

# **Project Summary Report Appendix 2**

(Calculation of the Water Supply Requirement)

January 2025

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### Acronyms and Abbreviations

Acronym	Meaning
CSO	Central Statistics Office
DMAs	District Metering Areas
DYAA	Dry Year Annual Average
DYCP	Dry Year Critical Period
EPA	Environmental Protection Agency
EY	Ernst Young
GDA WRZ	Greater Dublin Area Water Resource Zone
GVA	Gross Value Add
ICARUS	Irish Climate Analysis and Research Unit
LoS	Level of Service
Mld	Megaliters per day
MUR	Meter Under Registration
NPF	National Planning Framework
NWRP	National Water Resources Plan
NYAA	Normal Year Annual Average
PCC	Per Capita Consumption
PHC	Per Household Consumption
RSES	Regional Spatial and Economic Strategies
SDB	Supply Demand Balance
SELL	Sustainable Economic Level of Leakage
WAFU	Water Available for Use
WCP	Winter Critical Period
WRZ	Water Resource Zone

# 1 Calculation of the Water Supply Requirement

## 1.1 Introduction

1. The following sections provides supplementary information regarding the calculation of the volume of water that the Proposed Project infrastructure shall have the capacity to abstract and deliver to address a 'deficit' in water supply for the identified Water Supply Area<sup>1</sup>. The deficit is the 'gap' or difference between the water available for supply compared with the demand for water. The deficit is defined according to the Level of Service (LoS) that is to be provided.
2. LoS refers to the reliability of the supply that Uisce Éireann customers can expect to receive and is expressed as a frequency or return period of supply failure based on statistics. For example, if the LoS is stated as 1 in 50, a consumer would only ever expect to experience a water outage or severe limitations to supply, such as 'do not drink' notices or 'boil notices', on average, once every 50 years. This would be a 2% chance that in any given year that there would be a supply failure.
3. The current Level of Service for drinking water in Ireland varies according to location, ranging from lower than 1 in 10 to better than 1 in 50. In comparison in the UK, current best practice is to provide a 1 in 100 Year Level of Service.
4. In the National Water Resources Plan - Framework Plan, (the Framework Plan) Supply Demand Balance (SDB) assessments have been developed for each Water Resource Zone (WRZ) based on a target 1 in 50 Year LoS. This means Uisce Éireann will aim to provide a uniform minimum of 1 in 50-year LoS across the entire public water supply over time.
5. The difference between the water available for supply compared with the demand for water is referred to as the Supply Demand Balance (SDB). Therefore, the SDB defines the volume of water that needs to be provided to address the deficit needed in order to meet a 1 in 50 year LoS.
6. The Proposed Project infrastructure will provide the capacity to meet the drinking water need for a Water Supply Area consisting of 36 Water Resource Zones (WRZ) across the Eastern and Midlands Region<sup>2</sup>. It will do this by providing the capacity to supply up to 300 megalitres of water per day which will:
  - Immediately meet the identified need for water within the Greater Dublin Area Water Resource Zone (GDA WRZ) to 2050 and beyond.
  - Enable the future supply to 17 other WRZs by re-directing supplies within the GDA WRZ and expanding the GDA WRZ by incorporating these WRZs into the GDA Regional WRZ, when future projects are brought forward by Uisce Éireann.
  - Enable the future supply to a further 18 WRZs across the midlands from take-off points along the pipeline and facilitate the consolidation of those WRZs into four new WRZs, when future projects are brought forward by Uisce Éireann.
  - Make provision for potential reductions in existing supply volumes due to sustainability requirements anticipated under the new abstraction licensing regime.
7. Given the strategic nature of the Proposed Project, it is considered prudent that the project continue (as it has done in previous iterations of the project) to adopt 2050 as the forecast year for the purposes of identifying how much water the Proposed Project needs to supply. Therefore, the SDB for the Proposed Project is based on applying the Framework Plan methodology to the year 2050.

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<sup>1</sup> The Water Supply Area consists of 36 Water Resource Zones (WRZ) across the Eastern and Midlands Region.

<sup>2</sup> 37 Water Resource Zones were identified in the Regional Water Resource Plan - Eastern and Midlands consisting of the GDA WRZ and 36 other WRZs. Subsequently Barndarrig WRZ and Redcross WRZ have been rationalized and combined and so the total is now 36 Water Resource Zones consisting of the GDA WRZ and 35 other WRZs.

## 1.2 Supply Demand Balance

8. The SDB is a mechanism used for assessing the difference between the water available in supplies compared with the demand for water as summarised in Image 1.1. The SDB has been calculated for each WRZ under the following four weather event planning scenarios:

- Normal Year Annual Average (NYAA) – normal supply and demand availability in an average weather year;
- Dry Year Annual Average (DYAA) - low rainfall conditions, with no constraints on demand;
- Dry Year Critical Period (DYCP) – a period during the summer of a dry year, during which demands are significantly above the annual average; and
- Winter Critical Period (WCP) - a period during winter months whereby Winter Freeze Thaw conditions lead to increased demands due to leaks from burst pipes.

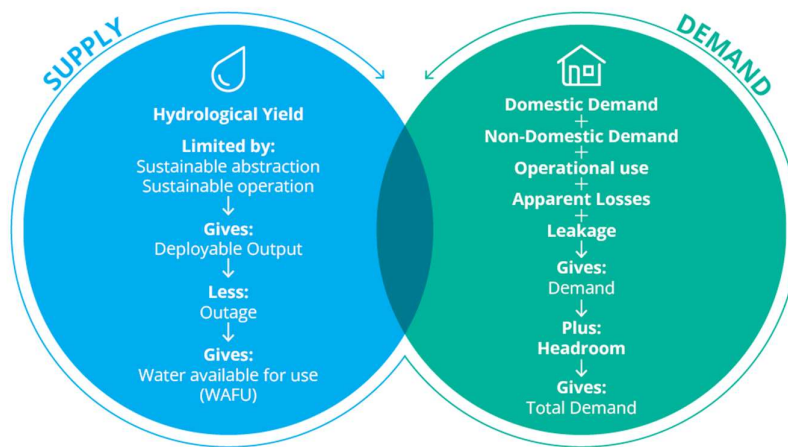


Image 1.1: Supply Demand Balance

9. Supply considers: water availability in the natural environment; current abstractions (hydrological yield); water treatment capacity; process losses; required allowances to ensure continuity of supply during planned and unplanned events; Levels of Service; and, trunk main constraints. When these factors have been considered, the Water Available for Use (WAFU)<sup>3</sup> can be calculated for each WRZ. As part of supply forecasting, declines in supply due to climate change and risks such as reductions in allowable abstraction from waterbodies, must be considered.
10. Demand considers: domestic and non-domestic (i.e., commercial and industrial) demand; operational usage (such as flushing water mains and fire hydrants); apparent losses<sup>4</sup> and leakage. Demand forecasting must also consider leakage reduction, growth in demand and allow for uncertainties by providing headroom (headroom is the safety margin which is applied to demand forecasts to allow for uncertainties). The sum of these components represents the total demand during normal conditions. Peaking factors are applied to the normal year demand to calculate demand for each of the different Weather Planning Scenarios.
11. Supply and demand are calculated for a base year and are projected forward to develop SDB forecasts. A deficit in the SDB means that the demand for water is higher than the available supply.

