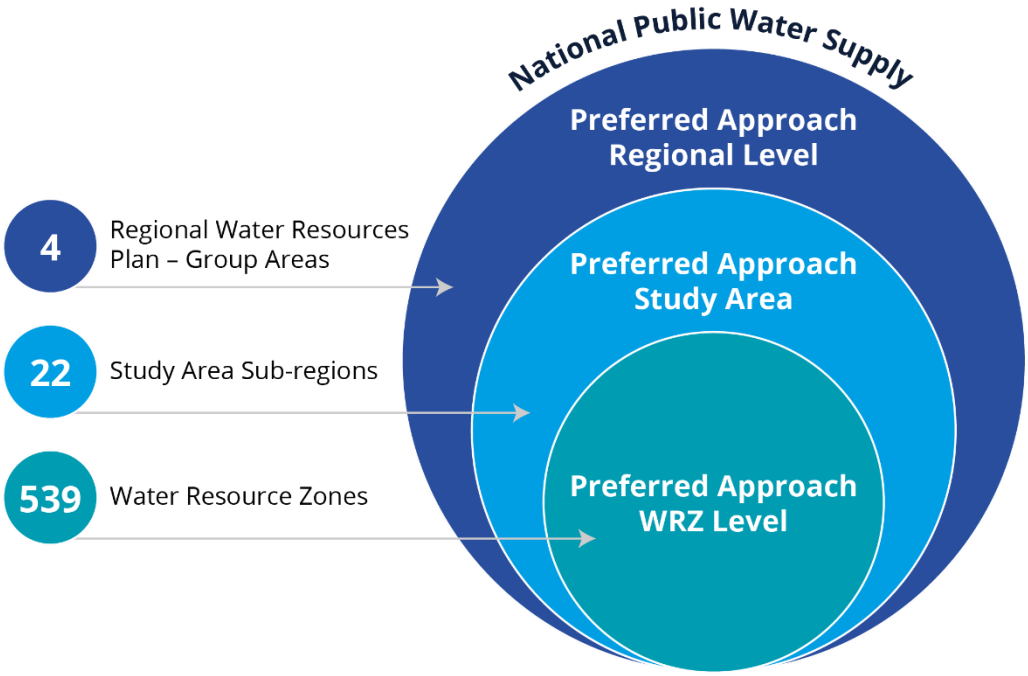

Figure 6.1 NWRP Spatial Scale of Assessment

WRZ Level Options - By reviewing each water supply individually, we can effectively examine Options that are local to each WRZ. For example, WRZ Level Options could include a new or upgraded groundwater or surface water source, an upgrade to an existing WTP or a transfer of water from a neighbouring water supply. This spatial scale is particularly useful for finding local solutions for small, isolated supplies. In areas where there is poor availability of raw water sources, finding a resilient and sustainable source can be difficult. In addition to this, for very small supplies, it is usually not feasible to develop Options that require small volumes of water to be transferred over a distance of five (5) kilometres or more due to potential water quality issues generally associated with such transfers.

Feasible Options for larger WRZs can be identified when looking at a wider area. For example, it is possible to transfer 10 million litres per day (Ml/d) of water over a distance of 40-50 kilometres without encountering low velocity or water quality issues. For very large supplies (greater than 100 Ml/d) it is possible to transfer water over 200 kilometres. As these types of Options involve long lengths of transfer mains that traverse through the region, additional Option opportunities for smaller WRZs can be feasible in areas through which they pass.

Therefore, we assess the Study Areas that contain the largest WRZs first, in order to see if they generate Options that might provide potential solutions for smaller WRZs in their vicinity.

Figure 6.2 provides an example of a WRZ spatial scale assessment and WRZ Option type.

Study Area Level Options - At Study Area Level, we review clusters or groups of these water supplies to see if there are Options that could resolve Need in more than one WRZ. The water supply in Ireland evolved in a piecemeal manner over time and compared to other EU countries Ireland has a large number of discrete small-scale local supplies.

An example of the Option Development Process at Study Area Level is in County Donegal in Study Area A (SAA). This Option expands a new surface water abstraction and WTP identified as a supply to Ballyshannon and Bundoran WRZ and interconnects three (3) additional WRZs to the source: Lough Mourne WRZ, Frosses-Inver WRZ and Donegal WRZ.

The benefits of larger SA Options (or Grouped Options) include:

1. Allowing Irish Water to strategically assess the water supplies in a particular area and consider whether there are any larger Options that could address Need in more than one WRZ.
2. Enabling transfers to groups of smaller WRZs. Taken individually, such small supplies and local sources may, depending on the circumstances, be vulnerable to pollution or may not be environmentally sustainable. Additionally, transfers into a single WRZ may not be feasible due to distance and age of water. Conversely, transfers into groups of WRZs, which collectively have a higher volumetric “Need”, can potentially be a Feasible Option. An example of this is the Lough Easkey Regional Water Supply in Study Area C (SAC) where there was no feasible local WRZ Level Options. Abstraction from the local Lough Easkey surface water source is likely to result in the waterbody not achieving high Water Framework Directive (WFD) status. A Feasible Option was identified at SA level when considered with other WRZs.

Figure 6.3 provides an example of a SA spatial scale assessment and SA Option type.

At **Regional Level** we assess whether there are Options that can resolve Need for groups of WRZs across the Region.

The benefit of assessing a wider regional approach is that:

1. It allows us to strategically assess the most sustainable larger water sources across the region, and whether these can be used to improve resilience to the larger demand centres across the region.
2. The regional hubs can in turn supply some of the smaller neighbouring WRZs.
3. Sustainability and cost efficiency can be tested and optimised across the region.
4. It facilitates integrated planning across the key growth centres regionally (and ultimately) nationally.
5. As set out in the Framework Plan, the impact of uncertainty in our design assumptions - which is accounted for through a Headroom Allowance that is added to our estimated total demand - is reduced with large integrated WRZs. The interconnectivity facilitates demand being met from more than one (1) source therefore increasing resilience. This reduces the impact of the uncertainty associated with population growth assumptions and the corresponding impact on the demand component of our Supply Demand Balance (SDB). Similarly, peak demands are less pronounced across larger supplies. For this reason, if a number of smaller supplies (which have higher peaking) merge with larger supplies, we recalculate the supply demand balance for the new combined WRZ at project level. This ultimately reduces the design Need requirement and optimises the sizes of the WTPs.

Assessment of Options at the three (3) spatial levels allows us to examine a wider Plan for a more integrated water supply that will allow for a more sustainable, resilient and cost-effective water supply service.

For the North West Region, our Option Development Process determined that there is no Feasible Option at regional scale for the North West Region. Section 8 of this draft Plan explains that the potential for regional interconnectivity, at scale, is limited by the terrain across the region and the volume of water we can sustainability abstract from our available sources.

