Uisce Éireann
Irish Water

Report: May 2026

Galway Wastewater Strategy

Appendix 3 - Status and Performance of the Wastewater System

Tionscadal Éireann
Project Ireland
2040

6 CLEAN WATER AND SANITATION

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Status and Performance of the Wastewater System	
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V1.0	Apr 26	Andrew Harte	Uisce Éireann	For Public Consultation

TABLE OF CONTENTS

Executive Summary

This report presents a summary of key performance indicators related to flooding, environmental and wastewater treatment performance within existing assets within the wastewater system for each agglomeration present in the Galway Wastewater Strategy (GWS) study area (i.e. Galway City, Athenry, Claregalway and Moycullen). Different time horizons (Baseline, 2040, 2055 and 2080) have been assessed against specific performance indicators, where relevant.

Three sewerage network performance indicators are summarised below, with analysis and further performance details provided in Section 2.

- **Current Storm Water Overflow (SWO) Environmental Performance** – evaluation was undertaken according to the "Procedures and Criteria in relation to SWOs (PCRSWOs)[1]". The assessment focused on four criteria:
    1. Causes significant visual or aesthetic impact and public complaints
    2. Causes deterioration in water quality in the receiving water
    3. Gives rise to failure in meeting the requirements of national Regulations on foot of EU Directives (e.g. Bathing Waters, etc.)
    4. Operates in dry weather
- **Future Storm Water Overflow (SWO) Environmental Performance** – In addition to the above, an assessment has been undertaken against the future requirements of the recast Urban Wastewater Treatment Directive (rUWWTD), including the indicative non-binding objective set out in Annex V. This indicative objective sets out that a storm water overflow represents a small percentage that cannot be more than 2 % of the annual collected urban wastewater load calculated in dry weather conditions. The rUWWTD requires that Integrated Urban Wastewater Management Plans shall be developed by 2033 for all agglomerations with populations exceeding 100,000 PE (including Galway City) and that these shall include measures that aim at limiting pollution from storm water overflow to the indicative, non-binding objective by 2039. Similarly, but subject to a risk assessment in Article 5(2), the rUWWTD requires that Integrated Urban Wastewater Management Plans shall be developed by 2039 for all agglomerations between 10,000 and 100,000 PE and that these shall include measures that aim at limiting pollution from storm water overflow to the indicative, non-binding objective by 2045.
- **Flooding Performance** – evaluated using network models and rainfall design events.

Analysis of Wastewater Treatment Plant (WWTP) performance is provided in Section 3 and summarised with two performance indicators:

- **Wastewater Treatment Plant (WWTP) Hydraulic Headroom** – an assessment of the hydraulic performance of each WWTP.

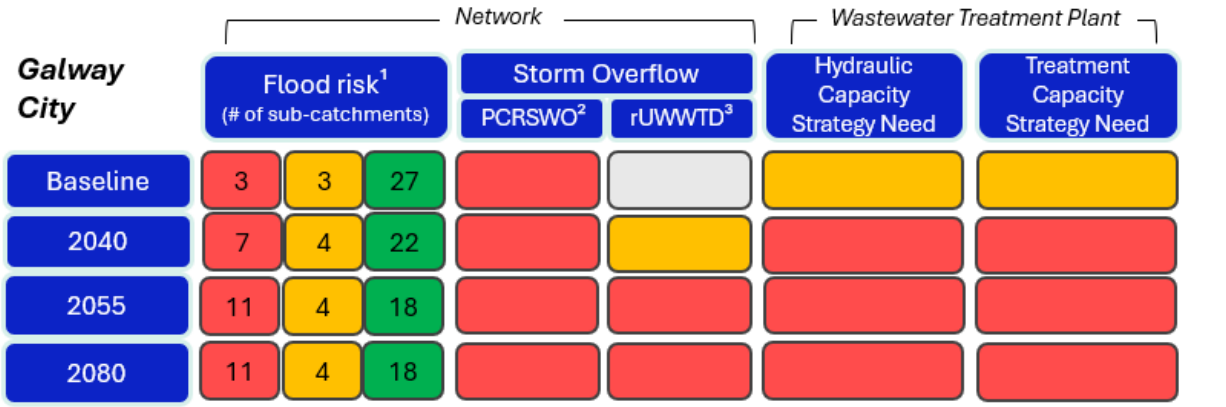
[1] https://www.epa.ie/publications/licensing--permitting/waste-water/procedures-and-criteria-in-relation-to-storm-water-overflows.php

- **Wastewater Treatment Plant (WWTP) Treatment Risks** – in combination with the hydraulic performance and water quality modelling (where applicable) an assessment on likely treatment risks and vulnerabilities is undertaken accompanied by some recommendations.

Performance Indicator summaries for each agglomeration are included in this section. For a deeper understanding of how the risks are informed and categorised please refer to section 2.3 in relation to the Procedures and Criteria in relation to SWOs (PCRSWOs), section 2.4 for future requirements with respect to the rUWWTD and section 2.6 for flood risk. Wastewater treatment is covered within section 3.

Performance indicators and detailed assessments of each wastewater treatment plant (WWTP) within the study area informed the identification of effective intervention strategies for improving both short-term and long-term operational performance. The evaluation included a comprehensive analysis of risk and vulnerability with respect to current regulations as well as projected regulatory changes. These findings are detailed throughout the report and are summarised in the graphics below.

Galway City Performance Indicators Summary



1. Red, Amber, Green corresponds to High, Medium and Low flood risk respectively. The number in the box denotes the number of subcatchments affected in the model.
2. This is an assessment against current SWO performance criteria (PCRSWOs)
3. This is a future assessment against the indicative non-binding objective within Annex 5 of the rUWWTD (2% Load Lost Objective)

Figure 0-1: Summary of the Key Performance Indicators for Galway City Agglomeration

Overall, Galway City presents significant risks which must be addressed as a priority. The agglomeration has several concerns related to network and treatment performance without any intervention:

Network Flood Risk: Flood risk from foul / combined sewer manholes has been evaluated. Galway City contains several subcatchments with medium (orange) to high (red) flood risk in the baseline model with risk in subcatchments increasing in the future. A subcatchment is a discrete drainage boundary that represents an area within a sewer network model. Flood risk categories are described further in section 2.6.

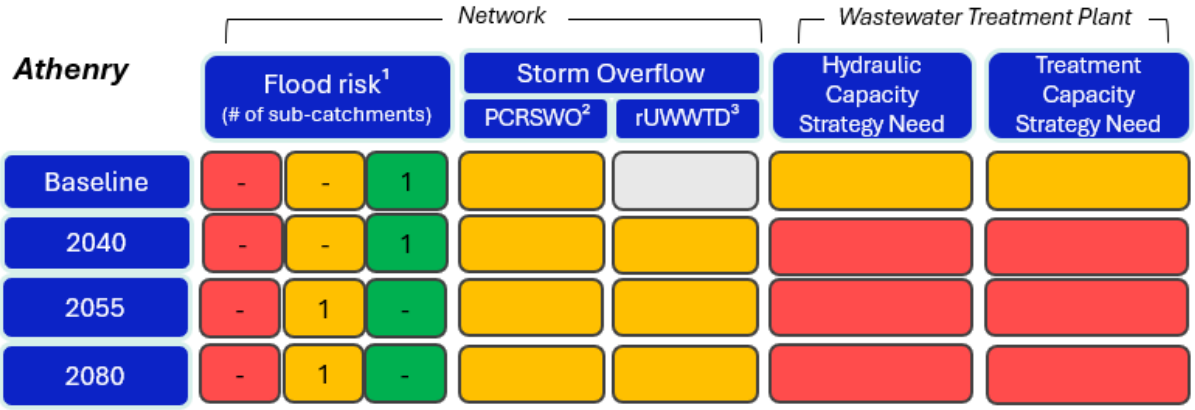
Network Environmental Risk: in relation to current environmental performance criteria, risks have been identified in relation to visual/aesthetic impact and an SWO operating in dry weather conditions requires further investigation. In future, there are risks related to non-conformance with the non-binding indicative target outlined in Annex V of the rUWWTD. Further details are explained within section 2.4.1.

WWTP Performance: Mutton Island WWTP, which serves the Galway City agglomeration, is currently operating within its designated capacity. However, without intervention and in line with estimated growth projections, Mutton Island WWTP may reach its current capacity by 2040. A detailed assessment of WWTP performance was conducted within section 3.2. Considering regulatory risk and resilience, and the physical expansion constraints of the current WWTP, it is not considered feasible for the plant to accommodate the forecasted growth of this Strategy in the medium to long term. Therefore, it is recommended that a new WWTP, that will treat a proportion of the existing Mutton Island WWTP load, is required in the medium term (c. 2040). In the short term and covering the intervening period before the new WWTP comes into operation, it is recommended that a resilience upgrade be implemented to ensure the plant meets its current discharge licence requirements and extends the design life of the wastewater treatment plant (WWTP) to support anticipated growth until a new WWTP is constructed. The diversion of load from this downsized Mutton Island WWTP to a new WWTP will be required to service the long-term growth demands of the study area and provide resilience to tightening regulatory standards at both WWTP locations.

Based on this risk analysis, the following recommendations were made for consideration within *Appendix 5: Our Approach to Optioneering and Feasible Option Development.*

Figure 0-2: Mutton Island WWTP Recommendations

Athenry Performance Indicators Summary



1. Red, Amber, Green corresponds to High, Medium and Low flood risk respectively. The number in the box denotes the number of subcatchments affected in the model.
2. This is an assessment against current SWO performance criteria (PCRSWOs)
3. This is a future assessment against the indicative non-binding objective within Annex 5 of the rUWWTD (2% Load Lost Objective)

Figure 0-3: Summary of the Key Performance Indicators for Athenry Agglomeration

Athenry catchment presents risks both in the baseline with risk increasing in future. The ability for treatment to increase in line with growth and ensure that the current receiving water body is protected presents a challenge:

Network Flood Risk: Athenry has low (green) but not negligible flood risk up to the 2055 horizon, where the risk increases without any strategic intervention.

Network Environmental Risk: in relation to current environmental performance criteria, there is an increasing risk from intermittent discharges to water quality in line with agglomeration growth. Modelling demonstrated that intermittent discharges are not at risk of causing ecological harm to the River Clarin, based on Fundamental Intermittent Standards (FIS), however, the UPM High Polluting Standards (which aren't legal targets in Ireland) suggest that the intermittent discharges may potentially have an ecological impact on the receiving watercourse. For this reason, the network is given medium risk status in relation to intermittent discharges. In relation to non-conformance with the non-binding objective outlined in Annex V of the rUWWTD the agglomeration is a risk.

WWTP Performance: In its current configuration, Athenry WWTP has a treatment capability up to 9,500PE as specified in the Annual Environmental Report. If housing development accelerates over the next 15 years at the rate specified in the RSES, the facility's capacity may be exceeded by 2030 unless capital investment is undertaken. This may result in the plant's inability to meet its discharge licence requirement, without intervention, therefore highlighting its deteriorating risk status at the 2040 horizon. There is limited dilution available in the River Clarin and water quality modelling indicates significant constraints in assimilative capacity. The downstream reach from the WWTP is "poor" WFD status and sits within a karst region, giving rise to significant concern about ongoing treatment at the site. Furthermore, water quality modelling indicates that treatment standards for the WWTP in future, to accommodate future design capacity, would not be viable using existing known technologies. The load from Athenry should be transferred to a new WWTP around the 2040 design horizon.

Based on this risk analysis, the following recommendations were made for consideration within *Appendix 5: Our Approach to Optioneering and Feasible Option Development:*

Figure 0-4: Athenry WWTP Recommendations

Claregalway Performance Indicators Summary

	Network					Wastewater Treatment Plant	
Claregalway	Flood risk[1] (# of sub-catchments)			Storm Overflow		Hydraulic Capacity Strategy Need	Treatment Capacity Strategy Need
				PCRSWO[2]	rUWWTD[3]		
Baseline	-	-	1	N/A	N/A		
2040	-	-	1	N/A	N/A		
2055	-	-	1	N/A	N/A		
2080	-	-	1	N/A	N/A		

1. Red, Amber, Green corresponds to High, Medium and Low flood risk respectively. The number in the box denotes the number of subcatchments affected in the model.
2. This is an assessment against current SWO performance criteria (PCRSWOs)
3. This is a future assessment against the indicative non-binding objective within Annex 5 of the rUWWTD (2% Load Lost Objective)

Figure 0-5: Summary of the Key Performance Indicators for Claregalway Agglomeration

Network Flood Risk: Claregalway has low (green) but not negligible flood risk which does not increase in line with catchment growth.

Network Environmental Risk: there are no SWOs within this agglomeration therefore there is no current or future risks.

WWTP Performance: The network is a foul only system and the WWTP has the potential to expand to meet future growth and regulatory requirements growth requirements. From the 2055 horizon a capacity increase need was identified. The current and future estimated licence conditions are readily achievable with known current technologies. Currently the plant would benefit from having more biological load being received for treatment, in a balanced fashion, to allow the biological process to operate more efficiently.

Based on this risk analysis, the following recommendations were made for consideration within *Appendix 5: Our Approach to Optioneering and Feasible Option Development:*

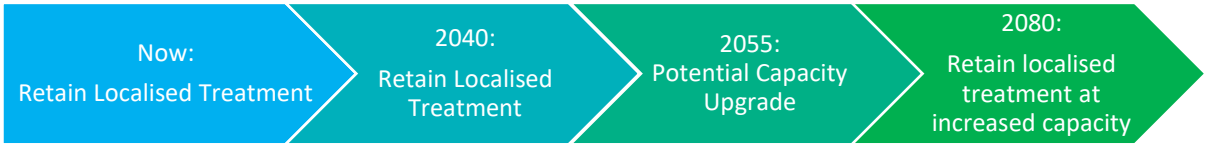


Figure 0-6: Claregalway WWTP Recommendations

Moycullen Performance Indicators Summary

Moycullen	Network: Flood risk[1] (# of sub-catchments)	Network: Storm Overflow PCRSWO[2]	Network: Storm Overflow rUWWTD[3]	Wastewater Treatment Plant: Hydraulic Capacity Strategy Need	Wastewater Treatment Plant: Treatment Capacity Strategy Need
Baseline	- - 1		N/A		
2040	- - 1		N/A		
2055	- - 1		N/A		
2080	- - 1		N/A		

1. Red, Amber, Green corresponds to High, Medium and Low flood risk respectively. The number in the box denotes the number of subcatchments affected in the model.
2. This is an assessment against current SWO performance criteria (PCRSWOs)
3. This is a future assessment against the indicative non-binding objective within Annex 5 of the rUWWTD (2% Load Lost Objective)

Figure 0-7: Summary of the Key Performance Indicators for Moycullen Agglomeration

Network Flood Risk: Moycullen has low (green) but not negligible flood risk which does not increase in line with catchment growth.