<sup>3</sup> Water Available for Use (WAFU) is the amount of water that can be supplied from a supply system taking into account infrastructure capacity constraints, treatment losses and planned and unplanned events that can reduce supplies.

<sup>4</sup> Apparent Losses include water that is used in properties (both domestic and non-domestic) through permanent and temporary connections that are currently unknown to Uisce Éireann.

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In the event of an identified deficit, remedial actions must be taken to reduce future demand, increase supply or a combination of both.



## 2 Calculation of the Water Supply Area Supply Demand Balance Deficit

12. The calculation of each of the main supply and demand components is described in the following sections.

### 2.1 Water Available for Use

13. WAFU is the water available to supply customers, accounting for water availability in the natural environment, current abstractions, capacity in production, capacity in transfer mains, reliability and risk within existing supplies.
14. The NWRP methodology for forecasting future WAFU includes consideration of the impact of climate change on existing sources by adjusting the future hydrological yield of each source using Ireland-specific climate change factors, which were developed by the ICARUS (Irish Climate Analysis and Research Unit) Department of NUI Maynooth in 2008. The work involved assessing nine catchment types across Ireland to develop seasonal adjustment factors that could be applied to hydrological yield.
15. As the GDA WRZ is a complex network consisting of nine individual water supplies, the supply has been modelled using a water resource planning tool known as Aquator. The Aquator model enables us to assess the deployable output for the combined supplies for all weather conditions (normal, dry, drought and winter), for an appropriate level of service. The Aquator model simulates all of the existing and planned sources within the GDA WRZ to assess the capability of these resources to supply increasing levels of demand and determines the deployable output from our sources for a target level of service. The Aquator model was used to develop the deployable output for the following scenarios: 2019 with current capabilities, 2022 with planned works implemented, and 2055 with climate change impacts applied.
16. WAFU for the GDA Regional WRZ will be a combination of the Aquator output for the GDA plus the WAFU for the supplies that will endure following connection of the relevant present day WRZs to the GDA WRZ.

### 2.2 Components of Demand

17. The total amount of water supplied into the distribution network (from our treatment works) is known as “distribution input”. For each WRZ, the demand components combine to give distribution input. This is illustrated in Image 2.1 and each is defined in this section of this report.



Image 2.1 – Distribution Input Calculation Process

18. The steps to derive the demand forecast, as part of the development of the Regional Water Resource Plan - Eastern and Midlands, were as follows:
- Step 1: Calculate base year demand (the water balance)
  - Step 2: Calculate forecasts for each component of demand
  - Step 3: Calculate headroom
  - Step 4: Calculate the total demand forecast

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- Step 5: Derive and apply factors, i.e. 'peaking factors' to convert demand to Weather Event Scenarios.

### 2.3.1 Domestic Water Demand

19. Domestic water demand is projected to increase based on projected population growth and population served multiplied by the per capita average water consumption rate. The estimated population currently living in each WRZ in the Water Supply Area has been based on the 2016 Census data. Forecasts for future populations are based on 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 2016 population was assigned to District Metering Areas (DMAs) by mapping the Central Statistics Office (CSO) data to DMA boundaries. Uisce Éireann has projected the 2016 population forward to 2019 using the growth projections in the NPF to establish our base year populations.
20. The NPF envisages 25% growth in Dublin City and suburbs between 2016 and 2040 with various rates for the remainder of the country ranging from 16% to 61% based on settlement type and size. The WRZ that covers the Greater Dublin Area includes Dublin City and suburbs and parts of Meath, Kildare, Wicklow and county Dublin. Therefore, the anticipated growth in this WRZ is a weighted combination of Dublin City and suburbs, and applicable growth rates for the other areas. The growth rate is extrapolated from the end of the NPF (2040) to 2044. The growth rate across the rest of Ireland is linear over the 25-year period within our Framework Plan. As a conservative assumption, for the period from 2044 to 2050 our projections do not include any further population growth.
21. The per capita consumptions figures applied in the forecasts are from the NWRP. For each WRZ the average metered Per Household Consumption (PHC) for those properties has been taken within the WRZ. An allowance of 2% for Meter Under Registration (MUR) has then been applied. This reflects that meters do not record usage to 100% accuracy and that the accuracy deteriorates with age of meter. For the unmetered domestic properties, Uisce Éireann has assumed that the metered data can be extrapolated and then apply it to the unmetered properties. The total domestic demand in a WRZ in the base year is:  
  
*(Metered domestic demand +2%) + (Ave. metered PHC x number of unmetered domestic properties)*
22. This total can then be divided by the population in the WRZ to calculate a per capita consumption (PCC) figure for that WRZ.
23. It is expected that the occupancy rate of homes in Ireland will decrease in the future meaning the average household will be smaller. This will tend to increase PCC levels as the components of water use which are shared amongst the household, will be spread across fewer occupants. However, recent models of appliances such as washing machines and dishwashers use less water per cycle, which can off-set increases from lower occupancy rates.
24. Due to current data limitations in Ireland, data from the UK was used in the Framework Plan to assess potential changes to PCC for the period of the Framework Plan. Uisce Éireann has considered how the improvement in appliance efficiency combined with falling occupancy (based on the NPF) would impact PCC over the next 25-years. This work has indicated that in Ireland, PCC would be expected to increase by 1l/p/d by 2044, largely driven by reduced household occupancy rates.



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25. On a conservative basis, as outlined in the Framework Plan, Uisce Éireann has taken the view that PCC should not increase by 1l/p/d from current levels. Therefore, the domestic demand forecasts are based on no change in PCC over the 25-year period of the National Water Resource Plan.
26. Table 2.1 presents the population forecast and PCC figure for each of the 37 WRZs in the Water Supply Area<sup>5</sup>. This is also presented graphically in Image 2.2 for the GDA WRZ only and Image 2.3 for the whole Water Supply Area. Bardarrig WRZ and Redcross WRZ have subsequently been rationalised and combined. Therefore, there are 35 Water Resource Zones and the Greater Dublin Area, within the Water Supply Area that the Proposed Project is to meet the water supply requirement, a combined total of 36 Water Resource Zones. This does not affect the volume of water to be supplied.
27. Tables 2.2, 2.3 and 2.4 present the resulting domestic demand forecast for each water resource zone. This profile of domestic demand growth is presented graphically in Image 2.4 for the GDA WRZ only, and in Image 2.5 for the whole Water Supply Area.
28. There is a forecast 24% increase in total domestic water demand in the Water Supply Area, from 251Mld in 2019 to 311Mld in 2050.

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<sup>5</sup> The Water Supply Area is defined in the Project Summary Report and consists of the 37 WRZs defined in the Regional Water Resource Plan – Eastern and Midlands as to be supplied by the Preferred Approach of a New Shannon Source with Transfers.

<sup>6</sup> 37 Water Resource Zones were identified in the Regional Water Resource Plan - Eastern and Midlands consisting of the GDA WRZ and 36 other WRZs. Subsequently Bardarrig WRZ and Redcross WRZ have been rationalised and combined and so the total is now 36 Water Resource Zones consisting of the GDA WRZ and 35 other WRZs.