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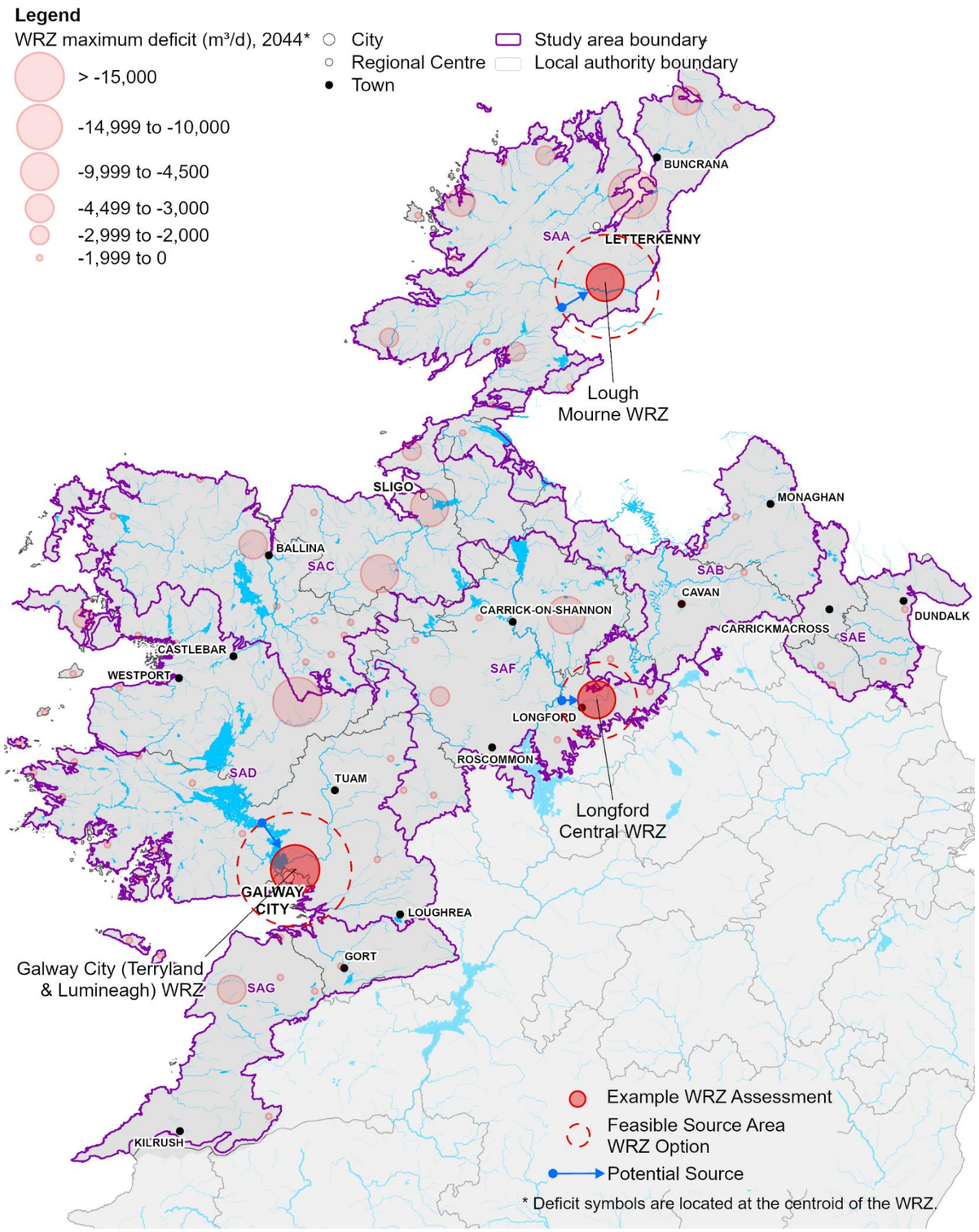