Network Environmental Risk: there is one SWO within this agglomeration at the WWTP. Sewer network modelling[2] demonstrates that the SWO discharges may require aesthetic screening, however, the frequency and volume of discharges can be considered negligible. There have also been no verified complaints in this area therefore it has been classified as low risk. For assessment under the rUWWTD, the assessment is currently classified as green as it is below 10,000 PE[3].

WWTP Performance: Although the assessment for Moycullen shows no immediate strategic needs identified for the WWTP, there are exceedances for ammonia that should be investigated at an appraisal level. To compliment this appraisal, a better understanding of treatment flows is required to accurately determine if there are any immediate needs and should be subject to further modelling. For purposes of the Strategy, any needs that could arise from this detailed assessment are likely to require base maintenance upgrades and are not detrimental to Strategy outcomes and recommendations.

[2] Further modelling is recommended in Moycullen

[3] Subject to Article 18 risk assessment.

Based on this risk analysis, the following recommendations were made for consideration within *Appendix 5: Our Approach to Optioneering and Feasible Option Development:*

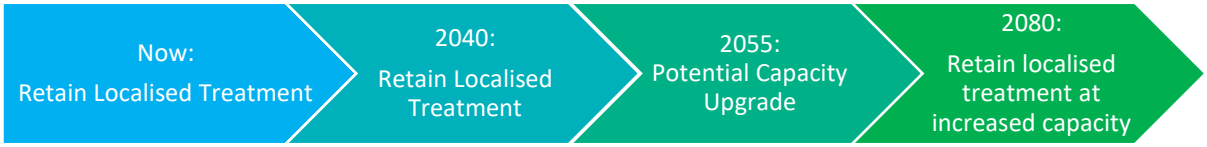


Figure 0-8: Moycullen WWTP Recommendations

The needs outlined in this report contribute to the optioneering process and screening of the TOTEX Hierarchy outlined in *Appendix 5: Our Approach to Optioneering and Feasible Option Development*, by guiding the identification of interventions that effectively address the underlying causes of risk in each agglomeration, thereby supporting informed decision-making throughout the optioneering process.

1. Purpose of this Report

The Galway Wastewater Strategy (GWS) study area comprises of four Uisce Éireann (UÉ) wastewater agglomerations: Galway City (consisting of Galway, Oranmore and Bearna), Athenry, Claregalway and Moycullen.

Figure 1-1: GWS Study Area

Clarinbridge, Craughwell, Furbough, Kilcolgan are settlements outside of the study boundary not serviced by UÉ WWTPs or networks. As discussed in *Appendix 1: Managing Growth*, only their organic load has been considered as part of the strategy in terms of projecting overall organic capacity up to 2080.

The purpose of this report is to summarise certain risk characteristics (performance indicators) of the existing assets within the wastewater system for each agglomeration present in the Galway Wastewater Strategy (GWS) study area.

Analysis of historical WWTP asset data and network model outputs are presented to establish current system performance and highlight risks associated with the wastewater system in the study area to inform Strategy development. The sewerage networks, their model representation and drainage system types present within each agglomeration within the study area are also discussed.

Three sewerage network performance indicators are presented:

- **Current Storm Water Overflow (SWO) Environmental Performance** – evaluation was undertaken according to the "Procedures and Criteria in relation to SWOs (PCRSWOs)[4]". The assessment focused on four criteria:
    1. Causes significant visual or aesthetic impact and public complaints
    2. Causes deterioration in water quality in the receiving water
    3. Gives rise to failure in meeting the requirements of national Regulations on foot of EU Directives (e.g. Bathing Waters, etc.)
    4. Operates in dry weather
- **Future Storm Water Overflow (SWO) Environmental Performance** – In addition to the above, an assessment has been undertaken against the future requirements of the recast Urban Wastewater Treatment Directive (rUWWTD), including the indicative non-binding objective set out in Annex V. This indicative objective sets out that a storm water overflow represents a small percentage that cannot be more than 2 % of the annual collected urban wastewater load calculated in dry weather conditions. The rUWWTD requires that Integrated Urban Wastewater Management Plans are established for all agglomeration of 100,000 PE and above by 2039 (including Galway City) and for agglomerations between 10,000 PE and 100,000 PE where storm water overflows or urban runoff pose a risk to the environment or public health. In those plans, measures should be set in place that aim at limiting pollution from storm water overflows to the future indicative, non-binding objective by 2039 for all agglomerations exceeding 100,000 PE and by 2045 for agglomerations between 10,000 and 100,000 PE (subject to risk assessment in Article 5(2)d).
- **Flooding Performance** – evaluated using network models and rainfall design events.

Analysis of Wastewater Treatment Plant (WWTP) performance is presented:

- **Wastewater Treatment Plant (WWTP) Hydraulic Headroom** – an assessment of the hydraulic performance of each WWTP.
- **Wastewater Treatment Plant (WWTP) Treatment Risks** – in combination with the hydraulic performance and water quality modelling (where applicable) an assessment on likely treatment risks and vulnerabilities is undertaken accompanied by some recommendations.

Finally, a summary is presented in Section 4 which summarises Performance Indicators for each agglomeration within the GWS study area on the overall status and performance of the wastewater system using a traffic light system. These were used in tandem and to inform subsequent phases of the GWS modelling and optioneering processes.

The needs outlined in this report contribute to the optioneering process and screening of the TOTEX Hierarchy (see *Appendix 5: Our Approach to Optioneering and Feasible Option Development*)

[4] https://www.epa.ie/publications/licensing--permitting/waste-water/procedures-and-criteria-in-relation-to-storm-water-overflows.php

by guiding the identification of interventions that effectively address the underlying causes of risk in each agglomeration, thereby supporting informed decision-making throughout the optioneering process.

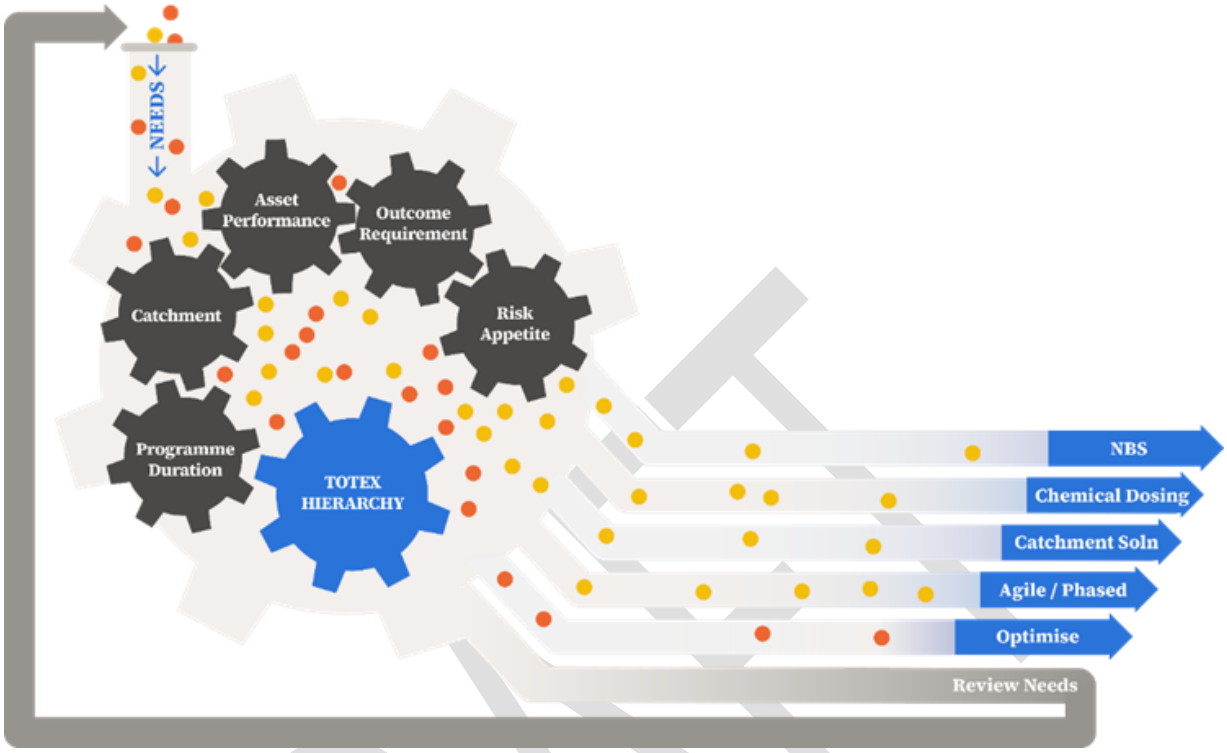


Figure 1-2: Effective Intervention Identification Engine

2. Sewerage Networks Performance

2.1 Overview of Sewerage Networks

For analysis, the agglomerations were sub-divided into 35 subcatchments (shown in Figure 2-1 and tabulated in Annex 1 – List of Subcatchments within Study Area). A subcatchment is a discrete drainage boundary that represents an area within a sewer network. These sewerage networks collect and convey foul sewage from domestic, commercial and industrial sources to four wastewater treatment plants (WWTPs). Urban runoff is captured together with foul sewage in combined sewer systems throughout the agglomerations, as well as in distinct separate sewer networks. Infiltration and ingress originating from groundwater and/or precipitation are essential components influencing the flow dynamics within some of these networks.

These four agglomerations comprise over 50 wastewater pumping stations (WWPSs) in ownership of UÉ. There are 29 storm water overflows (SWOs) across the four agglomerations, 26 of these are present within the Galway City (Mutton Island) agglomeration. These SWOs act as relief points (safety valves) during heavy rainfall to protect homes and businesses from flooding and overloading of downstream sewerage systems.

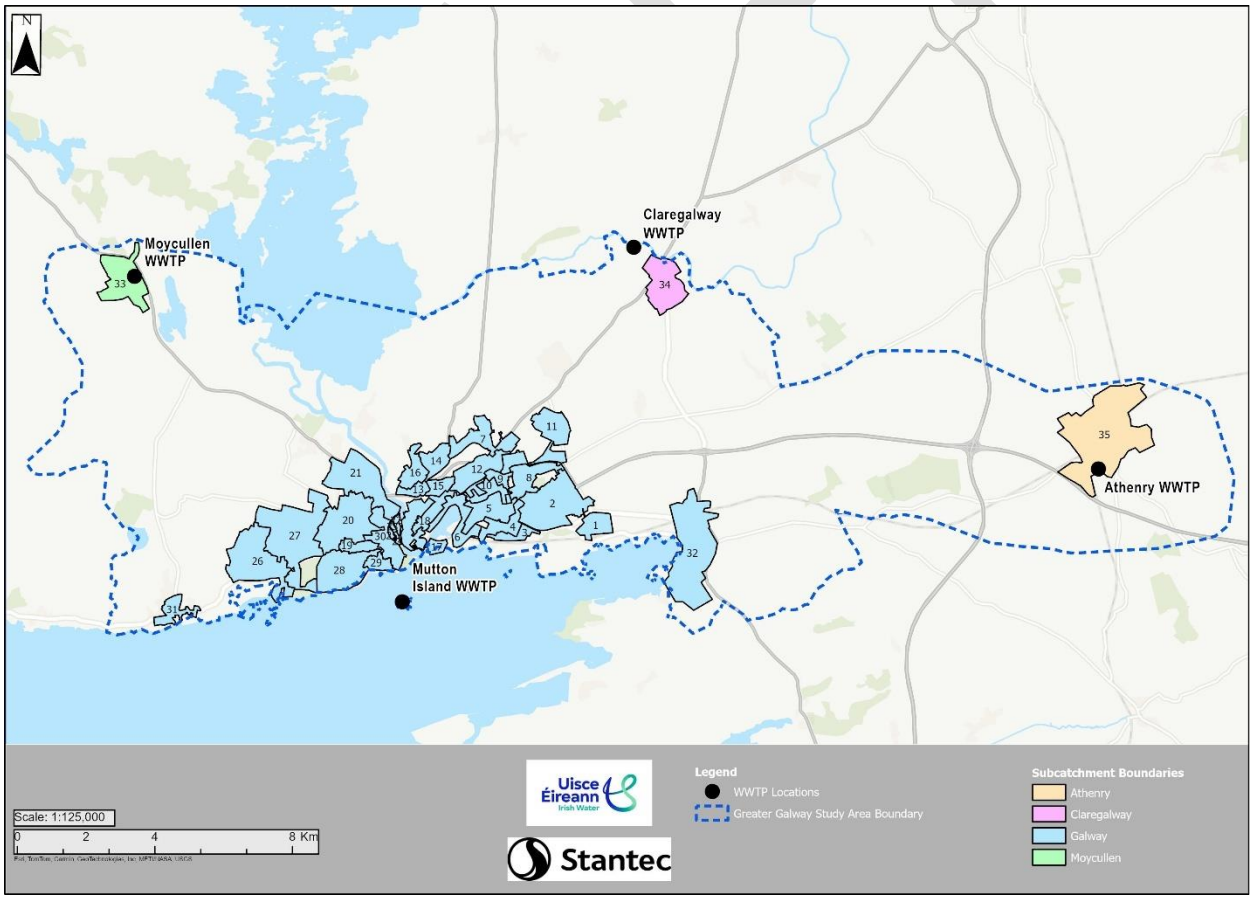


Figure 2-1: Subcatchments in the Agglomerations of the GWS Study Area

2.1.1. Drainage System Types

A comprehensive understanding of drainage system types is essential for assessing system responses and determining appropriate, effective interventions that promote resilient performance throughout GWS planning horizons ensuring that future investment delivers both operational efficiency and environmental protection. Figure 2-2 shows the different system types within the GWS study area.