**Table 2.1: Population forecast and PCC figure for each of the 37 WRZs in the Water Supply Area<sup>7</sup>**

Study Area	Water Resource Zone Code	Water Resource Zone Name	Per Capita Consumption l/person/d	Population							
				2016	2019	2025	2030	2035	2040	2044	2050
SA9	GDA	Greater Dublin Area	122	1,644,558	1,702,250	1,816,335	1,911,766	1,985,434	2,059,103	2,118,530	2,118,530
SA1	3400SC0007	Avoca Ballinaclash Public Supply	128	1,320	1,345	1,394	1,436	1,477	1,518	1,551	1,551
SA1	3400SC0012	Redcross Conary Public Supply	203	566	577	598	616	633	651	665	665
SA1	3400SC0017	Barndarrig	191	213	217	225	232	238	245	250	250
SA1	3400SC0025	Ballintekin Public Supply	78	50	51	53	54	56	58	59	59
SA1	3400SC0027	Ballinapark Public Supply	196	10	10	11	11	11	12	12	12
SA1	3400SC0046	Rathdrum Public Supply	123	1,854	1,889	1,958	2,016	2,074	2,132	2,178	2,178
SA1	3400SC0047	Laragh Annamoe Public Supply	147	646	658	682	703	723	743	759	759
SA2	0100SC0005	Hacketstown	129	599	610	633	651	670	689	704	704
SA2	3400SC0004	Dunlavin Public Supply	112	957	975	1,011	1,041	1,071	1,101	1,124	1,124
SA2	3400SC0005	Hollywood Donard Public Supply	148	890	907	940	968	996	1,024	1,046	1,046
SA3	2300SC0055	Navan-Mid Meath	115	38,985	40,101	42,333	44,194	46,054	47,914	49,402	49,402
SA3	2100SC0001	South Louth East Meath	122	104,562	107,827	114,356	119,797	124,397	128,997	132,677	132,677
SA3	2300SC0005	Kells Oldcastle	133	10,912	11,117	11,526	11,867	12,208	12,549	12,822	12,822
SA3	2300SC0014	Trim	117	10,625	11,399	11,818	12,168	12,518	12,867	13,147	13,147
SA3	2300SC0006	Athboy	146	4,583	4,669	4,841	4,984	5,127	5,270	5,385	5,385
SA3	2300SC0007	Ballivor	124	2,493	2,540	2,633	2,711	2,789	2,867	2,929	2,929
SA3	2300SC0011	Kilmessan	150	1,117	1,138	1,180	1,215	1,250	1,285	1,312	1,312
SA6	0100SC0001	Carlow North	130	36,740	37,872	40,137	42,024	43,911	45,798	47,308	47,308
SA6	2500SC0002	Tullamore	144	15,278	16,700	17,687	18,510	19,333	20,156	20,814	20,814
SA6	2500SC0013	Mountbolus PWS	123	149	152	157	162	167	171	175	175

<sup>7</sup> 37 Water Resource Zones were identified in the Regional Water Resource Plan - Eastern and Midlands consisting of the GDA WRZ and 36 other WRZs. Subsequently Barndarrig WRZ and Redcross WRZ have been rationalised and combined and so the total is now 36 Water Resource Zones consisting of the GDA WRZ and 35 other WRZs.

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Study Area	Water Resource Zone Code	Water Resource Zone Name	Per Capita Consumption l/person/d	Population							
				2016	2019	2025	2030	2035	2040	2044	2050
SA4	3200SC0003	Ballany	149	7,546	8,366	8,674	8,931	9,187	9,444	9,649	9,649
SA4	3200SC0001	Mullingar Regional	127	46,706	50,016	52,421	54,425	56,429	58,434	60,037	60,037
SA4	2300SC0012	Clonard/Abbeysfields Housing Estate	110	328	334	346	357	367	377	385	385
SA4	2300SC0016	Longwood WS	121	1,725	1,757	1,822	1,876	1,930	1,984	2,027	2,027
SA4	1400SC0004	Ardcarraig Clogherinkoe	150	109	111	115	119	122	125	128	128
SA4	2500SC0005	Edenderry & Rhode	143	10,838	11,041	11,448	11,786	12,125	12,464	12,735	12,735
SA4	2500SC0014	Daingean	141	1,477	1,505	1,560	1,606	1,652	1,699	1,735	1,735
SA4	2500SC0006	Walsh Island	153	960	978	1,014	1,044	1,074	1,104	1,128	1,128
SA4	2000SC0003	Ballymahon	149	8,247	8,402	8,711	8,969	9,226	9,484	9,690	9,690
SA4	2300SC0018	Enfield	105	3,274	3,748	4,697	5,488	6,279	7,069	7,702	7,702
SA4	2500SC0004	Geashill	124	708	721	748	770	792	814	832	832
SA7	2500SC0010	Dunkerrin /Moneygall	139	1,552	1,581	1,639	1,688	1,736	1,785	1,824	1,824
SA7	2900SC0045	Borrisokane (Greyford source to Crotta)	157	1,752	1,785	1,851	1,905	1,960	2,015	2,059	2,059
SA7	2900SC0046	Cloughjordan	156	1,205	1,228	1,273	1,310	1,348	1,386	1,416	1,416
SA8	2900SC0066	Newport	135	7,115	7,248	7,515	7,738	7,960	8,182	8,360	8,360
SA8	0300SC0024	Killaloe	177	1,781	1,762	1,725	1,694	1,813	1,968	2,093	2,093

Image 2.2 GDA WRZ Population Forecast 2016-2050

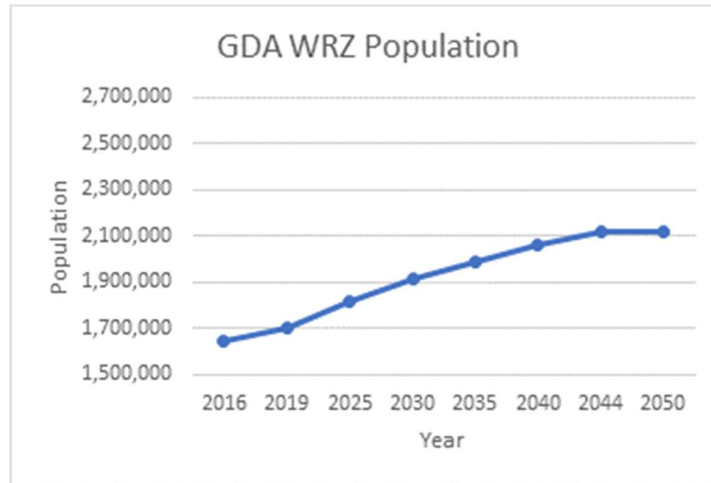
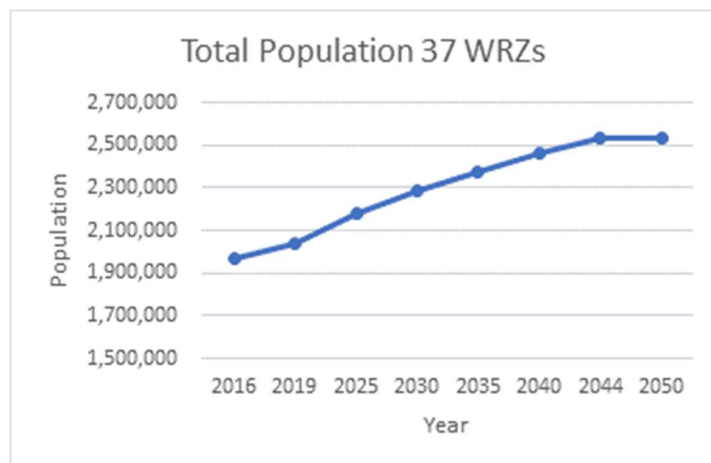