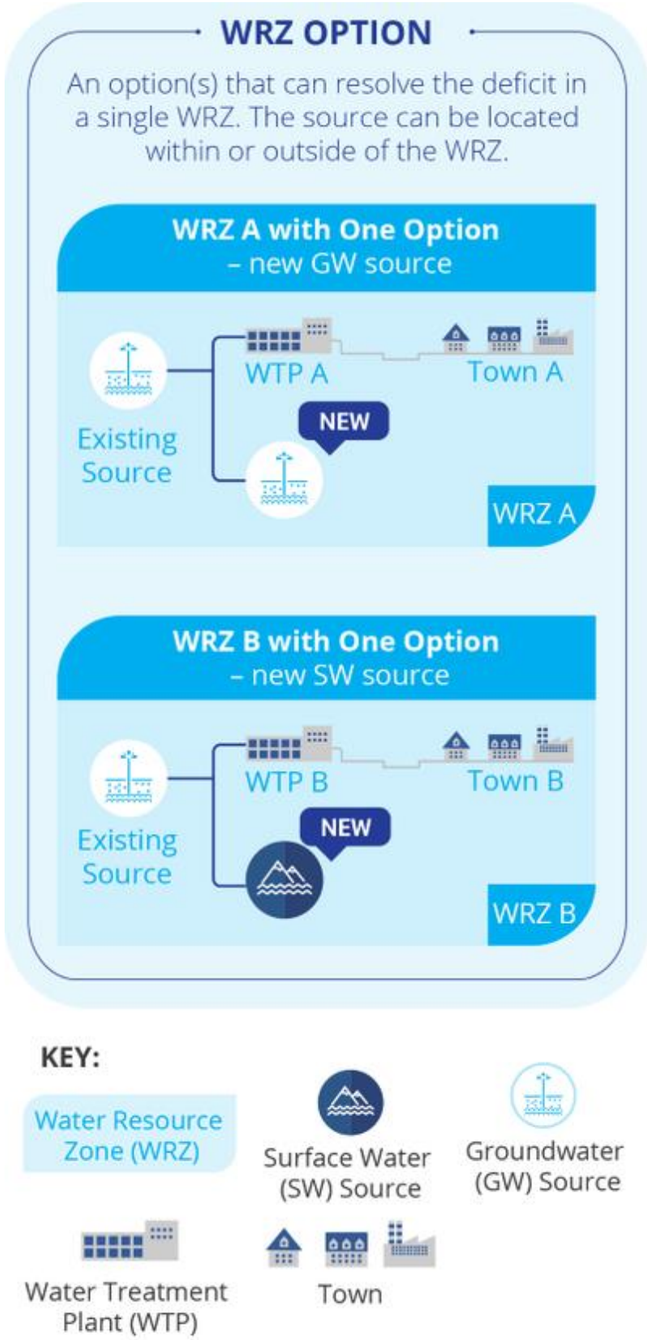
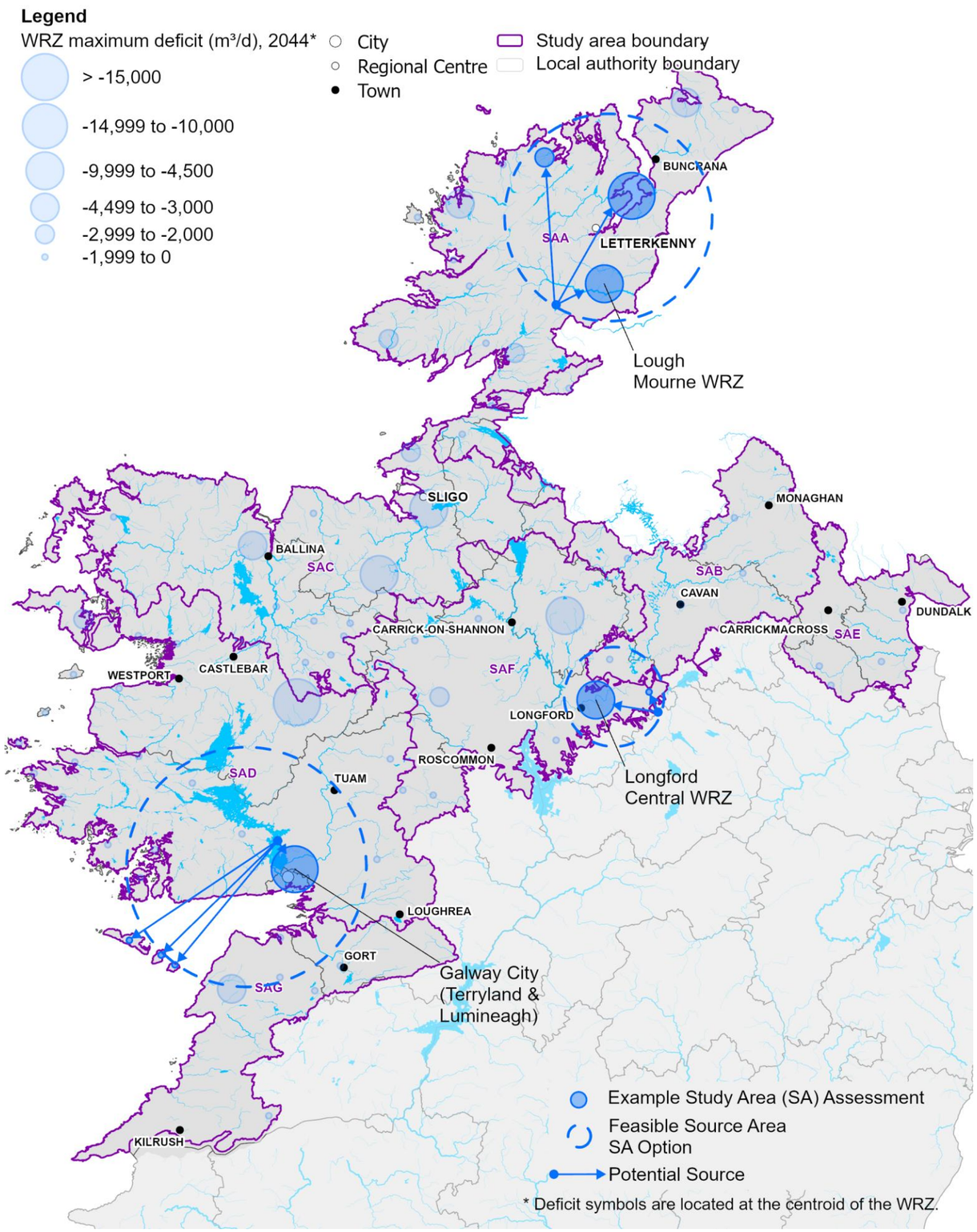
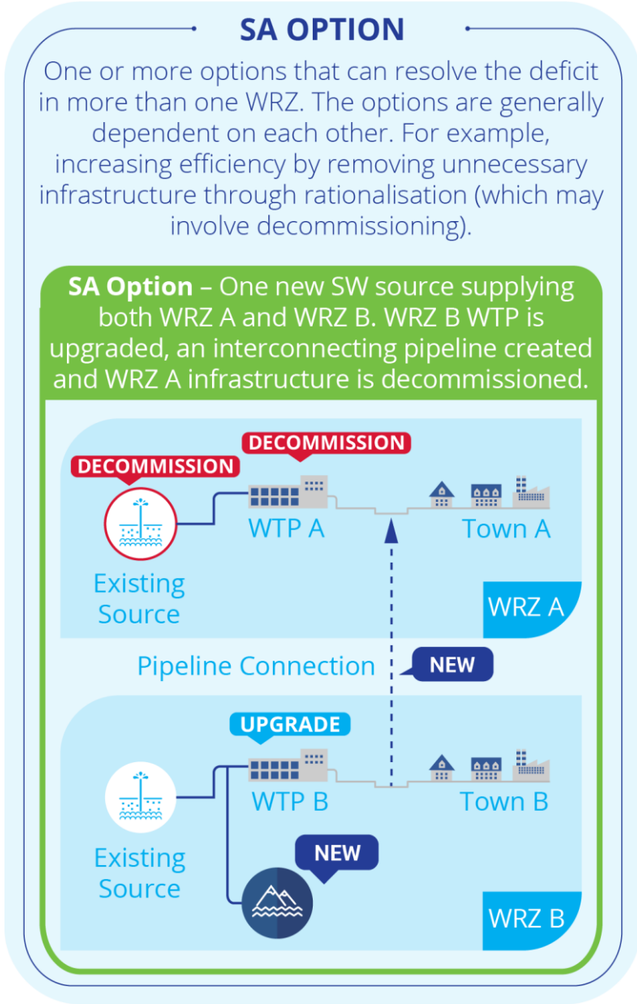


Figure 6.2 WRZ Level Assessment





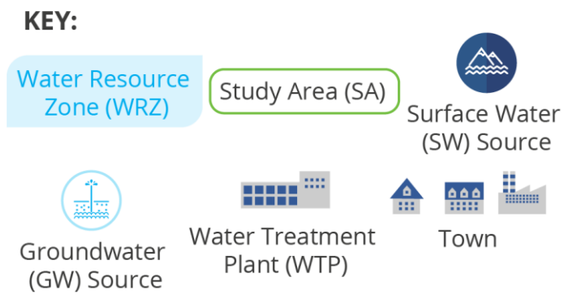


Figure 6.3 Study Area (SA) Level Assessment

6.1.2 Option Development Process

The Supply Demand Balance (SDB) and Barrier Assessment outlined in Section 3 inform the type and scale of Options that Irish Water must consider to address the Needs in each WRZ.

The main Option Types are shown in Figure 6.4.

Figure 6.4 Option Types

Nature-based solutions (NBS) and catchment measures will be considered as part of the Drinking Water Safety Plans (DWSPs), which aim to reduce risk to our supplies; and where possible, will be incorporated at project level (see Section 6.4). The DWSPs will include a comprehensive risk assessment of our supplies from water sources (catchment) to consumer (tap). Therefore, future iterations of the NWRP will include catchment Options based on information coming from the DWSP's. Further information on the development of our DWSPs is provided in Section 5.5 of the Framework Plan.

The purpose of our Option Development Process is to consider the widest practicable range of solutions to resolve identified Need within a given WRZ or Study Area. A suitable screening criterion is then applied to filter out any Options based on the five (5) screening criteria of Resilience, Deliverability, Progressibility, Sustainability (environmental and social impacts), and Cost.

The Options Assessment Screening Process involves the following:

- Developing a list of **Unconstrained Options** – the maximum possible list of unscreened Options for water supply, not limited by cost or feasibility;
- **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 Strategic Environmental Assessment (SEA) for the draft RWRP-NW (including biodiversity, the water environment and requirements under climate change adaptation) as well as Resilience, Deliverability and Progressibility. This produces the Feasible Option List.

It should be noted that Options are developed 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. Any projects that are progressed following the NWRP will require individual environmental assessments, including, where appropriate, Environmental Impact Assessment and Appropriate Assessment, 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.

6.1.3 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 abstraction sites, or to identify any potential new water sources within a Study Area. This assessment is completed by a specialist team including groundwater professionals (hydrogeologists), surface water professionals (hydrologists), environmental scientists, ecologists and engineers.

An Unconstrained List of Options is developed by reviewing:

- Options identified by Irish Water that have not been committed to in the current Investment Plan;

- Options previously considered by Local Authorities;
- Options identified in other strategy documents, approaches and projects (including those identified in pre-planning and in-flight projects); and
- Ideas generated at workshops with Irish Water's Local Authority Water Services Partners, drawing on their knowledge and experience of the supply system and the geographical area.