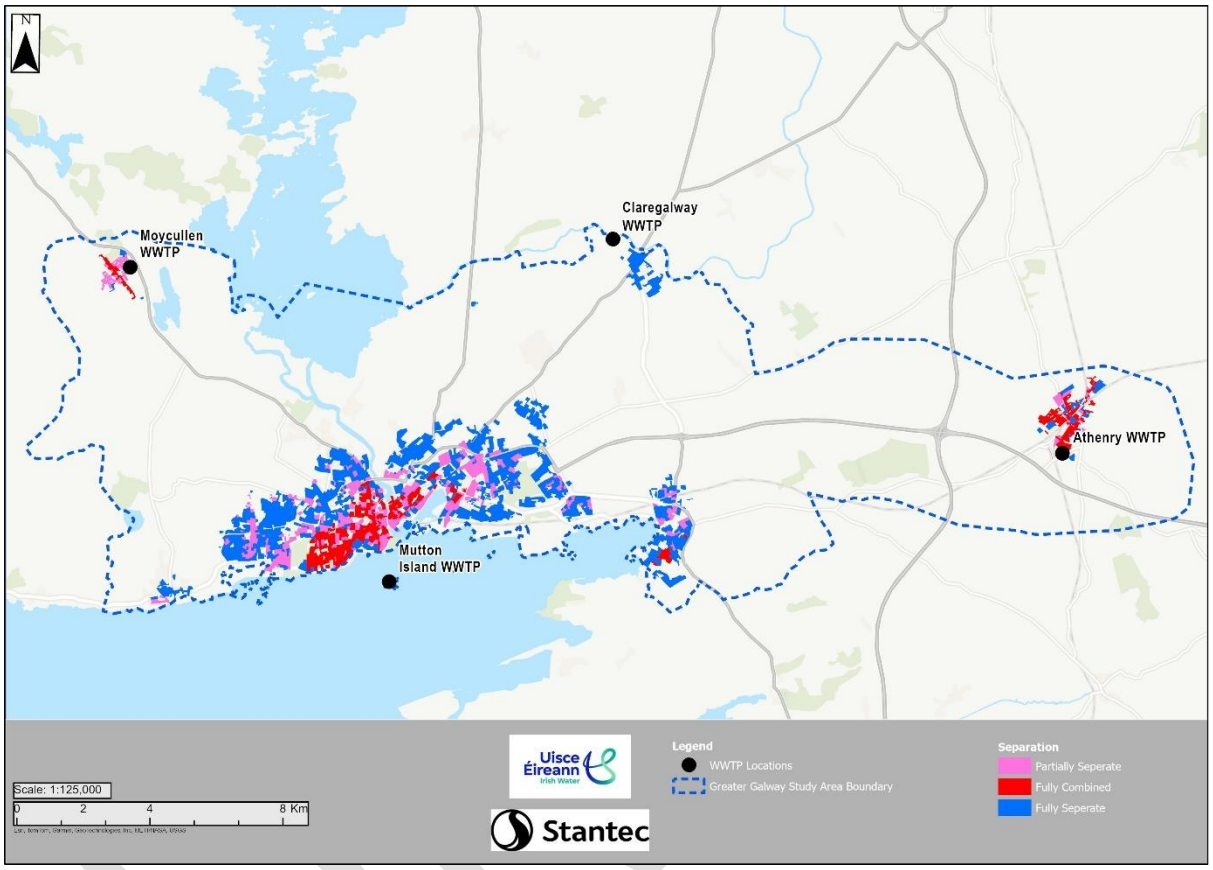


Figure 2-2: Drainage System Types in the GWS Study Area

- **Combined Sewer Systems and Storm Water Overflows**

  In older and central parts of Galway City and some adjacent areas, combined sewers collect and convey domestic, commercial and industrial wastewater with urban surface water runoff. This is typical in large historic cities. Sometimes, during heavy rainfall events, the combined flow may exceed the capacity of the sewer, triggering SWO discharges to protect the network from excessive surcharging and to prevent flooding. While combined systems minimise the number of assets to maintain, they place significant hydraulic stress on downstream assets and the wastewater treatment plant. They also have the potential to impact on the environment and/or public health.

- **Separate Foul and Urban Surface Water Runoff Networks**

  More modern residential, commercial and industrial areas (including much of Bearna, Oranmore's suburbs and recently developed housing developments) use separate systems. Foul sewage is carried to the wastewater treatment plant independently of urban runoff, which

discharges to the local watercourses or can be managed by Sustainable Urban Drainage Systems (SuDS). This arrangement greatly reduces peak flows arriving at WWTPs and may reduce SWO discharges on the downstream network but requires careful design and maintenance of two parallel networks. This method of constructing sewers has been commonplace in much of Europe in recent times.

However, it is also common that a small proportion of surface water urban runoff may be cross connected to the foul / combined system during construction or as a result of subsequent modifications to properties (for example, home improvements, extensions, garden sheds and hardscaping activities). This is known as "urban creep". This can, over time, cumulatively increase the volume of urban surface water runoff entering wastewater systems when considering all these local modifications at the agglomeration scale.

In some instances, there may not be the provision of a separate public surface water urban runoff system for a development to connect to when it is constructed. At a development level, there would be separate surface water systems, but they are connected to the public foul / combined system at the edge of the developments entrance, for example. These types of connections, as described later for the GWS study area in section 2.1.4, create good opportunity to remove large areas of urban runoff from entering the wastewater system as part of future improvement schemes.

Many foul networks have a WWPS to transfer foul flows to the downstream gravity network, these often have emergency overflows (EOs) and emergency storage within the sewer network to prevent properties from flooding in the event of an operational failure. There are several WWPS across Galway City which have EOs.

- **Partially Separated Systems**

  In some areas, networks are designed to have partial separation, for example some of the hardstanding areas, typically the rear of residential properties and roof areas are designed to drain to the foul system alongside the foul waste from these properties. This means the rear of these properties are acting as combined sewers. At the front of these properties, the hardstanding and roof areas, potentially alongside localised road surface runoff may drain to the surface water system. These systems still benefit from reduced hydraulic loading compared to fully combined sewers but still convey an element of surface inflow and infiltration which can continue to compromise capacity.

- **Sustainable Urban Drainage Systems (SuDS)**

  A key green infrastructure solution to surface-water management, SuDS are integrated at source to replicate natural drainage processes. These control, store and gradually release surface water into the ground or designated drains, alleviating pressure on receiving sewers (surface/foul/combined) and mitigating flood risk. The strategic retrofit of SuDS within combined and partially separated sub-catchments offers a high-value, low-regret intervention to reduce SWO impact and enhance water quality. Additionally, on re-development schemes, SuDS can be used to reduce inflows into the foul and combined sewers to mitigate flood risk or SWO impacts associated with development. Opportunities for partnership working, in

conjunction with Local Authorities, are required to manage these aspects to reduce the impact from storm water overflows.

Based on the hydraulic model, 17% of the GWS study area have fully combined sewers, 23% are partially separate and 60% are separate foul and urban surface water runoff systems. The impermeable area contributing to fully combined and partially separate catchments will be a factor into the performance of SWOs within the agglomerations. Claregalway is the only agglomeration within the study area designed with a fully modern separate sewer system.

2.1.2. Growth & Climate Change

As outlined in *Appendix 1*, a review of future growth in the agglomerations has been considered and represented in the modelling to consider the impact on future capacity and performance of the urban drainage systems. An overview of this domestic and non-domestic projected growth is summarised in Figure 2-3. This highlights the major proportion of growth in the Eastern areas of the GWS (82%). Appendix 1 can be referenced for the detailed analysis undertaken for the GWS.

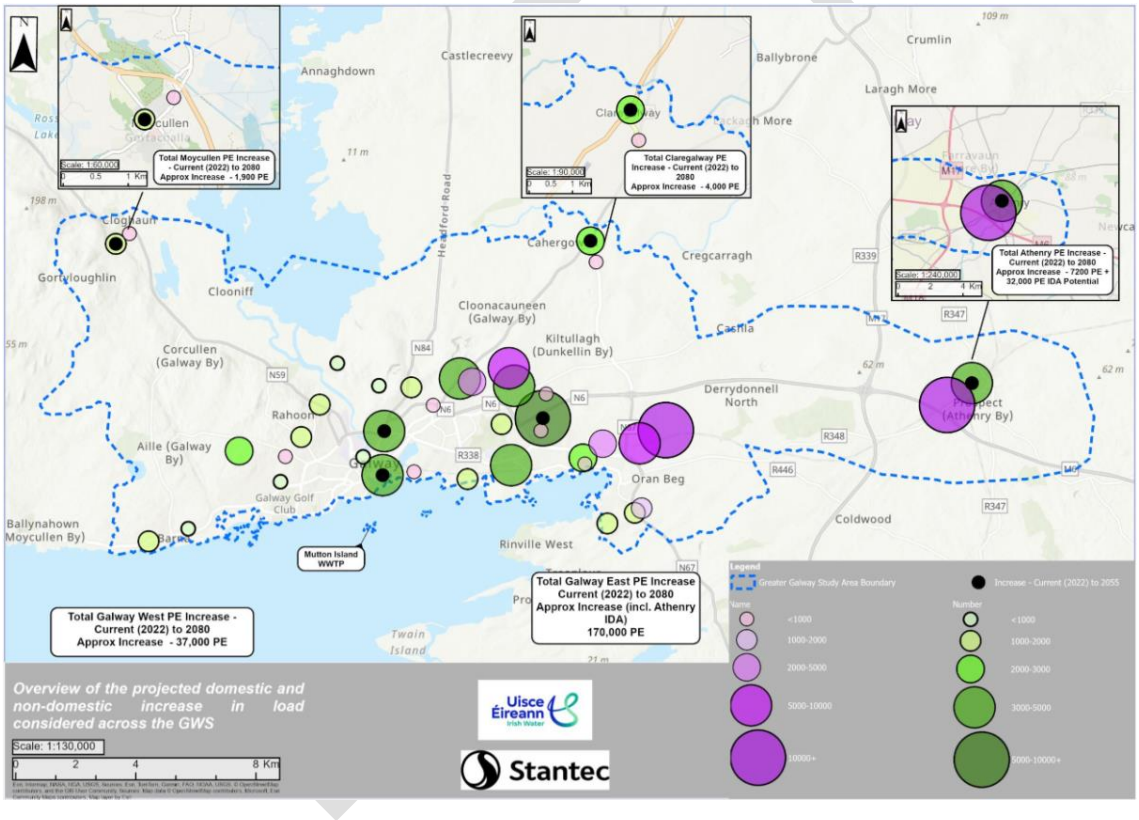


Figure 2-3: Overview of the projected domestic and non-domestic increase in load considered across the GWS

An allowance for changes to rainfall intensities has been made in line with *Appendix 2: Our Approach to Modelling and Climate Change.* For design events an uplift of 20% is applied for 2055 and 25% is applied for 2080. The time series rainfall used to assess environmental performance represents both the current as well as a future scenario to account for climate change based on the RCP8.5 projected emission scenario to represent the latest understanding of potential changes in climate.

2.1.3. Impermeable Area

As outlined in Section 2.1.1, different system types drain various surfaces in urban drainage networks. An analysis was undertaken to understand the proportion of impermeable areas draining into the combined sewer and partially separate networks that are treated by the WWTP in that agglomeration. Figure 2-4 shows a summary of this for the model subcatchments in the study area. Subcatchments where greater than 20% of total area drains to the subcatchment as impermeable area are shown on the map. The figure highlights the high proportion of impermeable runoff draining to the wastewater network in the highly urbanized areas in the centre of Galway City; in addition, there are also areas within Athenry and Moycullen which also have a high proportion of impermeable runoff contribution to the wastewater system. This results in large peak flows in the combined and partially separate sewer networks during wet weather.

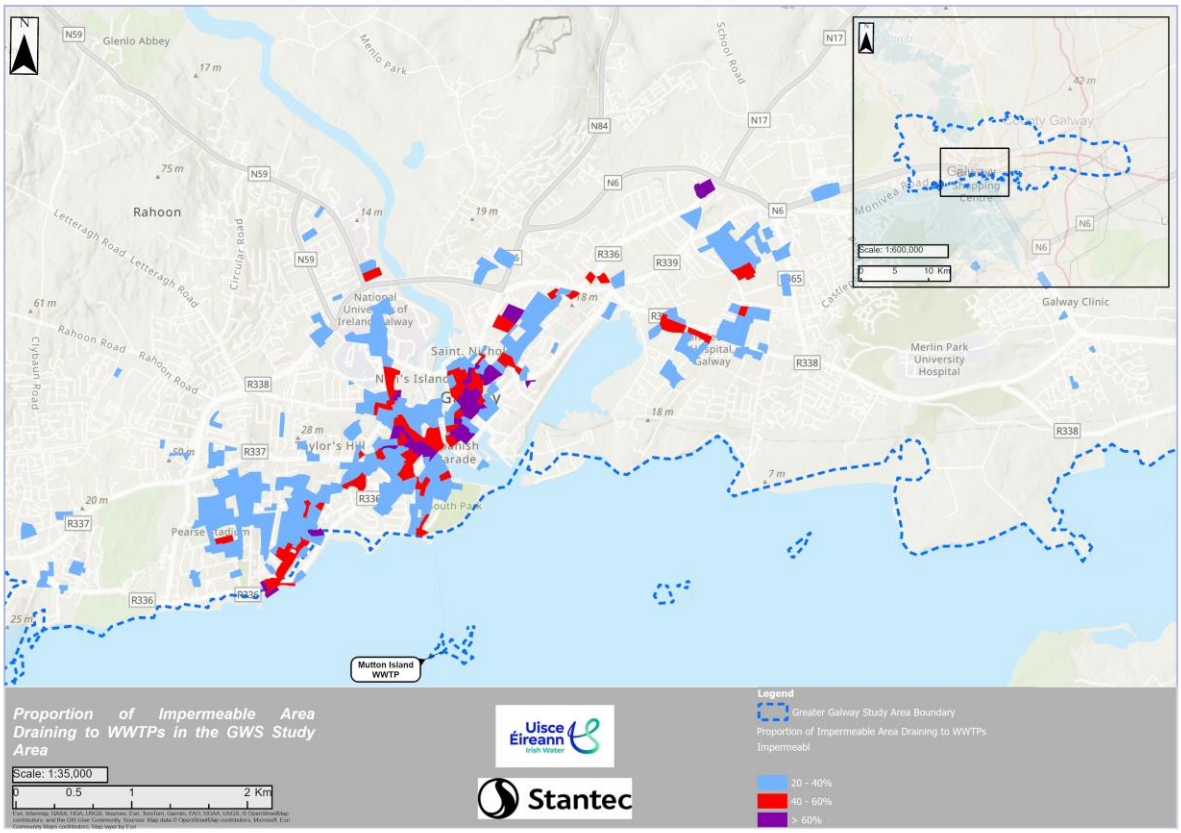


Figure 2-4: Proportion of Impermeable Area Draining to Mutton Island in the GWS Study Area

2.1.4. Surface Water Sewers Connected to the Wastewater Network

Impermeable area and associated urban runoff can drain into foul and combined sewers via surface water urban runoff cross-connections. In heavy rainfall events, this reduces the capacity of these sewers. This may be due to the unavailability of a surface water sewer to connect to at the time of development. An analysis was undertaken to understand the areas where cross-connections may be present across the agglomerations based on network monitoring in that agglomeration (Figure 2-5). Approximately 10 hectares of road and roof runoff drain to these cross-connections, with around 9 hectares in Galway City and 1 hectare in Athenry. These should

be considered as part of the TOTEX Hierarchy Interventions within the optioneering process as they represent significant contributors to unwanted water within the sewerage network.