Image 2.3 Water Supply Area Population Forecast 2016-2050



**Table 2.2 Domestic Demand Forecast by WRZ**

Study Area	Water Resource Zone Code	Water Resource Zone Name	WRZ Name post-rationalisation	Domestic Demand Mid							
				2016	2019	2025	2030	2035	2040	2044	2050
SA9	GDA	Greater Dublin Area	GDA Regional	199.8	206.8	220.7	232.3	241.2	250.2	257.4	257.4
SA1	3400SC0007	Avoca Ballinaclesh Public Supply	GDA Regional	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
SA1	3400SC0012	Redcross Conary Public Supply	GDA Regional	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
SA1	3400SC0017	Barndarrig	GDA Regional	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.05
SA1	3400SC0025	Ballinteskinn Public Supply	GDA Regional	0.004	0.004	0.004	0.004	0.004	0.005	0.005	0.005
SA1	3400SC0027	Ballinapark Public Supply	GDA Regional	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
SA1	3400SC0046	Rathdrum Public Supply	GDA Regional	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3
SA1	3400SC0047	Laragh Annamoe Public Supply	GDA Regional	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
SA2	0100SC0005	Hacketstown	GDA Regional	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
SA2	3400SC0004	Dunlavin Public Supply	GDA Regional	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
SA2	3400SC0005	Hollywood Donard Public Supply	GDA Regional	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
SA3	2300SC0055	Navan-Mid Meath	GDA Regional	4.5	4.6	4.9	5.1	5.3	5.5	5.7	5.7
SA3	2100SC0001	South Louth East Meath	GDA Regional	12.8	13.2	14.0	14.6	15.2	15.7	16.2	16.2
SA3	2300SC0005	Kells Oldcastle	GDA Regional	1.5	1.5	1.5	1.6	1.6	1.7	1.7	1.7

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Study Area	Water Resource Zone Code	Water Resource Zone Name	WRZ Name post-rationalisation	Domestic Demand Mld							
				2016	2019	2025	2030	2035	2040	2044	2050
SA3	2300SC0014	Trim	GDA Regional	1.2	1.3	1.4	1.4	1.5	1.5	1.5	1.5
SA3	2300SC0006	Athboy	GDA Regional	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8
SA3	2300SC0007	Ballivor	GDA Regional	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4
SA3	2300SC0011	Kilmessan	GDA Regional	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
SA6	0100SC0001	Carlow North	GDA Regional	4.8	4.9	5.2	5.5	5.7	6.0	6.2	6.2
SA6	2500SC0002	Tullamore	Tullamore/ Mountbolus	2.2	2.4	2.5	2.7	2.8	2.9	3.0	3.0
SA6	2500SC0013	Mountbolus PWS	Tullamore/ Mountbolus	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
SA4	3200SC0003	Ballany	Mullingar Regional	1.1	1.2	1.3	1.3	1.4	1.4	1.4	1.4
SA4	3200SC0001	Mullingar Regional	Mullingar Regional	5.9	6.4	6.7	6.9	7.2	7.4	7.6	7.6
SA4	2300SC0012	Clonard/Abbeysfields Housing Estate	Mullingar Regional	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
SA4	2300SC0016	Longwood WS	Mullingar Regional	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
SA4	1400SC0004	Ardcarraig Clogherinkoe	Mullingar Regional	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
SA4	2500SC0005	Edenderry & Rhode	Mullingar Regional	1.5	1.6	1.6	1.7	1.7	1.8	1.8	1.8
SA4	2500SC0014	Daingean	Mullingar Regional	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
SA4	2500SC0006	Walsh Island	Mullingar Regional	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2
SA4	2000SC0003	Ballymahon	Mullingar Regional	1.2	1.3	1.3	1.3	1.4	1.4	1.4	1.4



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Study Area	Water Resource Zone Code	Water Resource Zone Name	WRZ Name post-rationalisation	Domestic Demand Mld							
				2016	2019	2025	2030	2035	2040	2044	2050
SA4	2300SC0018	Enfield	Mullingar Regional	0.3	0.4	0.5	0.6	0.7	0.7	0.8	0.8
SA4	2500SC0004	Geashill	Mullingar Regional	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
SA7	2500SC0010	Dunkerrin /Moneygall	Dunkerrin/Moneygall/ Borrisokane	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3
SA7	2900SC0045	Borrisokane (Greyford source to Crotta)	Dunkerrin/Moneygall/ Borrisokane	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
SA7	2900SC0046	Cloughjordan	Dunkerrin/Moneygall/ Borrisokane	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
SA8	2900SC0066	Newport	Newport RWSS / Killaloe	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.1
SA8	0300SC0024	Killaloe	Newport RWSS / Killaloe	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4

Table 2.3 Domestic Demand Forecast for the GDA (2019 – 2050)

WRZ Name	Domestic Demand Mld						
	2019	2025	2030	2035	2040	2044	2050
GDA	207	221	232	241	250	257	257

Image 2.4 Domestic Demand forecast for the GDA (2019-2050)

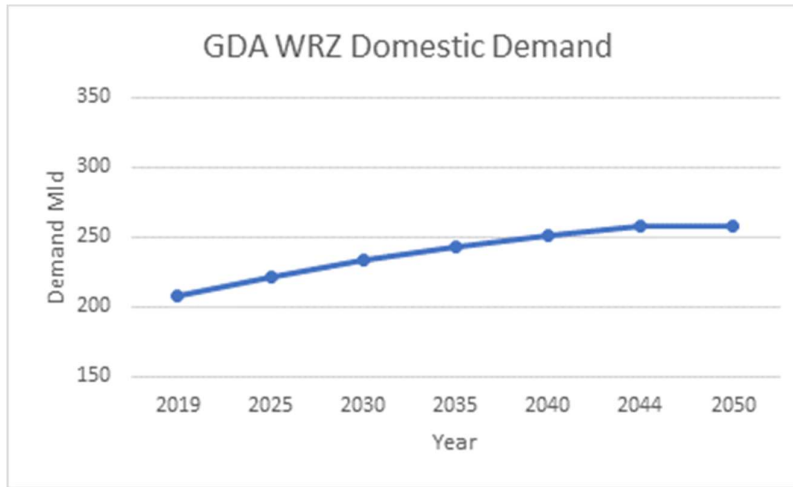
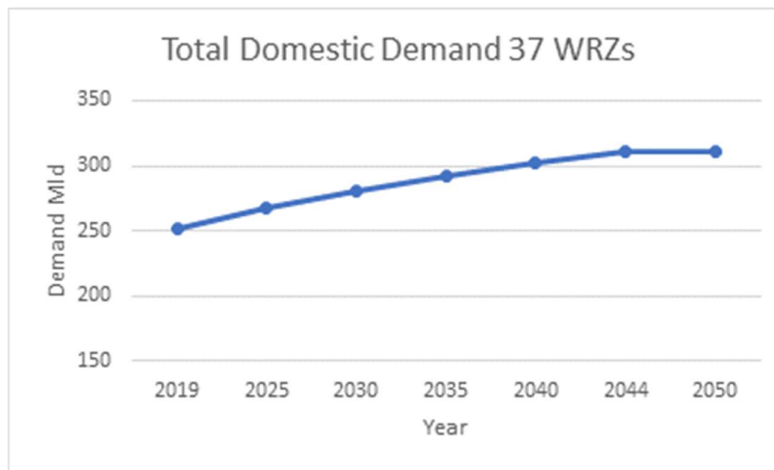