As sustainability is at the heart of our NWRP, environmental and social assessment criteria are included at the earliest stages of the screening process. Some fundamental rules are applied even before screening begins to ensure the protection of the environment. For example, 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. We also consider Water Framework Directive (WFD) objectives through a sustainable abstraction risk review. This is based on UK Technical Advisory Group (UKTAG) WFD guidance[1] on baseflows. When Ireland specific standards come into place, we will update our environmental risk assessments as part of the next iteration of the NWRP. The application of these conservative abstraction standards to new Options ensures that any new or increased abstractions from rivers are likely to support conservation objectives for the most sensitive environmental sites. The SEA Environmental Report for the Framework Plan provides further detail of the risk assessment approach. The Natura Impact Statement (NIS) of the Framework Plan sets out the approach in relation to the Appropriate Assessment.

An **Appropriate Assessment** is an assessment of the potential adverse effects of a plan or project (in combination with other plans or projects) on Special Areas of Conservation (SAC) and Special Protection Areas (SPAs). These sites are protected by National and European Law.

The "Unconstrained Option List" therefore comprises solutions that either fully or partly resolve a water supply Deficit regardless of cost, and with only high-level environmental considerations. The detailed environmental constraints are assessed during the Coarse Screening (Stage 4) and Fine Screening (Stage 5) stages of the Option Development Process.

We identified **1,355 Unconstrained Options** for the draft RWRP-NW.

Figure 6.5 shows the number of Unconstrained Options by Option Type.

Thirty-six percent (36%) of the 1,355 Unconstrained Options identified for the draft RWRP-NW are local surface water abstractions and 17% are local groundwater abstractions. These are either an expansion of an existing abstraction site or the development of new sites to meet the Needs of WRZs within close proximity. These Unconstrained Options are usually combined with WTP capacity upgrades.

Twenty-two percent (22%) of the Unconstrained Options involve rationalisation, which refers to the merging of water supply systems and the subsequent decommissioning of the obsolete water infrastructure and associated abstractions. These Options may require a new or enhanced supply source - for example, a new or enhanced groundwater or surface water abstraction or a water transfer from another supply system. The upgrade and/or expansion of existing WTPs may be carried out as part of a rationalisation process.

Water transfers make up 20% of Unconstrained Options. As with the rationalisation of supplies, many of these require an additional or upgraded source.

Two percent (2%) of the Unconstrained Options are WTP upgrades that have been identified for WRZs that are not in supply Deficit but require water quality improvements only.

The remaining three percent (3%) of the Unconstrained Options comprise:

- Network improvements that can include operational changes, strategic trunk mains and/or other critical infrastructure improvements that enhance supply capacity and increase resilience.
- Desalination plants (for example, a small desalination plant on Inishboffin Island to meet the estimated deficit of approximately 150 cubic metres per day in 2044.
- Reservoirs, such as the proposal to raise the existing dam height at Lake Coolacknick impoundment and construct a new impoundment on the other side of the lake to supply Inishturk Island (SAD).
- Cross Study Area supplies, such as the proposal to rationalise the Collon Drybridge WRZ in SAE to the South Louth East Meath WRZ in Study Area 3 of the Eastern and Midlands Region.
- Conjunctive Use involving the coordinated use of two (2) sources, usually surface in combination with groundwater.
- Advanced Leakage Reduction additional to the reduction achieved through our national Leakage Reduction Programme (as outlined in Section 3.2.6.6 and 5.2 of the draft RWRP-NW), which aims to meet our Sustainable Economic Level of Leakage targets (SELL). The Advanced Leakage Reduction Options will go beyond the SELL targets and reduce the calculated SDB Deficit.

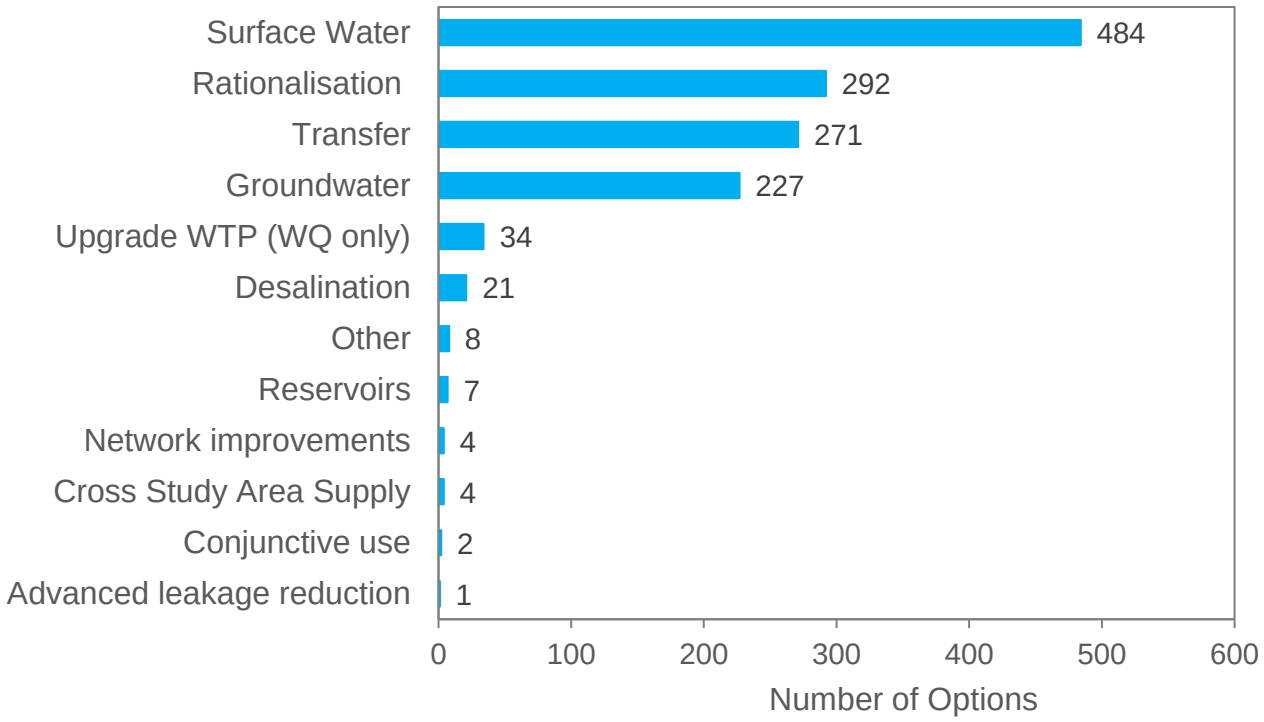


Figure 6.5 Unconstrained Option Types

6.1.3.1 Group Water Schemes

When looking at water transfers from other WRZs and SAs, all potential sources of water are considered, including Group Water Schemes. Details of Group Water Schemes are provided by Local Authority engineers working in the area. Available yield is determined through desktop assessments of

local hydrology or hydrogeology; in the same way as looking at a new abstraction from a surface water or groundwater source.

Although not many connections to a Group Water Scheme were deemed feasible within the region, where a connection to a Group Water Scheme was determined as the Preferred Approach, we consulted with the National Federation of Group Water Schemes. Further consultation with the local Group Water Scheme will be held at the project development stage.

6.2 Option Screening

Following the development of the Unconstrained Options List, a two-stage screening process (Coarse Screening and Fine Screening) is applied to the 1,355 Unconstrained Options to develop the 'Feasible Option List' for each Study Area.