Figure 2-5 highlights the point locations where a surface water pipe connects to a foul or combined manhole (red / orange dots). These locations could be targeted and prioritised for survey investigations to confirm connectivity and opportunity for disconnection when developing interventions for the strategy.

The 'red' dots are locations where a surface water sewer is connected to a manhole within the model and there is impermeable area modelled upstream of that connection. The 'orange' locations denote having no impermeable area applied upstream, but a cross-connection is present in the model. The 'red locations have impermeable area response upstream of the cross-connection. Several areas have greater than 0.5 Ha of impermeable area runoff applied (shaded purple in the image) and therefore these could be a 'quick win' to be considered when developing interventions for the Strategy as they display the highest potential to reduce rainfall induced flows in the network.

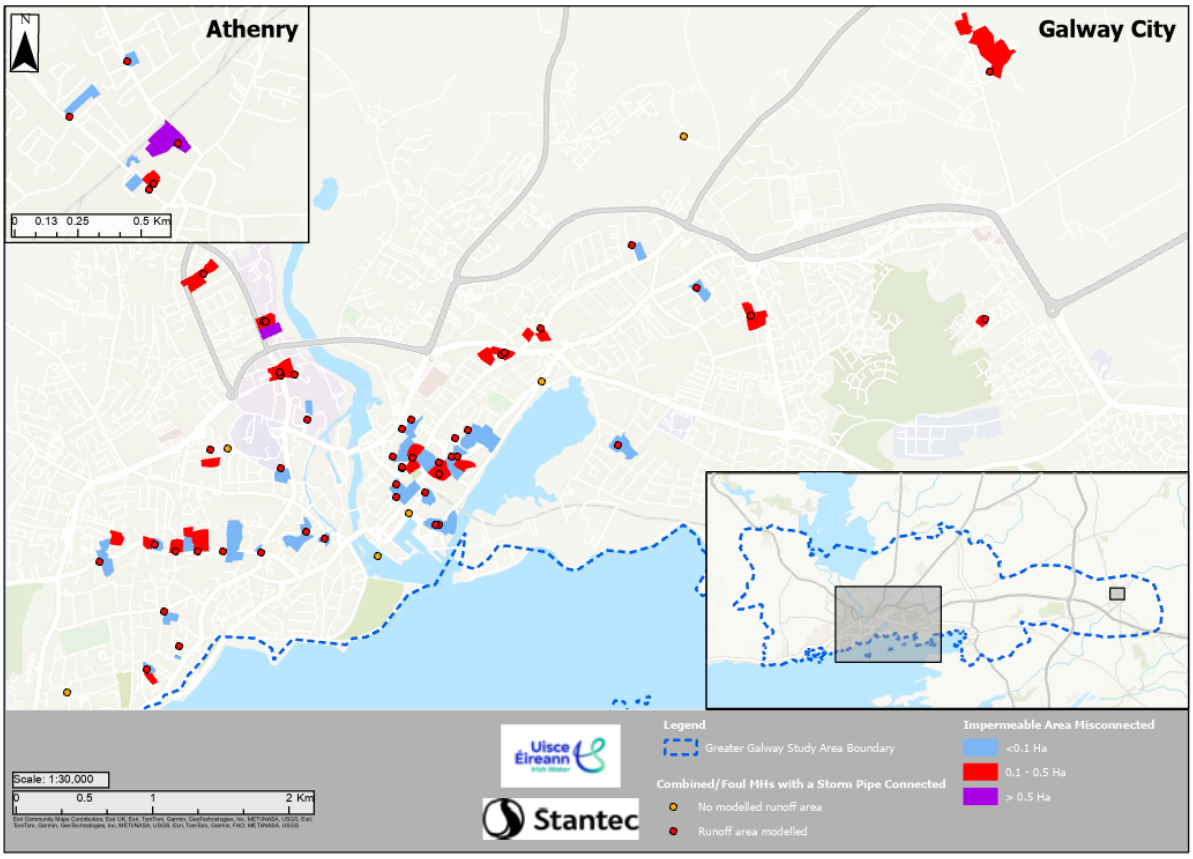
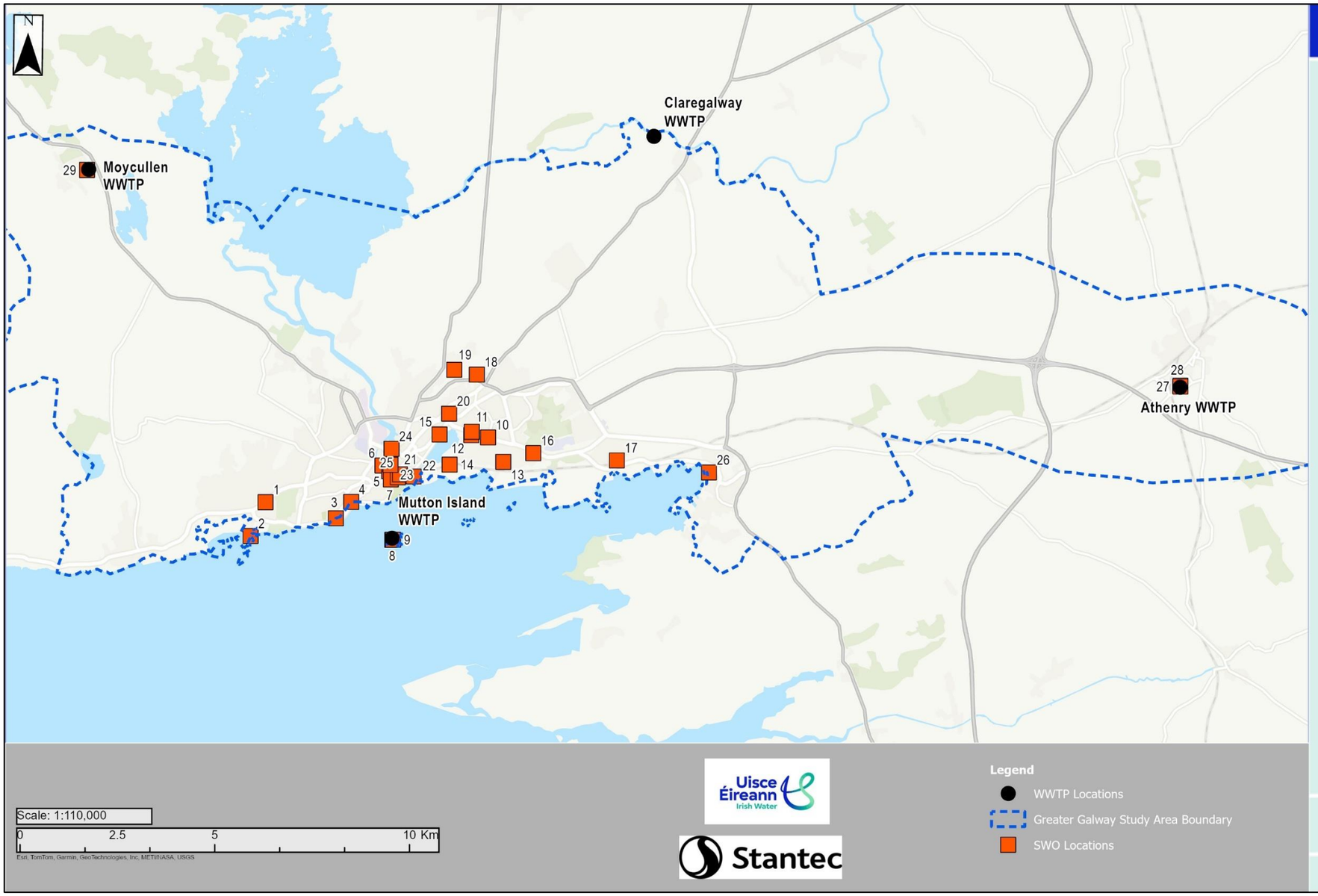


Figure 2-5: Surface Water Sewers draining to foul / combined manholes and associated impermeable area connected.

2.1.5. Overview of SWOs

There are 29 SWOs in the GWS study area, primarily located on combined sewers in Galway City as shown in Figure 2-6.



Agglomeration	No.	Overflow Name
Galway	1	Kingston Road SWO
	2	Gentian Hill PS SWO
	3	Salthill SWO
	4	Grattan Road SWO
	5	Dominick Street PS SWO
	6	Parkavera PS SWO
	7	Claddagh Quay SWO
	8	Mutton Island WWTP SWO
	9	Mutton Island Outfall (>FFT SWO)
	10	Michael Collins SWO
	11	Dublin Road SWO
	12	Renmore Park SWO
	13	Beach Avenue SWO
	14	Mellow Park SWO
	15	Lough Atalia SWO
	16	Merlin Park 1 PS SWO
	17	Merlin Park 2 PS SWO
	18	Glen Burren PS SWO
	19	Terryland River Valley PS SWO
	20	Moneenageisha SWO
	21	Dock Street SWO
	22	Harbour Enterprise Park PS SWO
	23	Bridge Street SWO
	24	Newtownsmith SWO
	25	Long Walk SWO
	26	Oranmore PS SWO
Athenry	27	Athenry Storm Tank SWO
	28	Athenry FA SWO
Moycullen	29	Moycullen Storm Tank SWO

Figure 2-6: Location of SWOs in the GWS Study Area[5]

[5] Dock Street SWO represents a cross-connection as opposed to an SWO. This area of the network is currently being investigated to verify the connectivity and to update the model to understand its discharge characteristics.

2.2 SWO Environmental Performance: Strategic Context

2.2.1. Current Environmental Performance - PCRSWO

The Procedures and Criteria in Relation to Storm Water Overflows (PCRSWOs) has been used to assess the ***current*** environmental performance of the sewerage network. In assessing the performance of an existing SWOs the criteria and approach identified in Table 2-1 was used.

Table 2-1: PCRSWO Assessment Criteria and Approach

Criteria	Approach
Causes significant visual or aesthetic impact and public complaints	Any verified complaints and/or incidents that have been attributed to the activation of the SWO in terms of visual or environmental impact (pollution incident).
Causes deterioration in water quality in the receiving water	The detailed requirements for this are addressed in *Appendix 4: Impact on Water Quality* and summarised in 2.3.1.
Gives rise to failure in meeting the requirements of national Regulations on foot of EU Directives (Bathing Waters, etc.)	Using a 10-year time series of rainfall, modelled performance of agglomerations was used to assess annual average significant (>50m^3) SWO discharges against the following discharge frequency triggers: • **Bathing Waters**: ≤3 discharges per bathing season on average. • **Shellfish Waters**: ≤10 discharges per annum on average. • **Recreational Waters:** ≤7 discharges per bathing season on average. There are no Shellfish Waters in proximity of the Study Area so therefore this requirement has not been assessed. Furthermore, as there is no agreed framework for the designation of recreational waters in Ireland currently, this requirement has also not been assessed.
Operates in dry weather	Evidence of SWO operation in dry weather from modelled or operational data.

2.2.2. Future Environmental Performance – rUWWTD

A key ***future*** legislative requirement is in relation to Annex V of the rUWWTD. Referencing the legal text specified in Annex V, there are objectives for the reduction of pollution from storm water overflows, including the following:

(a) an indicative non-binding objective that storm water overflow represents a small

percentage that cannot be more than 2 % of the annual collected urban wastewater load calculated in dry weather conditions.

(b) the progressive reduction of macroplastics.

For purposes of forecasting future risk as part of the GWS, an assessment has been made against the indicative non-binding objective that SWO represents no more than 2% of the annual collected urban wastewater load as a performance indicator. Given that the calculation of the SWO load indicator is subject to an rUWWTD Implementing Act under Article 5, (deadline of 2nd January 2028) this is likely to provide further detail on the directive's requirements. An assessment considered appropriate for the purposes of this Strategy was using the determinand BOD_5[6] to determine the risk associated for this performance indicator. An agreed approach for the progressive reduction of macroplastics in SWOs will be required by authorities with urban drainage management responsibilities (including Uisce Éireann) to support the future development of Integrated Urban Wastewater Management Plans.

By 31 December 2033, Ireland is required to establish an IUWWMP for agglomerations of 100,000 PE and above (including Galway City). Objectives of an IUWWMP include for an assessment against the indicative, non-binding objective. For agglomerations with populations between 10,000 and 100,000 PE (which includes Athenry with future growth requirements), a risk assessment must be conducted to determine whether an IUWWMP is required, these are outlined in Article 5, paragraph 2. Claregalway and Moycullen, both below the 10,000 PE threshold, are not subject to these provisions but may require an IUWWMP as an appropriate measure subject to the risk assessment required under Article 18, which will be undertaken at a national level in accordance with the timeline requirements of the rUWWTD (initially by 31st December 2027 and every 6 years thereafter).

Future reviews of this Strategy will need to consider the following known upcoming significant developments in the area of wastewater networks:

- **rUWWTD Implementing Acts**

  There are 3nr. Implementing Acts associated with Article 5, Integrated Urban Wastewater Management Plans. The acts relate to indicators of storm water overflow performance, the measures required in the plans and the format of the plans. These implementing acts are due to come into force by 2 January 2028.

- **Replacement of PCRSWO**

  As set out in the Water Action Plan for Ireland (ref. action UWW 9), following the rUWWTD the Department of Housing, Local Government and Heritage (DHLGH) are the lead organisation to update the criteria for the performance of storm water overflows and replace the Department of the Environment document: Procedures and Criteria in relation to Storm Water Overflows (PCRSWO). Quarter 2 2028 is the timeline for this action.

[6] BOD_5 – "Biochemical Oxygen Demand over 5 days," a measure of the oxygen consumed by microorganisms to decompose organic matter in water, typically expressed in mg/l. It is also used as a measure of equivalence for Population Equivalent (PE).

2.3 Current PCRSWOs: Results

2.3.1. Causes significant visual or aesthetic impact and public complaints

Table 2-2 indicates that four SWOs are currently causing visual or aesthetic impacts and subject to public complaints. A red icon denotes it is currently subject to complaints and aesthetic impacts whereas a green icon denotes that it is not.