Table 2.4 Domestic Demand forecast for the Water Supply Area (2019 – 2050)

	Domestic Demand Mld						
	2019	2025	2030	2035	2040	2044	2050
Total	251	268	281	292	303	311	311

Figure 2.5 Domestic Demand forecast for the Water Supply Area (2019-2050)



### 2.3.2 Non-domestic Water Demand

29. In the GDA WRZ, non-domestic water demand is projected to increase from 139Mld in 2019 to 241Mld by 2050. Due to its size and complexity, this forecast was developed by independent economic analysts from EY Consulting and considered:

- Customer and sector level water usage data provided by Uisce Éireann for the calendar year 2019;
- Census of Industrial Production and other census / Central Statistics Office data on output on a sector-by-sector basis;
- Position papers on development in the GDA;
- Government strategies on key industries and activities;
- Findings from econometric modelling of the likely future water intensity output; and,
- Long-term economic forecasts for the Irish economy (Gross Value Add (GVA))<sup>8</sup>.

30. The analysts developed low, medium and high demand scenarios for the GDA, as summarised in Table 2.5, based on economic growth projections. The forecasts include provision for contracted demand. This is where Uisce Éireann has an existing expectation of new water demand arising from existing customers or from new non-domestic connections based on connection enquires and is in addition to base non-domestic demand growth assumptions. The references to EY Base, Accelerated 1 and Accelerated 2 refer to scenarios presented in the Preliminary Business Case for the Proposed Project published in 2024.

**Table 2.5 Non-domestic Forecast Scenario Assumptions**

Scenario	Macroeconomic Forecast input (for GDA)	43Mld contracted demand	40Mld contracted demand
Low	GVA - EY Base	Excluded	Excluded
Medium	GVA - EY Accelerated 1	9Mld in 2021, growing to 19Mld in 2022, 38Mld in 2023 and 43 MLD in 2024 included	7Mld included from 2023
High	GVA - EY accelerated 2	9Mld in 2021, growing to 19Mld in 2022, 38Mld in 2023 and 43Mld in 2024 included	7Mld in 2023 rising to 40Mld by 2030 Included

31. Table 2.6 presents the forecasts based on these three scenarios. The medium demand scenario (considered the prudent scenario, where the economy performs in line with the baseline long-term forecasts) has been used to forecast growth in non-domestic water demand.

<sup>8</sup> GVA forecasts were prepared in early 2019 and represent pre-Covid-19 impact.

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**Table 2.6 – Scenario Driven GDA Non-domestic Demand Forecasts**

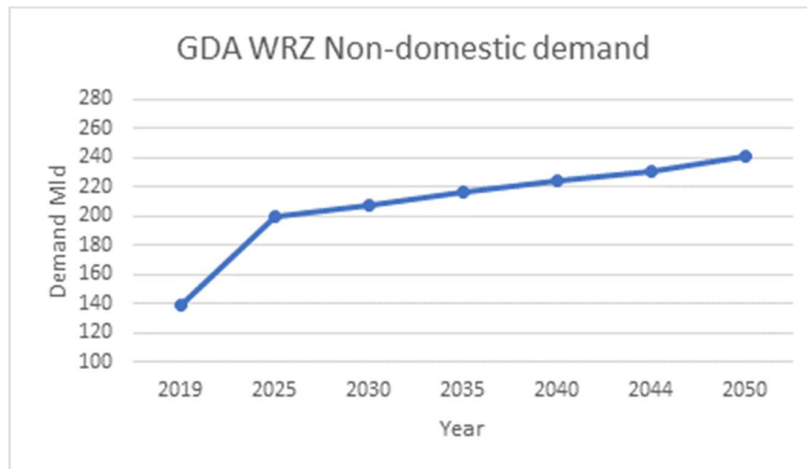
Scenario		GDA Non-domestic Demand Mld						
		2019	2021	2026	2031	2041	2046	2050
GVA - EY base	EY Low	139	142	145	148	154	157	158
GVA - EY accelerated 1	EY Medium	139	153	201	209	226	235	241
GVA - EY accelerated 2	EY High	139	153	217	248	282	299	313

32. Table 2.7 and Image 2.6 present the same profile as in Table 2.6 but aligns the year intervals used in this appendix, for consistency. The references to EY Base, Accelerated 1 and Accelerated 2 refer to scenarios presented in the Preliminary Business Case for the Proposed Project published in 2024.

**Table 2.7 GDA Non-domestic Demand Forecast Based on EY Analysis**

WRZ Name	Non-domestic Demand Mld						
	2019	2025	2030	2035	2040	2044	2050
GDA	139	200	208	216	225	231	241

**Image 2.6 GDA WRZ Non-domestic Demand Profile**

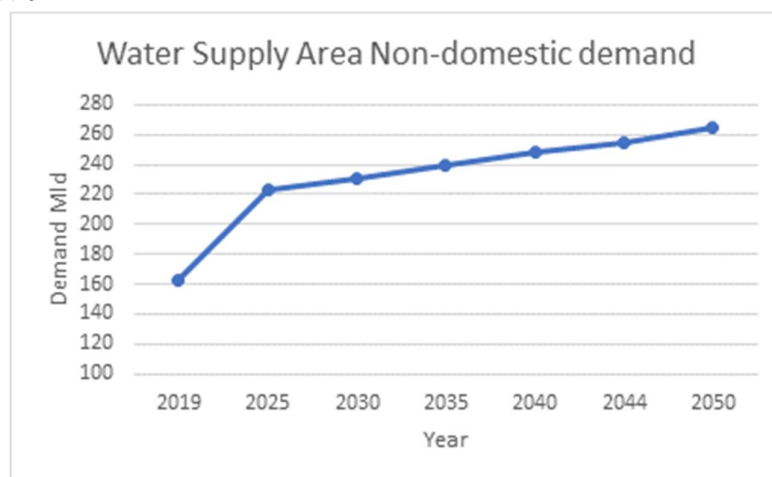


33. As identified in the NWRP Framework Plan (Section 4.3.2.3), non-domestic demand growth is assumed as zero outside of the GDA and Regional Growth Cities.
34. The total non-domestic demand profile for the Water Supply Area is presented in Table 2.8 and Image 2.7.