6.2.1 Coarse Screening

The Coarse Screening process assesses the Options against the criteria outlined in Table 6.1. The process allows the assessment of the Unconstrained Options to eliminate any that will not be viable when assessed against the three (3) high-level criteria. The Options are assigned a red, amber and green rating according to the descriptions in Table 6.2.

Any Option which scores "red" against a question has a fundamental issue that would be difficult to mitigate and is discounted on the basis that it is unlikely to ever be delivered.

An amber rating across any of the Coarse Screening criteria will not rule out an Option, however, it will highlight that this Option may require mitigation. For example, a surface water abstraction from a source which is designated as a European site will obtain an amber rating (assuming that it meets the allowable abstraction limit) against the Deliverability and Flexibility criterion and Sustainability (Environmental and Social Impacts) criterion. However, such an Option will most likely require mitigation which will take time to develop. Therefore, we must allow for consideration of the likely environmental site assessments and studies that will need to be carried out within the Framework Plan Level costing for an Option.

Coarse screening allows us to better understand the scope of Options at a plan level, and factor this into plan level costing. The process is explained in Section 8.3.4 of the Framework Plan with details on the environmental screening presented in Chapter 9 of the SEA Environmental Report for the Framework Plan.

Table 6.1 'Unconstrained Options' Assessment Criteria

Criteria	Unconstrained Option Assessment questions		Assessment Score
Resilience	Q1	Does the Option address the supply-demand problem?	Yes / Maybe / No
Deliverability and Flexibility	Q2	Is the Option technically feasible?	Yes / Maybe/ No
	Q3	Can the risks and uncertainties associated with the Option be mitigated to avoid failure of the Option?	Yes / Maybe / No
Sustainability (Environmental and Social Impacts)	Q4	Can the impacts on known high level environmental constraints including at internationally designated sites be avoided?	Yes / Maybe / No

Table 6.2 Red, Amber and Green Decision Matrix

RAG matrix	Red	Amber	Green
Resilience	Does not address the supply-demand problem at all.	May address part of the supply-demand problem (with due consideration on the size of the deficit).	Fully addresses the supply-demand problem.
Deliverability & Flexibility	Option is not technically feasible. Associated risks and uncertainties are unacceptable and will result in a failure of the Option.	There are some risks and uncertainties associated with the Option but are not considered to be insurmountable at this stage.	Option is technically feasible. There are no associated risks or uncertainties which are unacceptable.
Sustainability (Environmental and Social Impacts)	Likely unacceptable impacts on European designated sites or WFD objectives* which cannot be avoided through design or mitigation. * Options that cannot meet sustainable abstraction limits are removed/red rating	There are some impacts identified. However, they are not considered to be prohibitive at this stage due to the potential for improved design and/or mitigation.	No major issues or sensitivities identified at this stage.

The total number of Options rejected and passed at Coarse Screening for each Study Area is shown in Figure 6.6 and outlined in the Rejection Register Summary in Annex B of the Study Area Technical Reports (Appendices 1 - 7).

There were **544 Options rejected for the Region** after being assessed against the Coarse Screening criteria of Resilience, Feasibility and Environment. The remaining 811 Options (of the 1,355 Unconstrained Options) are taken forward for Fine Screening. The Rejection Register Summary is outlined in Annex B of the Study Area Technical Reports (Appendices 1 - 7).

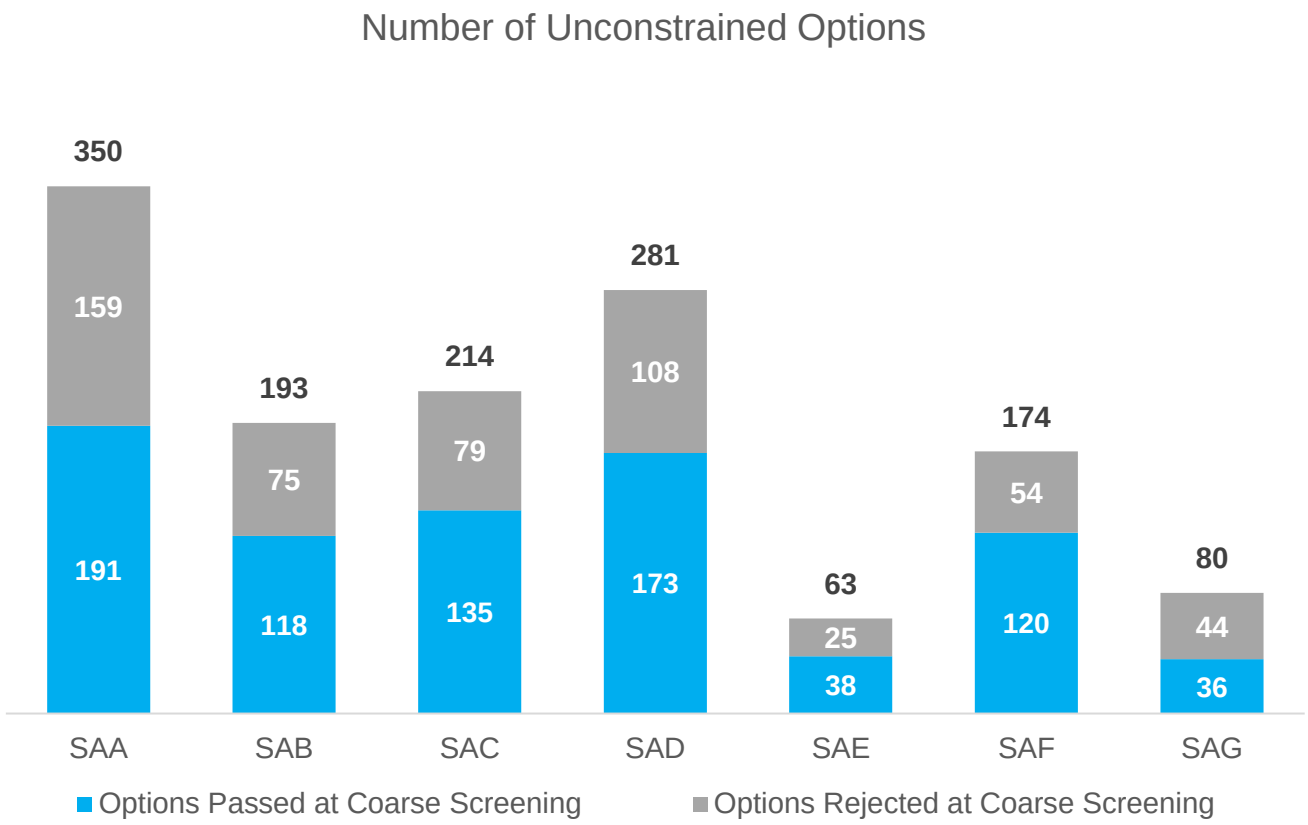


Figure 6.6 Coarse Screening Results

6.2.2 Fine Screening

Fine Screening involves a more detailed desktop assessment of the Options that have passed Coarse Screening, through a process known as Multi Criteria Assessment (MCA). The objective of the MCA and the Fine Screening process is to determine the potential benefits and impacts of the Options across a range of key criteria.

The MCA process allows a combination of issues to be considered together and allows us to assess the Options relative to each other. This can help indicate if one Option will be more cost effective, environmentally acceptable, promotable, resilient or feasible when compared to other Options. This process requires a more detailed analysis of the Options and their potential benefits and impacts against the key criteria.