Table 2-2: SWOs subject to visual or aesthetic impact and public complaints within Study Area

Agglomeration	SWO	Baseline
Galway City	Harbour Enterprise Park PS SWO	🟢
	Mutton Island Inlet SWO	🟢
	Mutton Island FFT SWO	🟢
	Dominick Street PS v	🟢
	Renmore Park SWO	🟢
	Oranmore PS SWO	🔴
	Terryland River Valley PS SWO	🟢
	Merlin Park PS 2 SWO	🟢
	Beach Avenue SWO	🟢
	Merlin Park 1 PS SWO	🟢
	Michael Collins SWO	🟢
	Glen Burren PS SWO	🟢
	Dublin Road SWO	🟢
	Lough Atalia SWO	🟢
	Mellow Park SWO	🟢
	Bridge Street SWO	🟢
	Dock Street SWO	🟢
	Long Walk SWO	🔴
	Newtownsmith SWO	🟢
	Moneenageisha SWO	🔴
	Gentian Hill PS SWO	🟢
	Kingston Road SWO	🟢
	Grattan Road SWO	🟢
	Claddagh Quay SWO	🔴
	Parkavera PS SWO	🟢
	Salthill SWO	🟢
Athenry	Athenry Storm Tank SWO	🟢
	Athenry FA SWO	🟢
Moycullen	Moycullen Storm Tank SWO	🟢

2.3.2. Causes deterioration in water quality in the receiving water

Appendix 4: *Impact on Water Quality* assesses the potential impact of wastewater discharges on water quality within the study area's receiving waters and can be referenced for additional information. A summary of specifically the SWO performance is presented here.

The analysis considers existing wastewater treatment infrastructure, projected population growth, and climate change scenarios to evaluate compliance with the Water Framework Directive (WFD), and Urban Pollution Management (UPM) Fundamental Intermittent Standards (FIS) and High Percentile Standards (HPS) standards (Note: HPS are not a legal target in Ireland but form part of the risk assessment). This analysis is summarised in Table 2-3.

Table 2-3: Summary of Impact to Water Quality in the Receiving Water

Agglomeration	Receiving Water Body	Assessment of Intermittent Impact
Moycullen[7]	Ballycuirke Canal	●
Claregalway	River Clare	●
Athenry	River Clarin	●

2.3.3. Failure to meet requirements of National Directives

There are four designated bathing waters within the study area and these are illustrated in Figure 2-7. The Bathing Waters with excellent water quality results are denoted in blue and those with good water quality are denoted in green. Only the bathing water - Grattan Road Beach - is currently not meeting "Excellent" status. All SWOs in proximity of these bathing waters are meeting the less than 3 spills per bathing season on average requirement. Therefore, the risk associated with this performance indicator is low.

[7] Further modelling work is recommended in Moycullen. Please see Appendix 4 for further details.

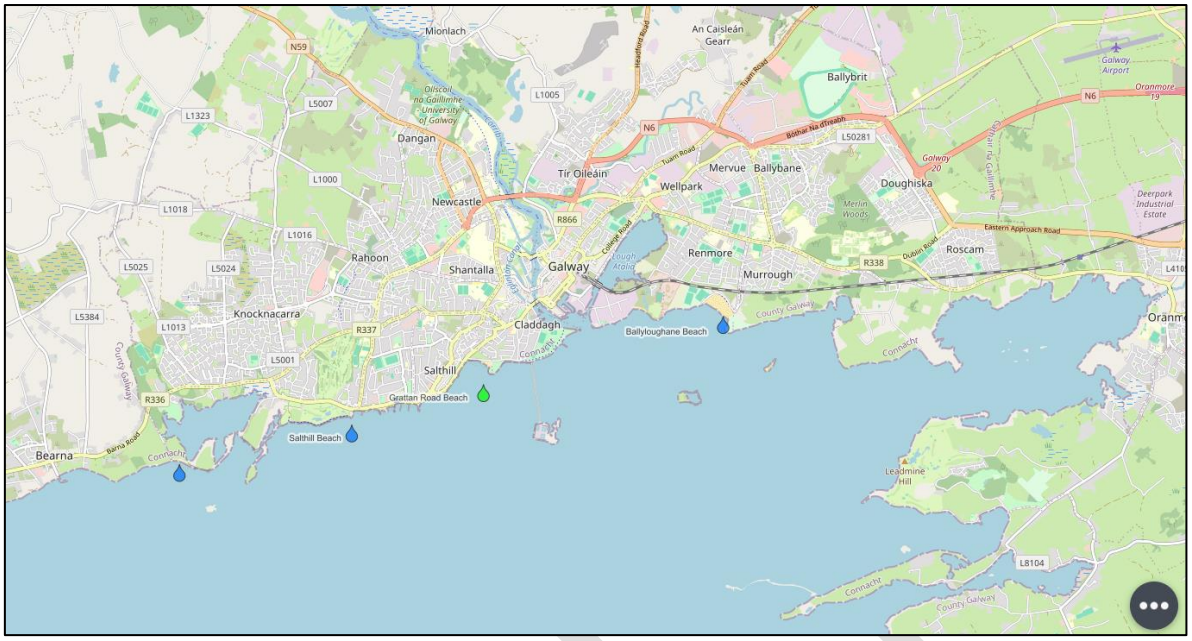


Figure 2-7: Bathing Waters and Status within Study Area[8]

2.3.4. SWOs Operating in Dry Weather

Table 2-4 summarises the SWO which has current recent evidence of discharge to the environment during dry weather. The operation of Renmore Park SWO during DWF is based on recent observed monitoring data which were not available at the time of the Drainage Area Plan.

The observed data at Renmore Park SWO indicate periodic short duration discharges during peak dry weather flow. This may be as a result of build-up of sediment / blockages in the continuation pipe related to an operational issue rather than a hydraulic capacity issue. This is currently undergoing further investigation and verification and for precautionary purposes is designated as high risk for Strategy development.

There are no additional SWOs anticipated to operate in dry weather conditions for the future design horizon with additional growth factors when modelled in the current sewer network model.

Table 2-4: SWO operating in dry weather (based on recent operational monitoring)

SWO Name	SWOs Operating in Dry Weather	Notes
Renmore Park SWO	●	Periodic operation

[8] https://gis.epa.ie/EPAMaps/ (accessed Jan 2026)

2.4 Future rUWWTD Performance: Results

2.4.1. Annex V Indicative Non – Binding Objective

An assessment has been undertaken against the future requirements of the recast Urban Wastewater Treatment Directive (rUWWTD) for the indicative non-binding objective set out in Annex V. This indicative objective sets out that a storm water overflow represents a small percentage that cannot be more than 2 % of the annual collected urban wastewater load calculated in dry weather conditions. The rUWWTD requires that Integrated Urban Wastewater Management Plans shall be developed by 2033 for all agglomerations with populations exceeding 100,000 PE (including Galway City) and that these shall include measures that aim at limiting pollution from storm water overflow to the indicative, non-binding objective by 2039. Similarly, but subject to a risk assessment in Article 5(2), the rUWWTD requires that Integrated Urban Wastewater Management Plans shall be developed by 2039 for all agglomerations between 10,000 and 100,000 PE and that these shall include measures that aim at limiting pollution from storm water overflow to the indicative, non-binding objective by 2045.

The assessment for the the indicative non-binding objective was not applied to the Baseline epoch.

Risk has been categorised in Table 2-5 for Strategy purposes to align with other metrics used for performance indicators within the Strategy. This analytical approach is being explored by Uisce Éireann in further detail in a parallel project to the Strategy and will conclude its assessment in 2027.

Table 2-5: SWO Discharge Banding

rUWWTD Indicative Non-Binding Objective "Load Lost" Bandings
<2%
2% - 5%
>5%

Table 2-6 shows the results of this assessment against the indicative non-binding objective at an agglomeration level. Both agglomerations have been given an amber score at the 2040 horizon as the assessment has indicated that the load lost is between 2% and 5%. As the growth in Galway City is due to increase, this risk has been increased beyond the 2040 horizon.

For Galway City, a "hybrid" assessment was undertaken. This means that modelled estimates of discharge volumes within the network were used alongside monitoring data to estimate the load lost. For Athenry, a modelled approach was undertaken.

Athenry contains only two SWOs, which have been represented collectively for clarity, as both are associated with a single asset – the WWTP.

Table 2-6: rUWWTD Performance Indicator assessment at agglomeration level

Agglomeration Name	% Load Lost Risk Banding[9]		
	2040[10]	2055	2080
Galway City	🟡	🟠	🟠
Athenry[11]	🟡	🟡	🟡

[9] An SWO BOD_5 Event Mean Concentration (EMC) of 120 mg/L was conservatively used for this risk assessment. This has been applied to the discharge volume across a 10-year time-series rainfall model simulation. SWO discharge concentrations are highly variable and catchment specific. The annual collected load for Galway City has been calculated based on monitoring and sampling data at the WWTP inlet. A mean BOD_5 concentration of 167mg/l and 200 mg/l has been used for Galway City and Athenry respectively to represent catchment characteristics. For both agglomerations, the Q80 measured flow (an estimate of dry weather flow) has been used for the annual collected load.

[10] Assessment of load lost for both agglomerations is of lower confidence and may be subject to Implementing Acts, therefore subject to revision.

[11] While a conservative methodology was applied to the annual collected load in Athenry, model simulations indicate that the estimated load lost continues to present a risk.

2.5 Environmental Performance Indicator Summaries

2.5.1. Current Environmental Performance Summary

Table 2-7 summarises the analysis of the current environmental performance indicators for each agglomeration within the GWS.

Table 2-7: Summary of the Current Environmental Performance Indicators

Agglomeration	PRCSWOs				Overall P&C	Rationale
	Aesthetic	WQ Impact	National Directives	Operation in DWF		
Galway City (Mutton Island)	🟡	-	🟢	🟠	🟠	Overall, Galway City has been classified as an agglomeration requiring priority investigation regarding current network performance. Needs have been identified regarding aesthetic issues and a risk associated with an SWO operating in DWF conditions. However, this SWO requires investigation as to the root cause of this operation as it is based on recent operational data.
Athenry	🟢	🟡	-	🟢	🟡	Athenry is classified as a medium-risk catchment regarding network performance. Water quality modelling indicates that under UPM High polluting Standards (which aren't legal targets in Ireland) that there may be a potential for ecological impact on the receiving watercourse at high percentile analysis. For this reason, the network is given an amber status.
Moycullen	🟢	🟢	-	🟢	🟢	Moycullen is classified as a low-risk catchment regarding network performance[12].
Claregalway	-	-	-	-	🟢	Claregalway is a fully modern separate sewerage system and therefore does not have any SWOs and any associated risks.

[12] As detailed in Appendix 2, there is low confidence provided for the Moycullen agglomeration as no sewer network monitoring was available to assess the distribution of urban runoff in the sewer network which reduces confidence in model predictions for environmental and flood risks.

2.5.2. Future Environmental Performance Summary

Table 2-8 summarises the analysis of the future potential environmental performance indicators for each agglomeration within the GWS, relative to non-binding objective outlined in Annex V of the rUWWTD.

Table 2-8: Summary of the Future Environmental Performance Indicators under rUWWTD

Agglomeration	Epoch	Non-Binding Load Indicator	Rationale
Galway City (Mutton Island)	Baseline	-	In Galway, there are future risks related to non-conformance with the non-binding objective outlined in Annex V of the rUWWTD.
	2040	🟡	
	2055	🟠	
	2080	🟠	
Athenry	Baseline	-	In Athenry, there are future risks related to non-conformance with the non-binding objective outlined in Annex V of the rUWWTD.
	2040	🟡	
	2055	🟡	
	2080	🟡	
Moycullen	Baseline	-	The non-binding objective outlined in Annex V of the rUWWTD is not applicable to Moycullen based on PE, however, a risk assessment under Article 18 may be required.
	2040	-	
	2055	-	
	2080	-	
Claregalway	Baseline	-	The non-binding objective outlined in Annex V of the rUWWTD is not applicable to Claregalway as there are no SWOs in this agglomeration.
	2040	-	
	2055	-	
	2080	-	

2.6 Flood Risk

Another fundamental ambition for network performance of the GWS is to reduce flood risk. Flood risk has been assessed using the baseline model and the 2055 and 2080 growth models. The 2055 model uses a rainfall climate change uplift factor of 20%, and the 2080 model results use an uplift factor of 25%. Flood risk has been assessed using the 1 in 20yr return period events. The analysis reports hydraulic flooding predicted in the sewer network models and does not consider other flooding causes, such as equipment failure.

Figure 2-8 demonstrates the change in flood risk between baseline, 2055 and 2080 design horizons[13]. These results show a close correlation between reported flooding from operational (Maximo) data collected in the Galway City DAP and model predicted flood risk which is predominantly in the urban areas of the Galway City agglomeration Table 2-9.

A tidal sensitivity assessment has identified Salthill, Grattan Road, and Oranmore as tide-sensitive subcatchments in the current hydraulic model. Significant efforts to reduce infiltration have occurred since the model's verification, therefore, recent interventions may not be reflected in its latest version, which may reduce the risk within these locations.

Table 2-9: Sub-Catchments with reported flooding

Sub-Catchment	Reported Flooding Location
3. Murrough	Seagrove. Fuscia WWPS Rising Main Discharge
5. Renmore	Oranmore WWPS Rising Main Discharge
6. Lough Atalia	Lough Atalia WWPS
12. Riverside & Tuam Road	Riverside Estate
14. Ballinfoile & Headford Road	Ballinfoile Park
17. City Centre	Quay Street (Basement) Cross Street (Basement) Eglington Street (Basement)
18. Dual Lines	Western Hotel (Basement)
19. Taylors Hill	Taylors Hill
20. Westside	Bothan le Cheile
26. Western Knocknacarra	Bearna Road Gentian Hill WWPS Kingston Road SWO
28. Salthill	Claude's Casino (Basement) Salthill Road Lower (Basement)
31. Bearna	Bearna WWPS

[13] Subcatchment areas with less than 200m3 of flood volume in the foul / combined sewers have been determined as low risk. Medium risk has been assigned where the total flood volume is over 200m^3 and the average flood volume is greater than 25m3. High risk has been classified based on a total flood volume of over 500m3 and an average predicted flood volume over 50m3.