Table 2.8 Water Supply Area Non-domestic Demand Forecast

WRZ Name post-rationalisation	Non-domestic Demand Mld						
	2019	2025	2030	2035	2040	2044	2050
GDA Regional	153	213	221	230	238	245	255
Tullamore/ Mountbolus	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Mullingar Regional	7	7	7	7	7	7	7
Dunkerrin/Moneygall/Borrisokane	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Newport RWSS / Killaloe	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Total	163	223	231	240	248	255	265

Image 2.7 Water Supply Area Non-domestic Demand Profile



35. There is a forecast 63% increase in total non-domestic water demand in the Water Supply Area, from 163Mld in 2019 to 265Mld in 2050. As noted above, this includes 50Mld of contracted demand. Therefore the base non-domestic demand growth, excluding contracted demand, is 52Mld or 32% over the period 2019 to 2050.

### 2.3.3 Leakage

36. Leakage reduction is a major priority for Uisce Éireann. Ambitious leakage reduction targets are included in the Supply Demand Balance calculations for the Water Supply Area. Details of the methodology for setting these targets are provided in the NWRP Framework Plan (Section 4.3.3).

37. When the total costs of producing water (including environmental and social) are greater than the cost of reducing leakage, there is a natural driver to further reduce leakage to achieve equilibrium. This is known as the Sustainable Economic Level of Leakage (SELL).

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38. The SELL forecasts have been calculated using the available data from the Leakage Management System for 2019, using best practice methodologies for calculating SELL within the UK.
39. In 2019, the level of leakage in the GDA WRZ was estimated to be 215Mld. SELL in the GDA WRZ has been estimated as 130Mld. In the NWRP Framework Plan, this target was set to be achieved by 2034. Further to a review of leakage targets carried-out by the Uisce Éireann leakage reduction team, the leakage reduction targets for the GDA were revised (ref. RWRP-EM SA9, Section 2.2). This revised target is to reduce leakage in the GDA WRZ to 122Mld. Uisce Éireann's intention is to strive to achieve this by 2030.
40. Outside the GDA, WRZs are prioritised for leakage reduction based on the extent of the supply demand deficit, existing abstractions with sustainability issues, and drought impacts. Operational efforts are focussed in off-setting the natural rate of rise of leakage in all other areas.
41. Table 2.9 and Image 2.8 summarise the leakage reduction glide path for the GDA and Table 2.10 and Image 2.9 present the equivalent for the full Water Supply Area.

**Table 2.9 GDA WRZ Leakage Forecast**

WRZ Name	Leakage Mld						
	2019	2025	2030	2035	2040	2044	2050
GDA	215	165	122	122	122	122	122

**Image 2.8 GDA WRZ Leakage Reduction Glidepath**

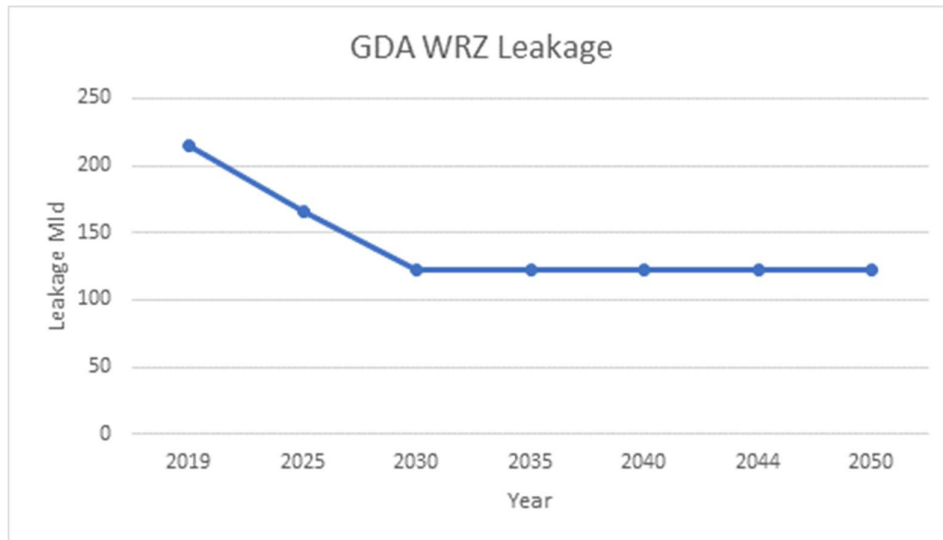
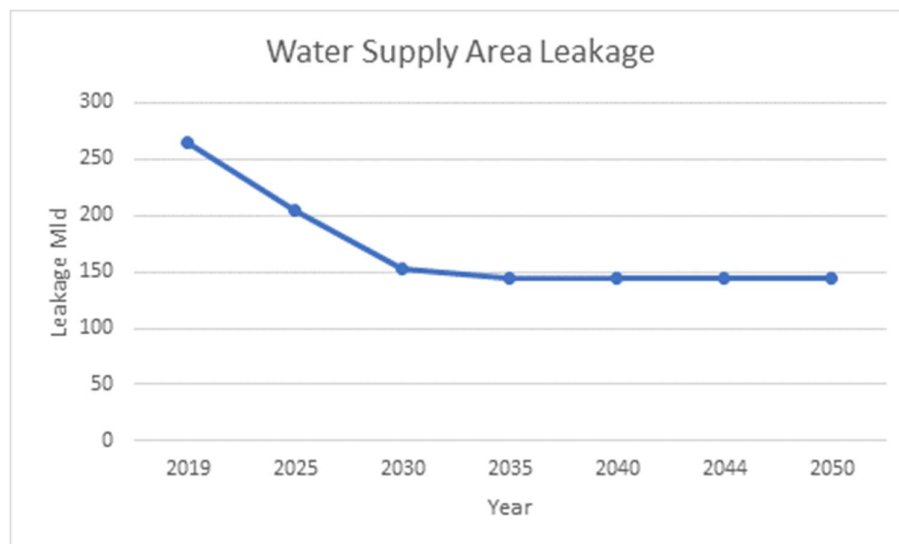




Table 2.10 Water Supply Area Leakage Forecast

WRZ Name post-rationalisation	Leakage Mld						
	2019	2025	2030	2035	2040	2044	2050
GDA Regional	245.1	189.1	140.6	136.2	136.2	136.2	136.2
Tullamore/ Mountbolus	1.2	1.1	1.0	1.0	1.0	1.0	1.0
Mullingar Regional	15.3	11.6	8.5	6.0	6.0	6.0	6.0
Dunkerrin/Moneygall/Borrisokane	1.2	1.1	1.0	0.9	0.9	0.9	0.9
Newport RWSS / Killaloe	1.8	1.4	1.0	0.8	0.8	0.8	0.8
Total	265	204	152	145	145	145	145

Image 2.9 Water Supply Area Leakage Reduction Glidepath



### 2.3.4 Other Demand Components

42. Illegal connections: provision for unknown temporary and permanent domestic and non-domestic connections is based on an allowance of 1% of overall demand in urban areas and 0.5% in rural areas in accordance with the National Water Resource Plan<sup>9</sup>.
43. Operational use (e.g., usage by Uisce Éireann, the Fire Service and Local Authorities for road cleaning etc.) has been calculated based on 1% of distribution input in accordance with the National Water Resources Plan.