The MCA methodology has been tailored to provide a structured and transparent approach to inform the decision-making process and to remove subjectivity, as far as reasonably possible. It also recognises that both monetary and non-monetary objectives may influence decisions. It applies a common set of questions to determine the relative merits of each Option across the key criteria. Thirty-three (33) questions are developed by dividing the criteria from the Coarse Screening stage into detailed sub-criteria against which Options can be assessed. The environmental MCA criteria are based on the SEA objectives from the SEA Scoping Report and have been consulted on with environmental stakeholders.

Habitats Directive considerations have been integrated into the Options Assessment Methodology at a number of points to ensure both robust assessment and protection are integrated into the NWRP. In particular, this is demonstrated through the MCA Fine Screening scoring for the European sites and biodiversity, and again, through consideration of mitigation measures to avoid adverse effects that have been identified. Table 8.6 of the Framework Plan lists the criteria, sub-criteria and questions that are applied at the Fine Screening Stage and Section 8.3.5 describes the approach in further detail.

It should be noted that comparable projects which may have been rejected at Coarse or Fine Screening in one Study Area may, in some limited cases, be brought through as Feasible Options in another. This would only occur if there were no other Options available or the size or location of the projects differed to the extent that the project was deemed feasible. An example of this is where there are a very large number of Options passed at Coarse Screening stage within a particular Study Area. In this instance, Fine Screening is useful for identifying the poorer performing Options (on a relative basis), noting that these Options may not strictly speaking be "unfeasible". In these circumstances, Options identified as relatively poorer performing are removed or placed on a reserve list. The relatively better performing Options are then taken forward for further consideration in the "Feasible" list. Any Options which are discounted at this stage are recorded on the Rejected Options Register. This method can be appropriate for large WRZs or Study Areas where there are a large number of potential Options for resolving Need.

For more limited numbers of Options within any WRZ or Study Area, Fine Screening is best used as a check. This is considered an appropriate method where Options are likely to have been identified with some constraints. Only Options identified as clearly unfeasible, unsustainable or unviable are removed. Where Options perform poorly against specific sub-criteria, the potential for design or mitigation to address effects will be considered. If there is any doubt as to whether a particular Option should be classified as feasible or not, then that Option is carried forward to the Feasible list with risks identified.

The general aim is to keep Options in for further consideration and to only remove Options where there is a clear justification for doing so and to avoid unnecessary further Option development and assessment work on unfeasible Options. Where there is uncertainty or potential for issues to be addressed through design or mitigation, Options are retained. This allows Irish Water to consider the widest reasonable range of Options, and to ensure the best overall outcome is identified as the Preferred Approach.

There were no further Options rejected at the Fine Screening stage. Therefore **811 Options were taken forward as Feasible Options**.

Table 6.3 summarises the number of Options selected at each stage of the screening process and the final number of Feasible Options for each Study Area.

Table 6.3 Number of Options at each Stage of the Screening Process

Study Area	Unconstrained Options	Feasible Options (following Coarse and Fine Screening)
SAA	350	191
SAB	193	118
SAC	214	135
SAD	281	173
SAE	63	38
SAF	174	120
SAG	80	36
TOTAL REGION	**1,355**	**811**

6.2.3 Rejection Summary

Details of the rejected Options and the justification for their rejection are outlined in Annex B of the Study Area Technical Reports (Appendices 1 - 7) for both Coarse Screening and Fine Screening. The rejection summary records the criteria against which the rejected Options were assessed. Box 6.1 provides an example of a rejection justification for an Option in SAC.

An Option is rejected if it fails against any one of the screening criteria. Some Options are screened out for multiple reasons. Table 6.4 shows the total number of Options rejected during the Coarse Screening and Fine Screening stages.

Table 6.4 Rejected Options Summary

Number of Options	Reason for Rejection
110	Deliverability & Flexibility
23	Resilience, Deliverability & Flexibility
299	Resilience, Deliverability & Flexibility & Sustainability
112	Other reasons such as repeat Options or operational Options which did not provide additional supply.
544	**Total**

Box 6.1- Example Rejected Option

Option SAC-08 - Study Area C

New surface water abstraction at Lough Arrow and abandon Lough Talt source

Rejection Reason:

Lough Arrow is a WFD high status waterbody. Abstracting the volume of water required to make this a Feasible Option is likely to result in the waterbody not achieving high WFD status and also to result in a greater risk of having adverse effects on this European site. Therefore, this Option did not meet the requirements of the Environmental, Resilience or Deliverability criteria.

6.3 Feasible Options

The Screening process produced **811 Feasible Options for the Region.** These Options or a combination of these Options are then appraised to select our Preferred Approach (solutions) to resolve the Deficit across the North West Region.

6.3.1 Feasible Option Types

Of the 811 Feasible Options, 251 of these are referred to as WRZ Options. These Options are only sufficient to resolve Need in a single WRZ in the vicinity of the source. The remaining 560 Options are Study Area Options which can resolve the Deficit in more than one WRZ within a Study Area. This is summarised in Table 6.5 for each Study Area. A WRZ Option or SA Option may consist of individual or multiple projects that can meet the Deficit in a particular area. The NWRP identifies and, where suitable, groups these projects as Options to meet Need but the individual components of the relevant Option may be rolled out over multiple investment cycles or under different programmes. For instance, an Option could consist of a mixture of a Leakage Reduction Programme, Capital Maintenance Works, and WTP upgrades that, when all are complete, will ultimately address the Need. The benefit of the NWRP is to provide a holistic view of the different types of Options that can collectively resolve the identified Need.

Box 6.2 and Box 6.3 provide an example of a WRZ Option and SA Option, respectively.

Table 6.5 Number of Feasible WRZ and SA Options

Study Area	No. of WRZs	Number of Feasible Options	
		WRZ Option	SA Option
SAA	21	41	150
SAB	23	42	76
SAC	17	39	96
SAD	25	59	114
SAE	9	18	20
SAF	15	34	86

Study Area	No. of WRZs	Number of Feasible Options	
		WRZ Option	SA Option
SAG	9	18	18
Total	119	251	560

Box 6.2 - Example of a WRZ Option

Increase existing surface water abstraction from River Corrib

(Study Area D, Galway and Mayo; Lough Corrib (Galway City, Tuam, Loughrea) WRZ

Option Type: Surface Water

This Option proposes to increase the existing surface water abstraction from the River Corrib, upgrade Terryland WTP, abandon Lake Road and Knockanima WTPs, provide new storage and pumps and lay approximately 8.8 km of new network. Tuam (Luimnagh) WTP will be upgraded for water quality purposes.

The locations and details of any required mains, network upgrades and service reservoirs will be determined at project level.

Box 6.3 - Example of a Study Area Option

Rationalise 5 WRZs to new sources developed near Letterkenny

(Study Area A, Donegal)

WRZs: Inoshowan West/Carndonagh/Culdaff, Culdaff, Letterkeny & Innoshowen East & Pollan Dam, Creeslough Dunfanaghy, Carrigart-Downings & Cranford, Buncrana, Fanad West, Fanad East

Option Type: Surface Water, Interconnection and Rationalisation

This Option proposes to increase the existing surface water (SW) abstraction from the river Crana, provide new SW abstractions from Gartan Lough and Glen Lough, upgrade Letterkenny and Illies WTP, provide new storage (4 raw water storages and 11 treated water storages), new pump stations and lay approximately 126 km of new network.

Inishowan Easte (Redcastle), Ballymacool, Tiernaleague, Inishowan West, Rathmullen and Milford WTPs will be upgraded for water quality purposes.

Culdaff, Cranford, Carrigart-Downings, Fanad East (Lough Shannagh), Tullyconnel and Buncrana WTPs will be decommissioned.