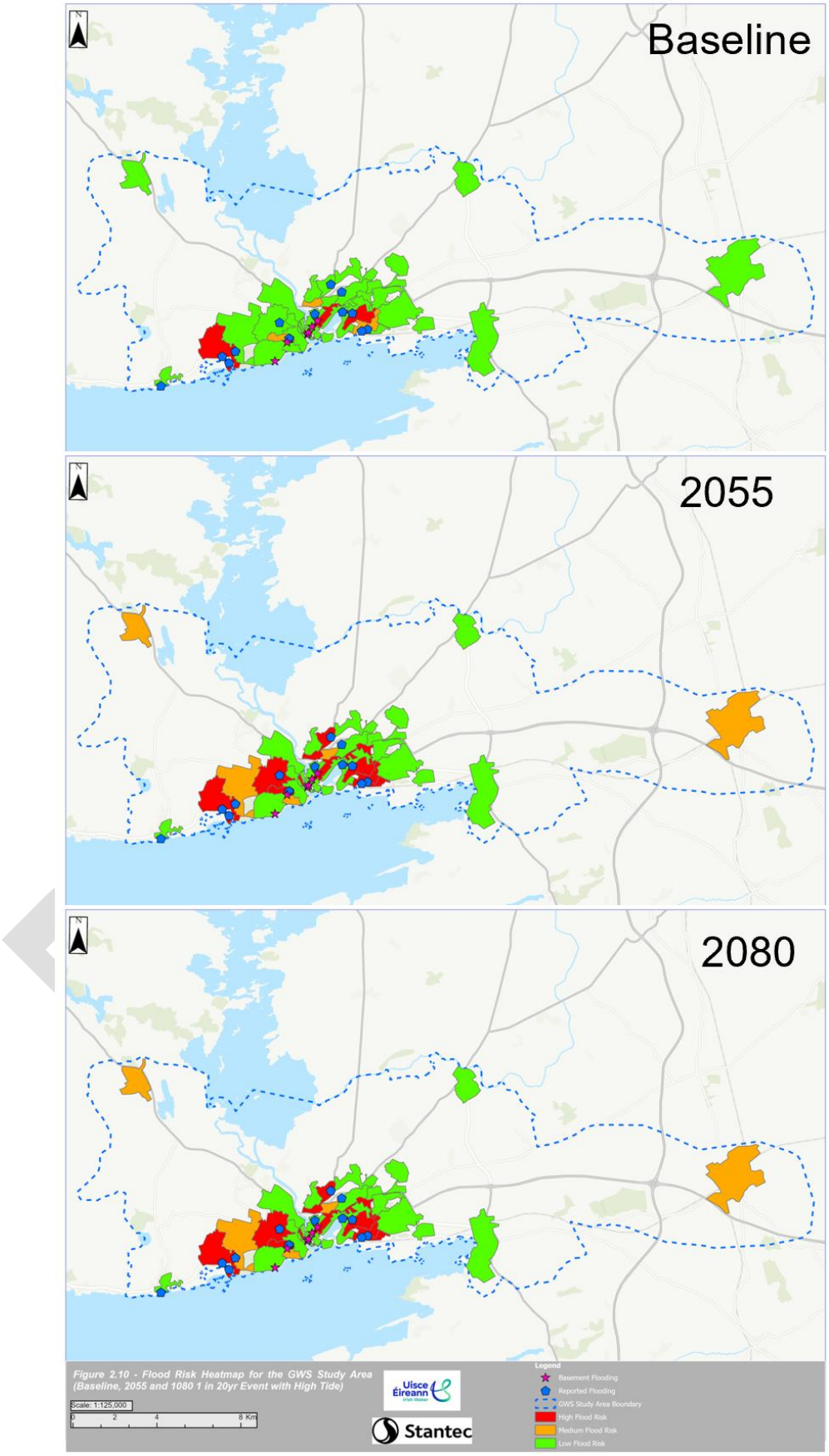


Figure 2-8: Flood Risk Heatmap for the GWS Study Area (Baseline, 2055 and 2080 1 in 20yr Event)

3. Wastewater Treatment Plants Performance

3.1 Overview of Wastewater Treatment Plants (WWTPs)

There are four Uisce Éireann WWTPs in the GWS study area: Mutton Island, Athenry, Moycullen and Claregalway.

Figure 3-1 provides a location overview of the existing WWTPs within the study area.

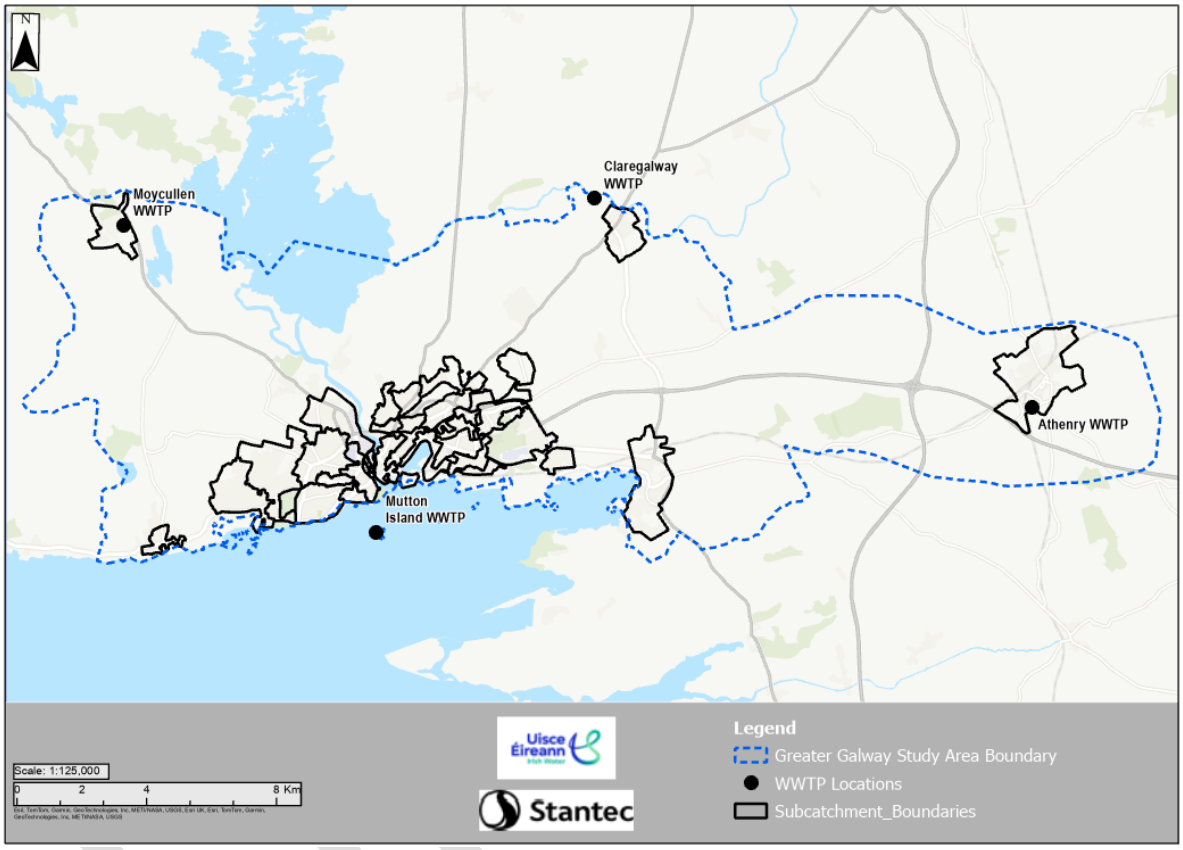


Figure 3-1: Overview of WWTP Locations and Agglomeration areas in the GWS Study Area

Figure 3-2 shows the coastal, transitional and river waterbodies and their WFD classification. This is based on the 2019 – 2024 river basin planning cycle.

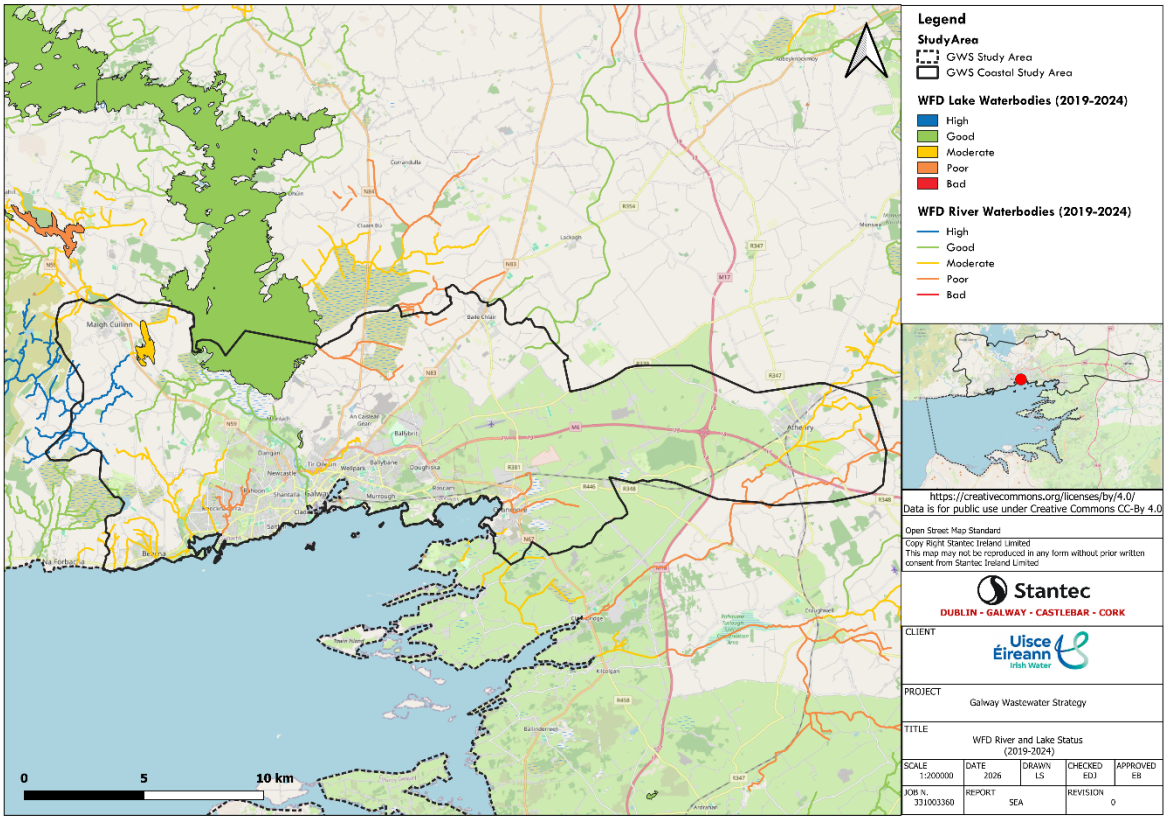


Figure 3-2: Overview of EU WFD Classification for Rivers, Lakes and Coastal Waterbodies and Protected Areas in the GWS Study Area

Table 3-1 provides a summary of the design organic and hydraulic capacities for the four agglomerations and their respective Emission Limit Values (ELVs). Table 3-2 shows estimated potential ELVs (pELVs) from *Appendix 4: Impact on Water Quality* for purposes of Strategy planning.

Table 3-1: Design organic and hydraulic capacities and ELVs

Site/Parameter[14]	Mutton Island WWTP	Athenry WWTP	Claregalway WWTP	Moycullen WWTP
Design PE Capacity	170,000	9,500	6,000	4,000
Design FFT (m^3/d)	135,000	6,413	3,600	2,160
Design DWF (m^3/d)	45,000	2,138	1,200	720
BOD Licence (mg/l)	25	6	25	10
COD Licence (mg/l)	125	125	125	125
SS Licence (mg/l)	35	35	35	35
Total Ammonia-N Licence (mg/l)	25	0.4	10	1
TON Licence (mg/l)	20	-	-	-
Total N Licence (mg/l)	35	-	-	-
Ortho – P (as P) (mg/l)[15]	-	0.2	9	0.5

Table 3-2: Modelled estimated ELVs at 2080 Horizon (based on modelling in Appendix 4)

Site/Parameter[16]	Mutton Island WWTP[17]	Athenry WWTP	Claregalway WWTP[18]	Moycullen WWTP[19]
BOD Licence (mg/l)	25	4	25	26
Total Ammonia-N Licence (mg/l)	-	<0.1	10	1,1
Total P Licence (mg/l)	0.5	-	-	-
Total N Licence (mg/l)	8	-	-	-
Ortho – P (as P) (mg/l)	-	<0.1	9	1.1

[14] All values taken from Annual Environmental Reports using WWDL ELV Schedule A values for effluent treatment standards.

[15] Ortho-phosphate standards only applied to surface water discharges. There is no Total Phosphorus standard at the Mutton Island WWTP.

[16] The existing ELVs for COD and Suspended Solids are assumed to be consistent at the 2080 horizon.

[17] rUWWTD Annex I, Table 1 and 2, were assumed for Mutton Island.

[18] Modelling demonstrated no tightening of the standard so existing ELV is assumed.

[19] The modelling undertaken at Moycullen requires refinement as it is sensitive to multiple parameters to determine estimated ELVs.

3.2 Mutton Island WWTP

3.2.1. Site Description

Mutton Island WWTP serves Galway City and is Ireland's third-largest wastewater agglomeration, surrounding areas such as Oranmore and Bearna are treated at this facility. The WWTP is located on Mutton Island, approximately 900 meters off the southern coast of Galway City. The site is accessed by a manmade causeway and spans an area of 2.29 hectares. The WWTP is surrounded by a protective wave wall and rock armouring, with a security gate in place. An aerial image is shown in Figure 3-3.

The WWTP treats wastewater with preliminary, primary, and secondary treatment processes, and two SWOs are present for discharge of wastewater during heavy rainfall conditions and as an emergency in the case of equipment failure.

The plant collects and treats domestic, commercial, and surface water urban runoff from both combined and separated foul sewerage systems. The primary discharge is to the Corrib Estuary, located 400 meters south of the WWTP, via a sea outfall with diffusers. The discharge point is close to the boundary of the Inner Galway Bay North coastal waterbody and lies within the Galway Bay Complex Special Area of Conservation (SAC) and Inner Galway Bay Special Protection Area (SPA).