### 2.3.5 Headroom and Peaking

44. Headroom is the safety margin which is applied to demand forecasts to allow for uncertainties. Based on UKWIR methodologies, the headroom allowance for the GDA is 8%.

<sup>9</sup> National Water Resources Plan 25-year strategy to meet Ireland's water requirements in the short, medium & long-term by ensuring a safe, secure, sustainable and reliable water supply for all of its customers. Spring 2021.

**Table 2.11: Headroom Allowances**

WRZ	Headroom Allowance	Comment
GDA	8%	Based on UKWIR methodology
Large zones (10–100Mld)	10%	Large urban centres not significantly different to GDA
Medium zones (1–10Mld)	15%	Mostly WRZs with small number of sources or lots of small sources leading to significant uncertainty

45. Peaking factors are derived for each of the four Weather Event Planning Scenarios to reflect the scale of the increase in total demand for each scenario<sup>10</sup>. The peaking factor for the GDA in the DYCP is 13% and is 20% for other Water Resource Zones.

**Table 2.12: Peaking Factors**

Size of WRZ	DYAA	Summer Planning Scenario (DYCP)	Winter Planning Scenario (WCP)
Small WRZ (up to 1Mld)	2%	20%	50%
Medium WRZ (up to 10Mld)	2%	20%	40%
Large WRZ (up to 100Mld)	2%	20%	30%
GDA (> 100Mld)	2%	13%	20%

<sup>10</sup> Peaking factors are applied to normal year total demand. For the DYAA and DYCP scenarios, the peaking factor is multiplied by the annual climate change factor and applied to total demand.

### 3 Supply Demand Balance

46. The forecast increase in domestic and non-domestic water demand combined with operational requirements, illegal connections, leakage, required headroom allowances and peaking results in an increase in the DYCP water demand for the GDA Water Resource Zone to 774Mld by 2050 as shown in Table 3.1.

Table 3.1: GDA WRZ Supply Demand Balance

	Supply Demand Balance Mld						
	2019	2025	2030	2035	2040	2044	2050
Demand:-							
Domestic	207	221	232	241	250	257	257
Non – Domestic	139	200	208	216	225	231	241
Water Taken Unbilled - Illegally	6	6	6	6	6	6	6
Operational Use	6	6	6	6	6	6	6
Leakage	215	165	122	122	122	122	122
Average Demand	572	598	574	591	609	623	633
NYAA WAFU	571	599	595	594	593	593	592
NYAA Demand	618	645	620	639	658	673	683
NYAA Deficit	-48	-47	-25	-45	-65	-80	-92
DYAA WAFU	516	539	533	532	530	529	528
DYAA Demand	630	658	633	653	673	689	700
DYAA Deficit	-114	-120	-100	-122	-144	-160	-172
DYCP WAFU	565	590	584	582	581	580	578
DYCP Demand	697	728	700	722	745	762	<b>774</b>
DYCP Deficit	-132	-139	-117	-141	-164	-183	<b>-197</b>
WCP WAFU	595	629	629	629	629	629	629
WCP Demand	742	775	744	766	789	807	820
WCP Deficit	-147	-146	-115	-137	-160	-178	-191

47. There is a need for 34% more water to be available to meet the needs of the GDA by 2050 than there is forecast to be available<sup>11</sup>. The need is based on the maximum or critical supply demand

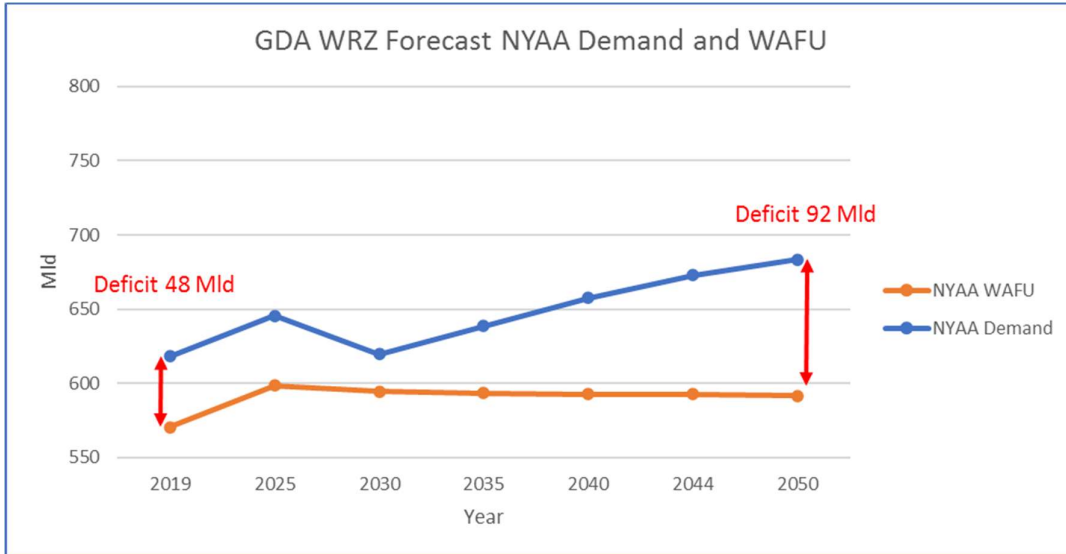
<sup>11</sup> Based on DYCP WAFU in 2050 Vs. DYCP demand in 2050.

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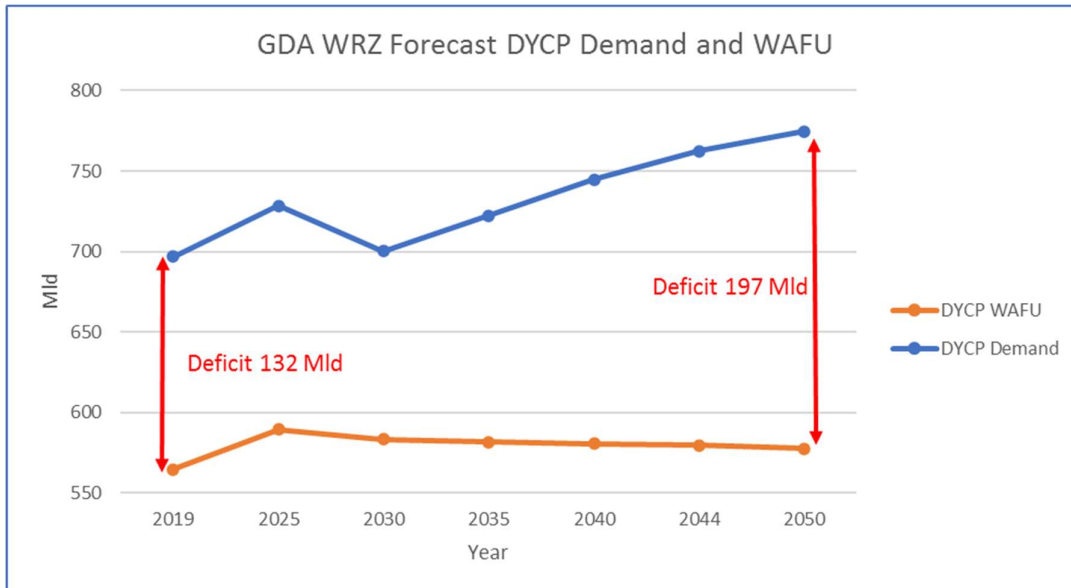
deficit (i.e., the DYCP scenario) to ensure there is adequate water for all weather planning scenarios and to deliver a 1 in 50 year LoS.