The locations and details of any required mains, network upgrades and service reservoirs will be determined at project level.

Table 6.6 and Figure 6.7 compare the number of Feasible Options by Option Type for each Study Area. Options that involve an increased existing or new surface water or groundwater source make up 56% of the Feasible Options. Twenty-two percent (22%) of the Options involve rationalisation, where multiple WRZs are merged and redundant infrastructure is decommissioned; while transfers from WRZs within

the same Study Area (without rationalisation) make about 16%. Where a WRZ is not in Deficit, it is only the water Quality Need that it is addressed through new or upgraded WTPs. This represents 4% of Feasible Options. The remaining two percent (2%) of Options include desalination, connections to supplies in adjacent Study Areas, and network improvements that support resilience.

Table 6.6 Feasible Options by Option Type

Option Type	Number of Options by Type							
	SAA	SAB	SAC	SAD	SAE	SAF	SAG	Total
Rationalisation	29	34	50	27	6	21	8	175
Groundwater	28	19	16	33	13	37	13	159
Surface Water	90	28	45	83	6	31	10	293
Transfer	42	21	16	20	5	27	4	135
Upgraded Water Treatment*	1	16	7	-	3	4	1	32
Desalination	1	-	1	10	-	-	-	12
Cross Study Area Supply	-	-	-	-	4	-	-	4
Network Improvements	-	-	-	-	1	-	-	1
TOTAL No. of Options	**191**	**118**	**135**	**173**	**38**	**120**	**36**	**811**

**Upgraded WTPs refers to treatment plants where only water Quality improvements are proposed as the WRZ is not in Deficit.*

*** Conjunctive Use refers to Options that involve combined surface water and groundwater supplies.*

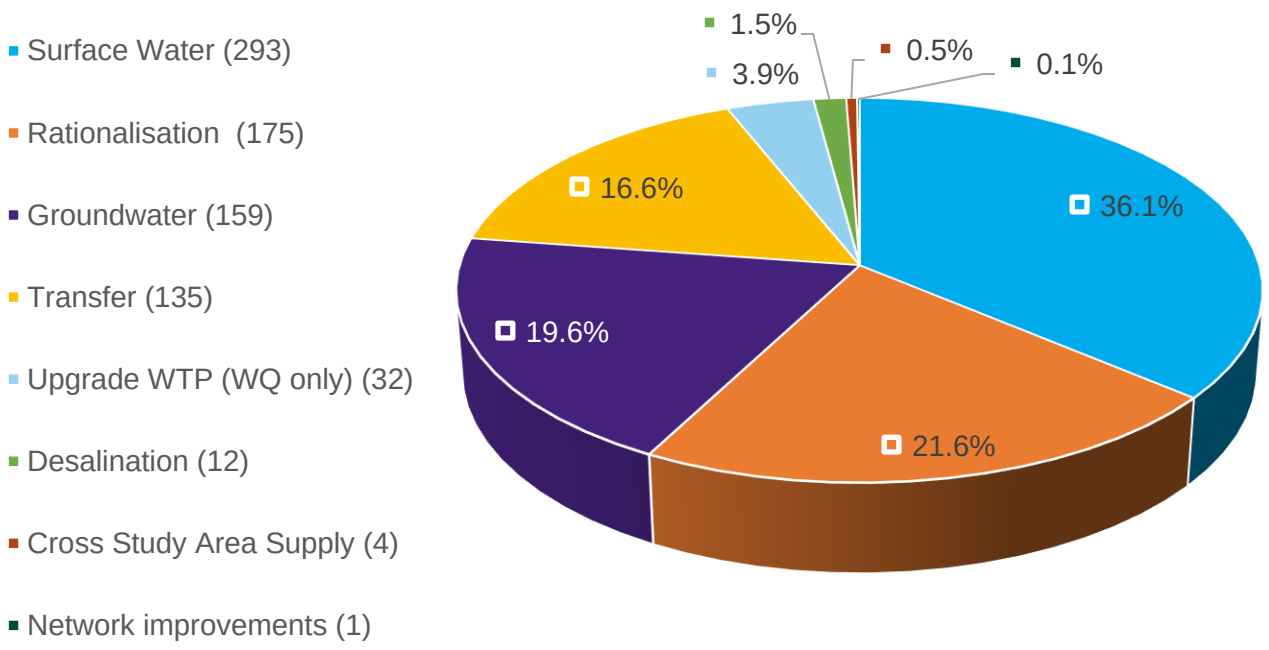


Figure 6.7 Feasible Option Types

6.3.2 Option Costing

An outline design and estimated cost is developed for each Feasible Option and summarised within Option dossiers. At this stage, designs, costings and environmental assessments are desk-based and plan level assessments. These aspects are further developed at project level

As the RWRP-NW level costing is intended to be a comparative assessment between Option types identified by the Plan (independent of the existence of any “in-flight” projects), we do not include detailed project level costing for “In-Flight Projects” when identifying Preferred Approaches as we might only have this information for a few Feasible Options. This is to ensure that the methodology in this Framework Plan is uniformly applied in the development of Preferred Approaches.

Environmental and Social Valuation

In addition to the construction and operational cost estimates and qualitative environmental Options assessment, an environmental and social valuation of the Feasible Options is undertaken to provide monetised values to feed directly into the Approach Development Process, which is used to select the Preferred Approach.

While the SEA methodology is based primarily on qualitative assessments to consider if potential effects are likely to be significant, this is informed by quantitative information such as GIS based analysis. In addition, where possible the valuation of environmental and social costs and benefits (including carbon) are used to inform Options appraisal. This involves monetising societal impacts and benefits and is undertaken through a range of environmental economics tools, including natural capital accounting and ecosystems services assessment methodologies. These approaches are new and are still being developed but are likely to be increasingly used in the future.

The areas covered for the environmental and social costings are:

- Climate regulation – woodland;
- Traffic impacts – opportunity cost of time due to road congestion from roadworks;
- Food – crops and livestock; and
- Carbon emissions (calculated alongside the construction and operational costs for the Options).

The aim of the calculations is to capture and value significant residual impacts in relation to the categories examined for each Option. This can be especially valuable for providing information on combinations of Options. The categories that can be used depend on the Option and environmental information available to allow quantification metrics and valuation.

The approach for valuation of environmental and social costs and benefits aims to provide a framework for developing Natural Capital methodology in the future. This is described in Appendix E of the SEA Environmental Report. The costings complement the qualitative assessment undertaken through the SEA and are included as part of the Options assessment reported in the Study Area Technical Reports.

The Option costing information, and desk-based design and environmental assessments are used in the Approach Development Process described in Section 7.

6.4 Project Level Summary

As previously noted in this section, the Feasible Options are considered at plan level and the assessment of the Options are desktop-based. Any Options that are progressed following NWRP will be considered in more detail at project level. The following sections provide an overview of the project development process.