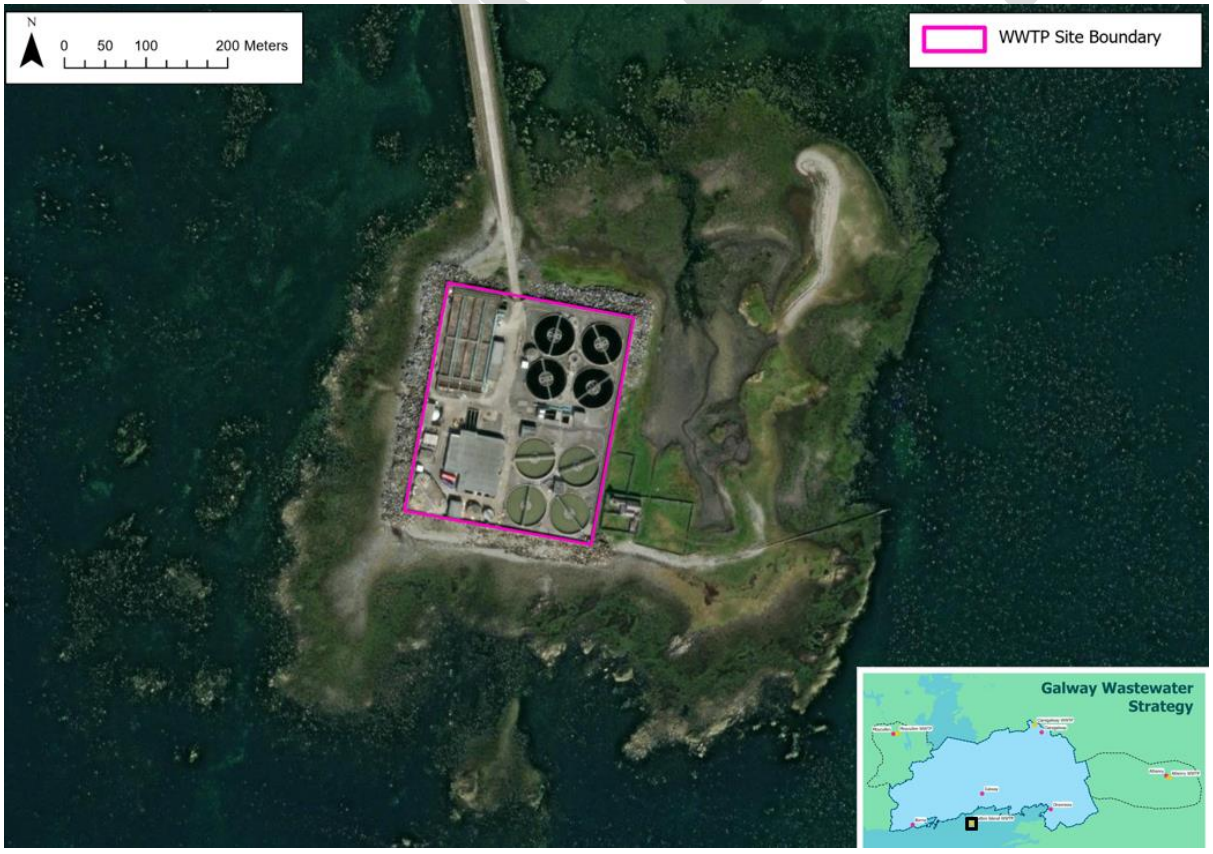


Figure 3-3: Mutton Island WWTP Site Location

3.2.2. Overview of Treatment Processes

Inlet Pump Sump: Raw wastewater is conveyed to Mutton Island via a 900m gravity sewer located in the causeway connecting Mutton Island to the mainland. Inlet flows enter the WWTP for preliminary treatment from the inlet screw pumping station. Three Archimedes screw pumps operating in a duty/assist/standby arrangement transfer flow from a low level to a high level for preliminary treatment. Flows up to an estimated 1700 l/s (3.2DWF) are passed forward for preliminary treatment by the Archimedes screw pumps. There is an SWO at the inlet pump sump ("Formula A" SWO (SD02)). This SWO/EO operates when flows exceed the capacity of the inlet screws and storage within the network.

Preliminary treatment: Preliminary treatment includes fine screening via three Longwood 6mm mesh escalator screens, and grit removal via two vortex grit removal units.

FFT Weir: A double-sided FFT weir is present at the WWTP (see Figure 3-4). When one screw pump is in operation, an estimated 850 - 875 l/s (1.7DWF) is transferred forward for primary treatment. When two screw pumps are in operation, up to 1150 l/s (2.2DWF) can be transferred forward to primary treatment (depending on hydraulic conditions). When two screw pumps are in operation, around 2DWF is typically passed forward for primary treatment and is representative of FFT. Typically, when one screw pump is in operation, the WWTP does not discharge over the double-sided weir to the marine outfall WWPS. At higher flows, the second screw pump comes into operation and when the capacity of the inlet channel is exceeded, the excess flows (above FFT) overtop the weirs and gravitate to the marine outfall final effluent WWPS. Within this WWPS, it is blended with final effluent and monitored alongside the primary discharge (PD01).

Figure 3-4: Mutton Island WWTP FFT Double Sided Weir

Mutton Island WWTP does not provide dedicated storm storage on site. However, the inlet sewer acts to store and balance incoming wastewater flows during heavy rainfall events

Biological Treatment: After preliminary treatment and FFT flow splitting, wastewater flows to primary treatment where it is split between four primary settlement tanks (including two that were re-configured as final tanks) for initial settlement of solids. Effluent from the primary tanks gravitate to the intermediate pumping station which directs flow into the four secondary treatment lanes.

Secondary treatment involves fine bubble diffused aeration (FBDA) to supply oxygen to the wastewater and final settlement to clarify the effluent. Effluent from the secondary treatment process is discharged to the sea through the 400m long, 900mm diameter outfall pipe with the final 100m comprising a long diffuser section which disperses the treated effluent. When the tide is low, treated effluent is discharged by gravity; in high tide the treated effluent is pumped via dry mounted pumps in a duty/assist/standby arrangement.

3.2.3. Growth Context

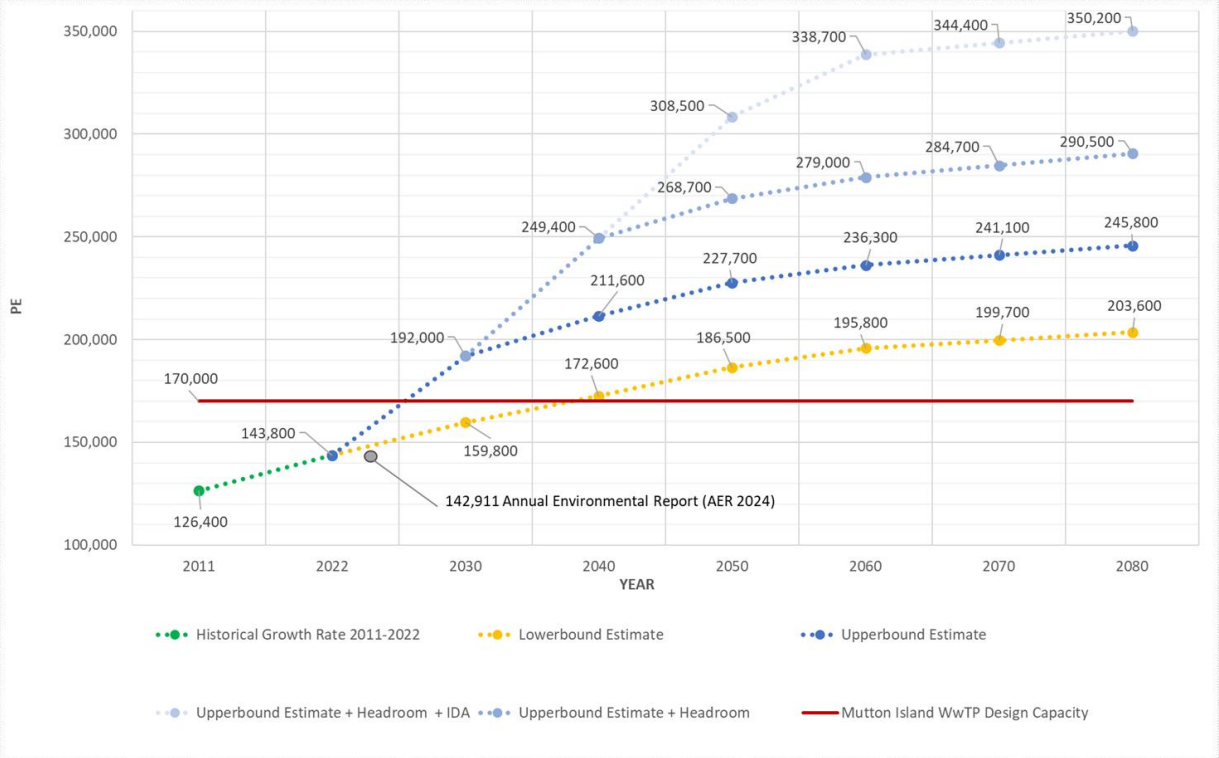


Figure 3-5 Mutton Island WWTP (Galway City, Oranmore and Bearna) PE Growth Projection

As discussed in *Appendix 1: Managing Growth,* based on upper bound projections, the estimated growth for this agglomeration from 2022 to 2080 indicates an increase of over 200,000 PE, equating to a nearly 240% rise in capacity requirement. Considering available headroom and IDA projections, by 2080 the wastewater treatment plant (WWTP) may exceed its design capacity by approximately 200% (180,000 PE).

3.2.4. WWTP Hydraulic Headroom

According to the 2024 AER[20], Mutton Island WWTP has a plant capacity of 170,000 PE. In 2024, the estimated peak collected load at the WWTP was 142,911 PE, and therefore based on 2024 data, the plant capacity is not being exceeded and has approximately 27,000 (16%) capacity remaining.

The AER states that the WWTP is designed to treat up to 45,000m^3/day at dry weather flow (DWF), and the peak hydraulic capacity of the plant is 135,000m^3/day at flow to full treatment (FFT).

Figure 3-6 gives a summary of the measured Q90 flows to treatment at Mutton Island WWTP and available headroom for the period 2019-2023.This is measured downstream of the FFT weir prior to primary treatment. This confirms that the WWTP is currently not treating up to the DWF limit of 45,000m^3/day over the 5-year analysis period. Over the analysis period, hydraulic headroom is an average of 8% with a maximum of 10% in 2021.

Due to the flow entering the WWTP being hydraulically limited by the FFT weir, the Q90 flow figure does not give a full picture of the hydraulic flow range entering the WWTP catchment prior to the FFT overflow weir. Furthermore, due to saline ingress in the network upstream of the FFT overflow weir, which can occur in dry periods, hydraulic headroom may be being taken up by other sources of non-wastewater flow. A detailed flow survey is required to ascertain the true picture of hydraulic headroom at Mutton Island WWTP.

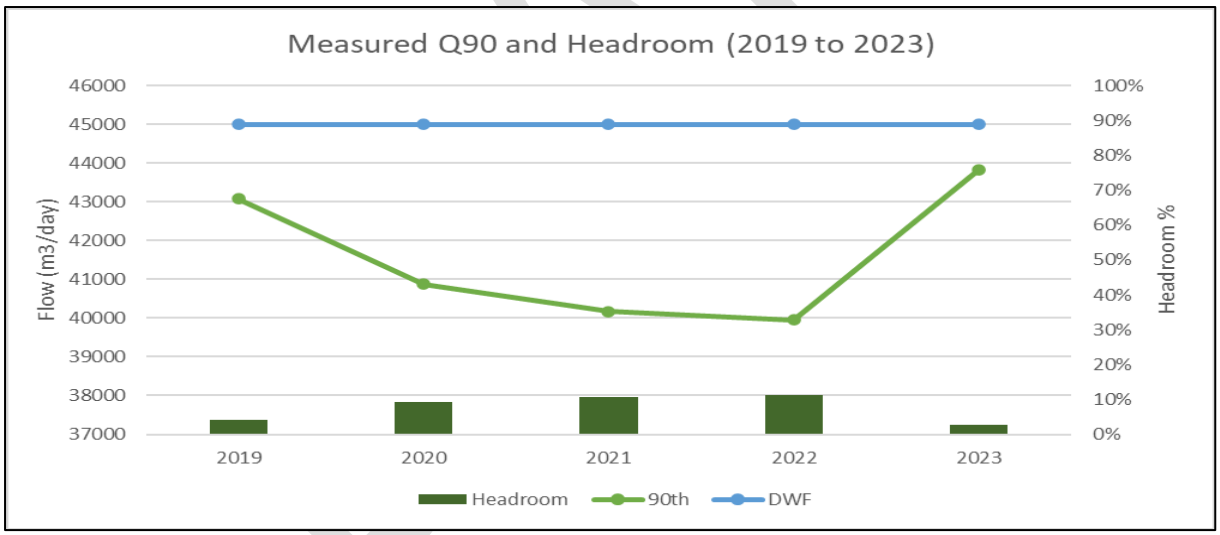


Figure 3-6: Measured Q90 and Headroom for Mutton Island WWTP (2019 to 2023)

Figure 3-7 shows the measured FFT against the WWTP's current design FFT limit of 135,000m^3/day. (1,562 l/s – 3DWF). This shows that the plant may not be always passing forward flow up to design FFT and "peak shaving" may be occurring during higher flows. As further assessment is required, assumptions were made on FFT for purposes of the strategy in order to evaluate the hydraulic performance of the plant. More detailed evaluations should be conducted to for setting of an appropriate FFT figure. Uisce Éireann have commissioned further surveys to assess the treatment capability of the plant as a result of Strategy recommendations.

[20] D0050-01_2024_AER_Rev1

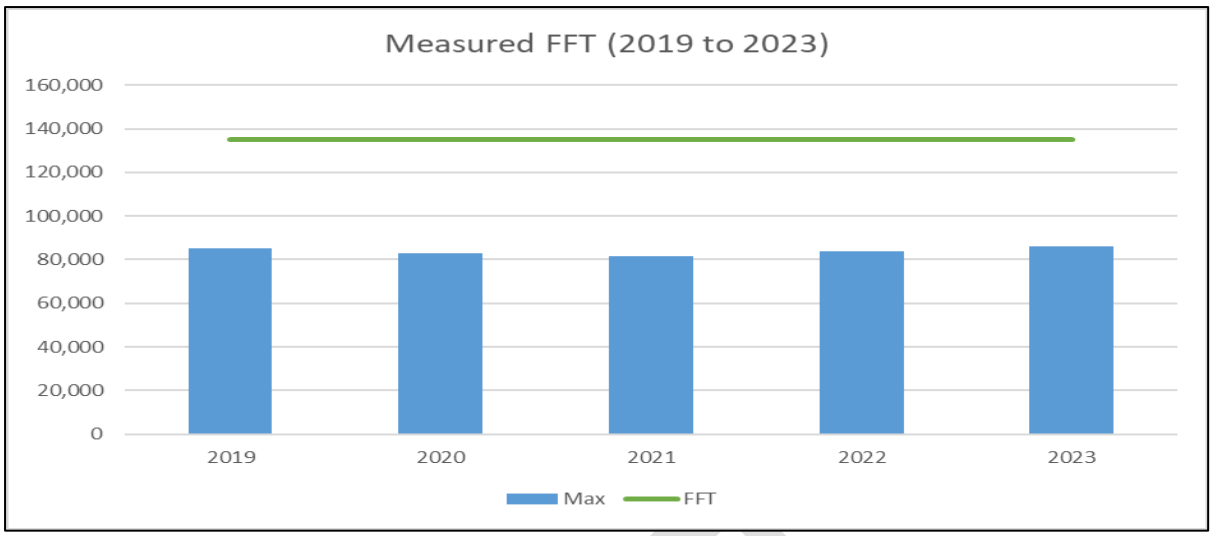


Figure 3-7: Measured FFT at Mutton Island WWTP (2019-2023)

3.2.5. WWTP Treatment Risks

The Wastewater Discharge Licence (WWDL) for Galway City (Mutton Island) details the emission limit values (ELVs) for the WWTP. These are given in Table 3-3. Final effluent samples charted against these ELVs are shown in Figure 3-8 to Figure 3-13.