48. The deficits in the GDA in the NYAA and DYCP scenarios are shown graphically in Image 3.1 and 3.2 respectively.

**Image 3.1 GDA WRZ Forecast NYAA Demand and WAFU**



**Image 3.2 GDA WRZ Forecast DYCP Demand and WAFU**




49. With 578Mld of water available (DYCP) for the GDA Water Resource Zone projected for 2050, this results in a 197Mld water supply deficit in the GDA Water Resource Zone. There is also projected to be an 83Mld deficit (as calculated post-connection to the New Shannon Source) in the other 36

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WRZs<sup>12</sup> that will make up the Water Supply Area, in the same timeframe. By 2050, there will be a total DYCP deficit of 280Mld to be addressed as shown in Table 3.2.

**Table 3.2: Treated Water Requirement in the GDA & 36<sup>13</sup> other WRZs by 2050<sup>14</sup>**

Component - GDA	2020 (Mld*)		Component - GDA	2050 (Mld*)
Domestic Usage	209		Domestic Usage	257
Non-domestic Usage	142		Non-domestic Usage	241
Operational	6		Operational	6
Illegal Connections	6		Illegal Connections	6
Leakage	207		Leakage	122
Total Distribution Input	569		Total NYAA Demand	633
Headroom 8%				51
Peaking (DYCP)				91
Water Requirement for GDA (DYCP)				774
Water available for GDA (DYCP)				578
GDA Deficit (DYCP)				-197
Deficit in 36 <sup>15</sup> other WRZs (DYCP)				-83
Total Deficit (DYCP)				-280
(*Note: Rounding may apply)				

50. Table 3.3 presents the increasing supply requirement as connections are gradually made to the Proposed Project in the future. Years 2019, 2025 and 2030 in the table represent GDA WRZ deficit figures, with the Mullingar connection and deficits included in years 2035 and 2040 and all connections and deficits included in years 2044 and 2050.

<sup>12</sup> 37 Water Resource Zones were identified in the Regional Water Resource Plan - Eastern and Midlands consisting of the GDA WRZ and 36 other WRZs. Subsequently Barndarrig WRZ and Redcross WRZ have been rationalised and combined and so the total is now 36 Water Resource Zones consisting of the GDA WRZ and 35 other WRZs.

<sup>13</sup> 37 Water Resource Zones were identified in the Regional Water Resource Plan - Eastern and Midlands consisting of the GDA WRZ and 36 other WRZs. Subsequently Barndarrig WRZ and Redcross WRZ have been rationalised and combined and so the total is now 36 Water Resource Zones consisting of the GDA WRZ and 35 other WRZs.

<sup>14</sup> Supply Demand Balance based on adopted Regional Water Resources Plan – Eastern and Midlands Region projected to 2050.

<sup>15</sup> 37 Water Resource Zones were identified in the Regional Water Resource Plan - Eastern and Midlands consisting of the GDA WRZ and 36 other WRZs. Subsequently Barndarrig WRZ and Redcross WRZ have been rationalised and combined and so the total is now 36 Water Resource Zones consisting of the GDA WRZ and 35 other WRZs.

Table 3.3: Profile of Water Supply Required from the New Shannon Source

	Supply Demand Deficit Mld						
	2019	2025	2030	2035	2040	2044	2050
NYAA Deficit	-48	-47	-25	-74	-95	-142	-154
DYAA Deficit	-114	-120	-100	-152	-174	-232	-244
DYCP Deficit	-132	-139	-117	-176	-200	-266	-280
WCP Deficit	-147	-146	-115	-175	-199	-258	-271

51. The forecast deficit for the Water Supply Area at 2050 is 280Mld based on the critical supply demand balance deficit.
52. Regarding the composition of the Water Supply Area, Barndarrig WRZ and Redcross WRZ have subsequently been rationalised and combined. Therefore, there are 35 Water Resource Zones and the Greater Dublin Area, within the Water Supply Area that the Proposed Project is to meet the water supply requirement, a combined total of 36 Water Resource Zones. This does not affect the volume of water to be supplied.



## 4 Provision for reductions in existing supplies

53. The NWRP baseline Supply Demand Balance projections could not take account of some anticipated reductions in the amount of water that the Environmental Protection Agency (EPA) will permit to be abstracted from some existing sources for sustainability reasons under the incoming abstraction licensing regime.
54. It has been acknowledged in the NWRP, that a risk of reductions in volumes of water available from the current levels of abstraction from a number of existing sources is possible when they are licensed. It is known that this will occur but it is uncertain as to the extent of these reductions and therefore, the reduction is currently unquantifiable. Nevertheless, it is considered prudent that Uisce Éireann should make an allowance for sustainability reductions to existing sources when determining its maximum abstraction required from the Lower Shannon for the purposes of progressing the design and statutory consents for the Proposed Project.
55. It is not possible to determine a precise figure, (because the extent of any reductions in abstraction volumes as a result of the EPA licensing regime is not information that is currently known), and it is impossible to predict. Given that, provision must be made for this eventuality, Uisce Éireann considers that an allowance of an additional 20Mld to the forecast deficit of 280Mld at 2050 is appropriate on a prudent provision basis. This allowance of 20Mld is Uisce Éireann's best current estimate of what will be required to address these potential reductions to existing supplies.

## 5 Proposed Project Water Supply Requirement

56. On the basis of a current forecast supply demand balance deficit of 280Mld and an additional prudent provision of 20Mld for sustainability reductions in existing supplies the Proposed Project infrastructure shall be designed and developed on the basis of having the capacity to abstract and deliver 300Mld as set out in Table 5.1.

**Table 5.1.2: Total Volume of Water to be supplied by the Proposed Project<sup>16</sup>**

Demand	2050 Mld*
GDA	197
35 WRZs <sup>17</sup>	83
Provision for potential sustainability reductions from existing supply volumes due to future abstraction licensing	20
<b>Total Peak Volume of Water</b>	<b>300</b>

<sup>16</sup> Supply Demand Balance based on adopted Regional Water Resources Plan – Eastern and Midlands Region projected to 2050.

<sup>17</sup> 37 Water Resource Zones were identified in the Eastern and Midlands Plan consisting of the GDA WRZ and 36 other WRZs.

Subsequently Bardarrig WRZ and Redcross WRZ have been rationalised and combined and so the total is now 36 Water Resource Zones consisting of the GDA WRZ and 35 other WRZs.