6.4.1 Data Review

The first step prior to the development of any solution will be to carry out a review of the data feeding into the project. The data that is reviewed at project level will include, but will not be limited to, the following:

- Supply Demand Balance – This will be updated at project level to align recent projected growth with actual growth, include new data on population growth and non-domestic growth. We will consider specific demand requirements of any Strategic Development Zone or Metropolitan Areas within the WRZ and incorporate improved information on water availability assessments and climate change impacts. At this stage we will also review assumptions relating to peaking and headroom factors and leakage targets, which are based on the size of WRZs. For example, if the Preferred Approach merges WRZs to form a larger interconnected WRZ, the benefits of increased resilience and supply security will allow for potential reduction in peaking and headroom factors. This will reduce the estimated demand and correspondingly, the Deficit. Similarly, changes to leakage targets will impact the Deficit and need to be considered. For example, if we build a new WTP we assess the demand profile of that supply over 25 years and then deliver the capacity in modules to align with demand increase. Therefore, if we meet or exceed our leakage targets and the demand is less, we do not build the last modules of the new WTP, thus balancing supply with demand.
- Water Quality – A review of the existing infrastructure impacted by the Preferred Approach will be carried out to identify any recent water Quality Need which should be included in the project. If Drinking Water Safety Plans have been completed, these will be reviewed to ensure the solution resolves any outstanding significant risks.
- Environmental baseline – A full review will be completed to reflect any changes in designations or waterbody status.

6.4.2 Project Development

In addition to refining the data feeding into the project, the scope and design of the project will be developed in parallel with a number of feasibility and environmental assessments and stakeholder engagement.

The Options will be developed to ensure all potential opportunities that can be afforded by the solution are realised. This might include an augmentation of the Option in line with our Biodiversity Action Plan[2] or Energy Efficiency Plan. For example, at plan level we would have assumed the yield required from a source needs to meet the customer demand with an allowance for process losses at the WTP. At project level, further to water quality assessments the process engineers may be able to design a plant with limited to no process losses. Such a design would reduce the overall environmental impact of the project. Another example of this would be the development of renewable energy as part of a project. At our newly developed Thurles WTP, 230 solar panels were included in the design.

Where we are looking to bring on new sources, the catchment assessment of the Drinking Water Safety Plans will be developed at the project level to ensure there is an understanding of all risks in the catchment feeding the new source. At this stage we will consider any nature-based solutions which could complement the Option. Such solutions could reduce the volume of chemicals required in the treatment process.

An example of our source protection and catchment activities includes the cross-border partnership project with Northern Ireland that focuses on the River Erne and the River Derg catchments. The project aims to develop sustainable, catchment-scale solutions for the protection of rivers and lakes, which are the main sources of our shared drinking water. Further details of this partnership are provided in Section 2. We are also working with Local Authorities to progress an innovative wastewater project in Belturbet.

The project is trialling an installation of reed beds as a way of sustainably managing water treatment sludge.

In projects where the Preferred Approach includes the decommissioning of a WTP and associated abstractions, to reduce risk to our customers the existing abstractions and associated infrastructure will not be decommissioned until the commissioning phase of the new project is completed and an abstraction license for the new or existing alternative source has been obtained. Many of our existing abstractions are facilitated by the presence of structures such as a weir or dam and these can create obstacles for fish passage. When we decommission abstractions facilitated by structures the possibility of removing these structures will be considered. Many of these structures are not owned or operated by Irish Water and as such, their removal will need to be considered in consultation with the relevant stakeholders.

6.4.3 Project Level Assessments

In parallel to the development of the project scope, design feasibility and environmental assessments will be required. The level of assessments required will depend on the size and scale of the solutions.

Assessments at project level will typically include:

- Hydrological and hydrogeological assessments of yield - These will include the collection of specific data. A critical aspect of the project level yield assessments will be to ensure that the development of a new source for water supply will not impact other existing sources or other water users. For example, if we are looking to develop a new groundwater source, we would need to determine that these sources do not impact any existing abstraction such as an existing Irish Water or Group Water Scheme groundwater source or an existing abstraction required for industry or agricultural use. This would be assessed by installing water level monitors on existing boreholes that could be impacted by the new source for the duration of the pump testing.
- Environmental assessments, including an Appropriate Assessment (AA) screening, Environmental Impact Assessment (EIA) screening and WFD assessments - Outputs from the hydrological and hydrogeological assessments will be a key factor in the determination of the level of environmental assessments required, as these will provide more information on the boundary of any potential environmental impacts. For example, pumping tests may indicate that the zone of contribution for an aquifer is larger than initially anticipated and confirm a link with a Special Area of Conservation (SAC). In such a scenario, any potential impact to the SAC will need to be considered as part of the environmental assessment for the project. Where the requirement for AA or EIA is identified, further site-specific environmental assessments will be required, and the scope of these works will need to be developed in consultation with the relevant stakeholders.
- Water Quality assessments - These will include the collection of samples of raw water from the proposed source to determine the required treatment process.
- Site selection and route selection assessments - While the indicative locations of infrastructure have been provided in the Plan, the actual routes and location of assets will need to be considered in more detail at project level. At this stage details of all existing infrastructure, including underground services, will be obtained. This, along with environmental constraints, and specific needs for any Metropolitan Areas or Strategic Development Zones will be considered in the determination of the preferred route/site.

Stakeholder engagement is also an important aspect to project development. The extent of engagement will be dependent on the size and scale of the project but will typically include environmental stakeholders, landowners, the general public, Local Authorities, and asset owners (Group Water Schemes, the Electricity Supply Board (ESB), Bord Gáis etc).

6.4.4 Next Steps

If at project level it is determined that a Preferred Approach is not feasible, consideration will be given to other Feasible Options outlined in the draft RWRP-NW. If there is a change to the Preferred Approach, but this impacts a single WRZ then there is no variation to the RWRP-NW; however, the change will be assessed at project level. This envisages a situation where refinements to a single project, or closely related project within a WRZ, will be considered within their own environmental assessments. The change would not have any systemic impacts on the wider RWRP-NW.

6.5 Summary

This section describes our approach to identifying and assessing Options to produce a Feasible Option List for the North West Region. Our approach involved:

- Identification of 1,355 Unconstrained Options through assessments undertaken by a specialist team and workshops with our Local Authority partners;
- Coarse screening, against the Resilience, Deliverability and Flexibility, and Sustainability criteria. At this stage 544 Options were rejected, and 811 Options passed to the Fine Screening stage;
- Fine screening, against 33 sub-criteria using a Multi-Criteria Assessment (MCA). Plan level environmental assessments were undertaken as part of the screening process. There were no further Options rejected at this stage. Therefore, the 811 Options passed at coarse screening were developed as Feasible Options.

The environmental MCA criteria are based on the SEA objectives from the SEA Scoping Report as consulted on with environmental stakeholders; and

Habitats Directive considerations have been integrated into the Options Assessment Methodology at a number of points to ensure both robust assessment and protection are integrated into the Plan.

The 811 Feasible Options consist of 251 WRZ Options that can meet local Needs only and 560 SA Options that can meet the Needs of multiple WRZs. They comprise a wide range of Option Types including:

- 159 (20%) local groundwater Options;
- 293 (36%) local surface water Options;
- 175 (22%) Options involving supply system rationalisation. This consists of merging supply systems and decommissioning obsolete infrastructure, and is usually accompanied by increased or new groundwater and/or surface water abstraction/s;
- 135 (16%) transfer Options, usually accompanied by increased or new groundwater and/or surface water abstractions;
- 32 (4%) WTP upgrades for Water Quality for Study Areas not in Deficit; and
- 17 (2%) Options include desalination (12), cross study area supplies (4), and network improvement (1).

An outline design and estimated cost is developed for each Feasible Option. The Option costs include monetised values for environmental and social aspects, and embodied and whole life carbon costs.

6.6 References

1. UK Technical Working Group (UKTAG). 2013*. River flow for good ecological potential. Final Recommendations.*
2. Irish Water. 2021. Biodiversity Action Plan. [Online]. Available from: https://www.water.ie/projects/national-projects/biodiversity/.