Table 3-3: Galway City ELVs

Parameter	WWDL ELV (Schedule A)
COD	125mg/l
Suspended Solids	35mg/l
BOD (5 Days)	25mg/l
pH	9.0
Ammonia Total (N)	25mg/l
Total Nitrogen	35mg/l
Total Oxidised Nitrogen	20mg/l

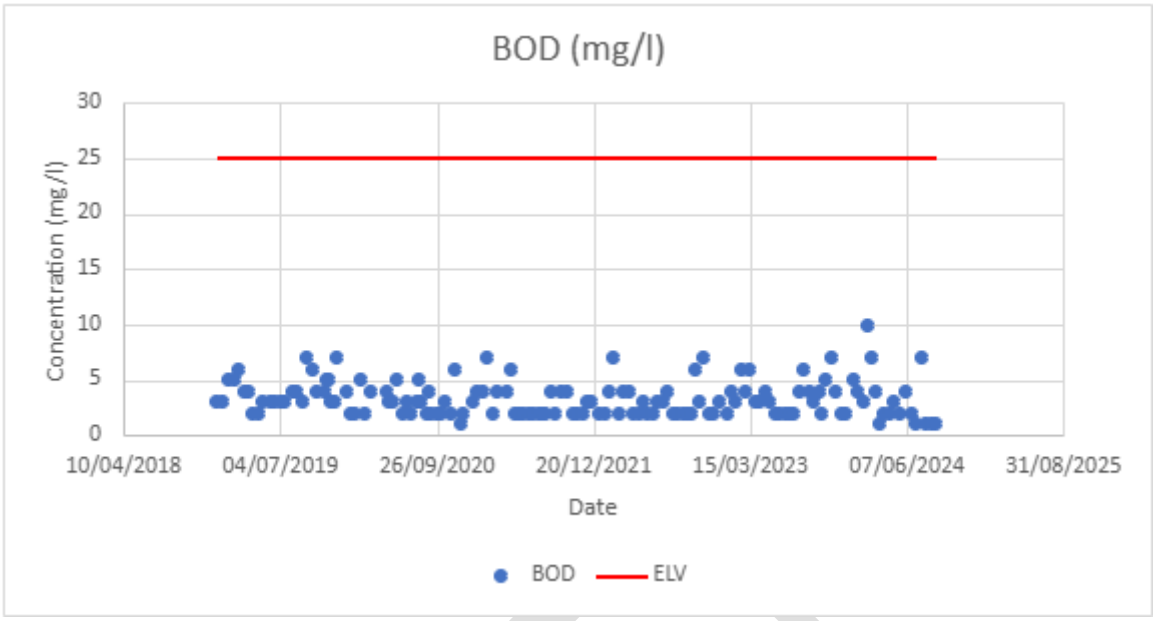


Figure 3-8: Final Effluent Performance at Mutton Island WWTP (BOD_5)

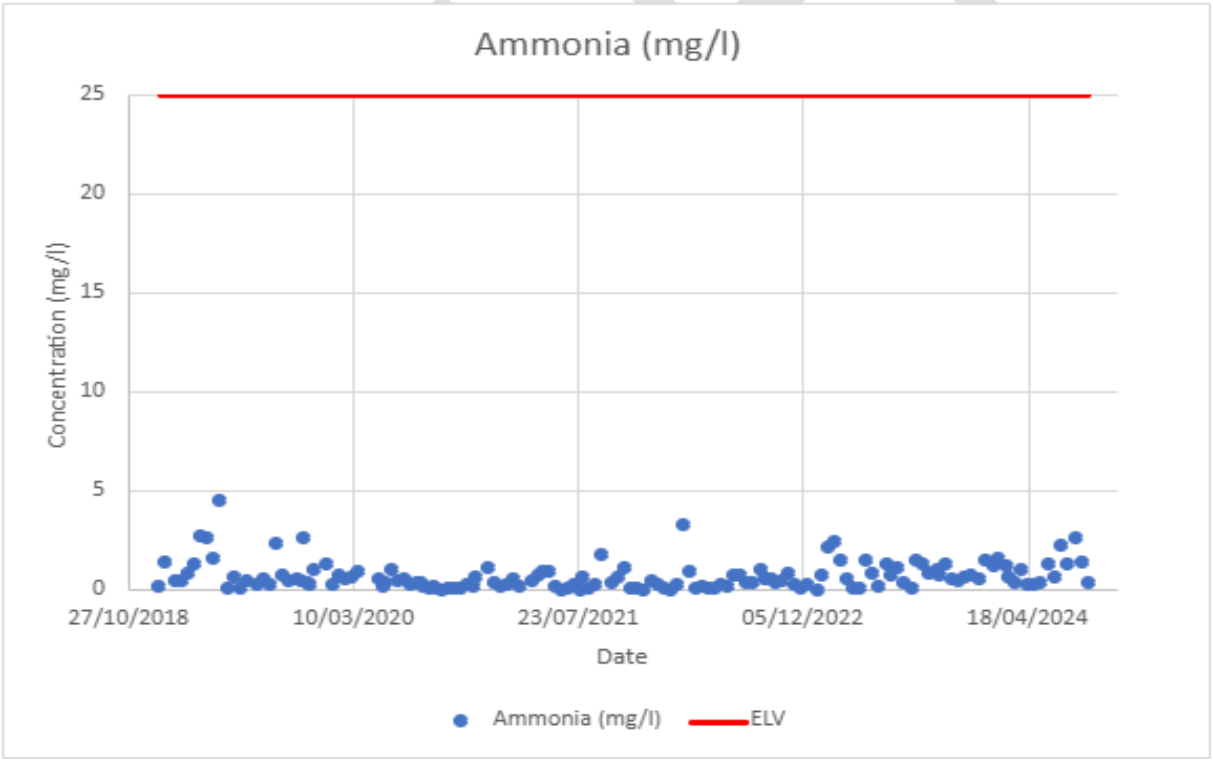


Figure 3-9: Final Effluent Performance at Mutton Island WWTP (Ammonium as N)

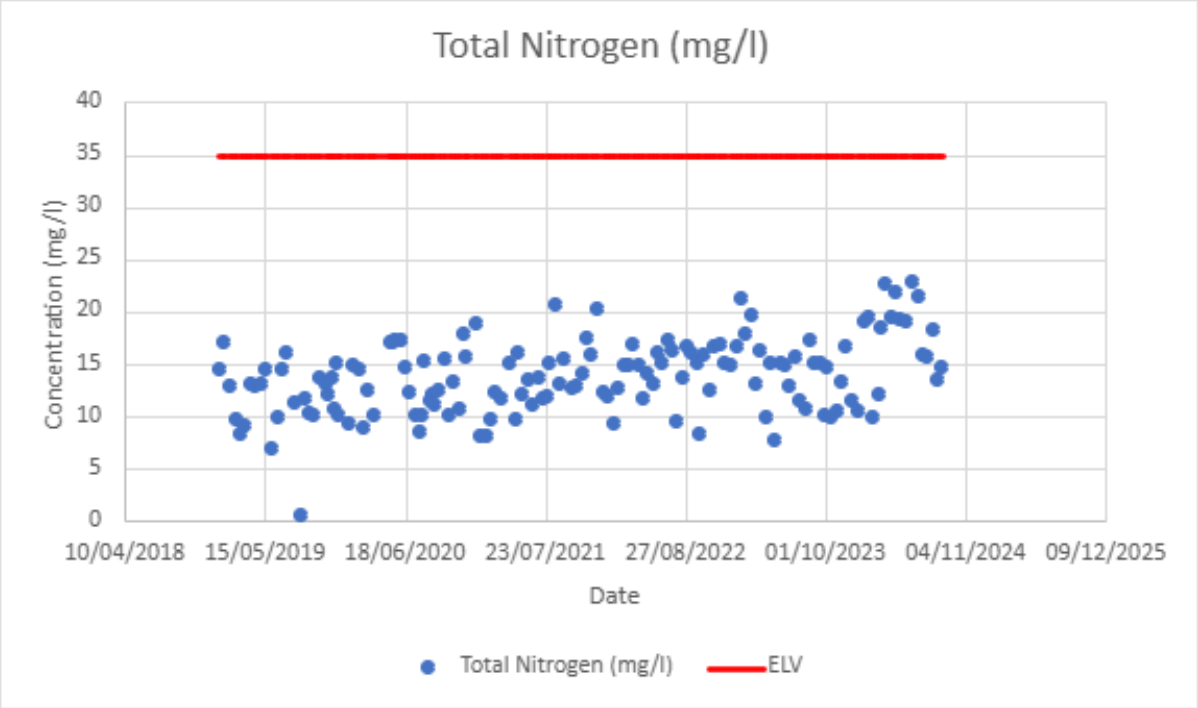


Figure 3-10: Final Effluent Performance at Mutton Island WWTP (TN)

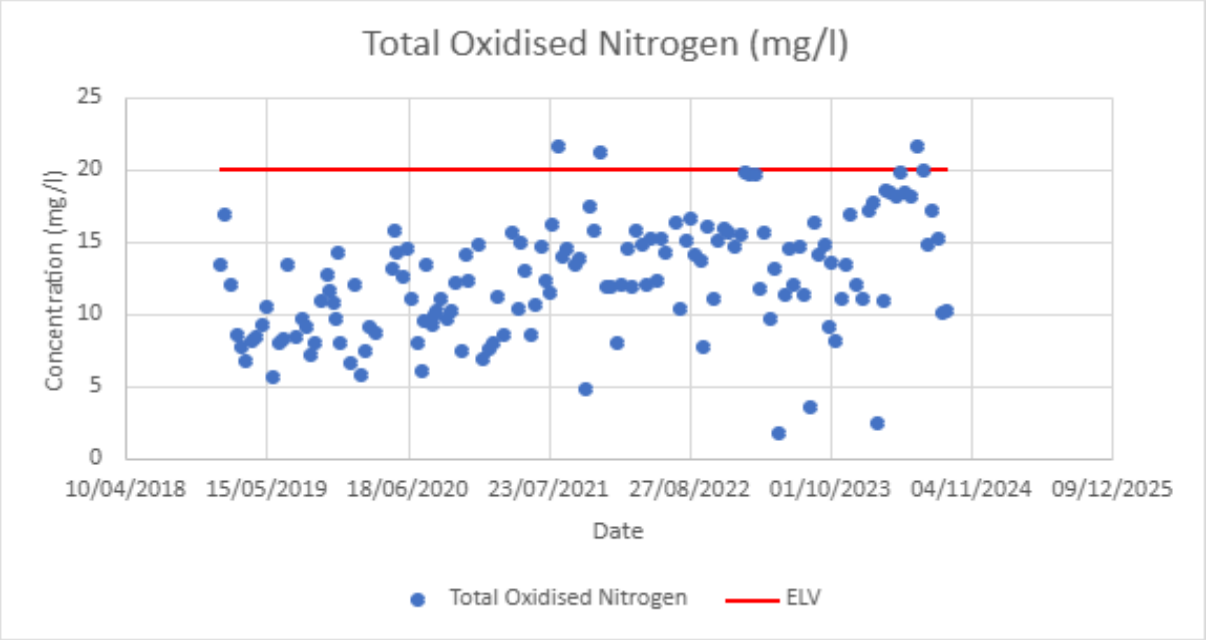


Figure 3-11: Final Effluent Performance at Mutton Island WWTP (TON)

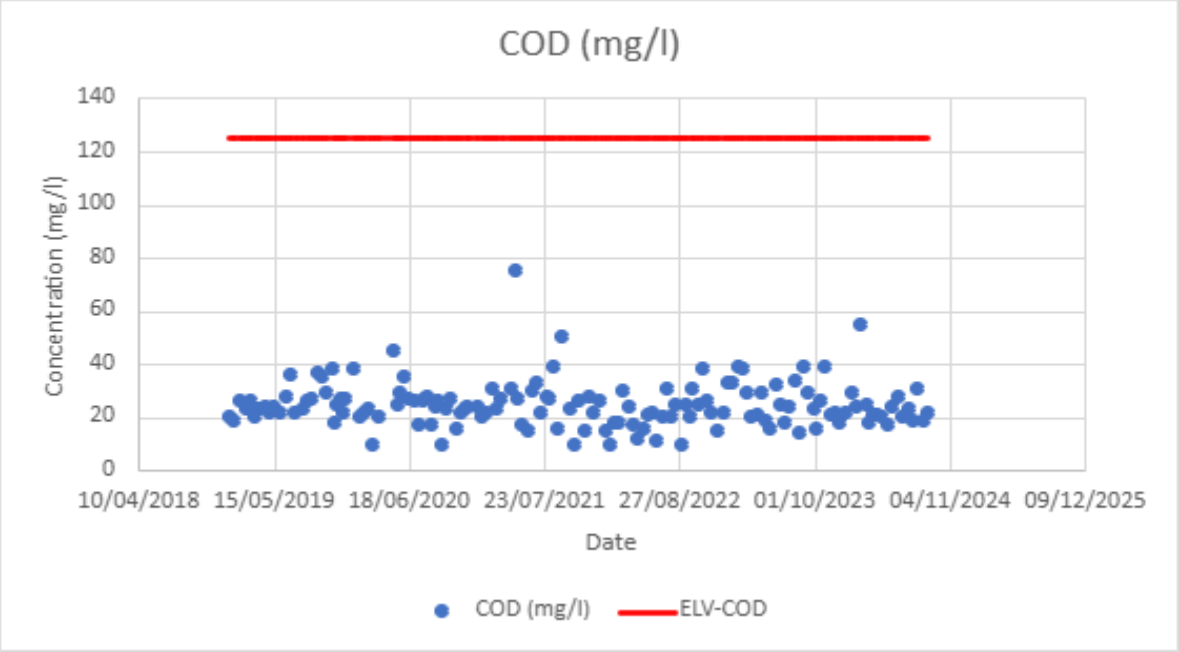


Figure 3-12: Final Effluent Performance at Mutton Island WWTP (COD)

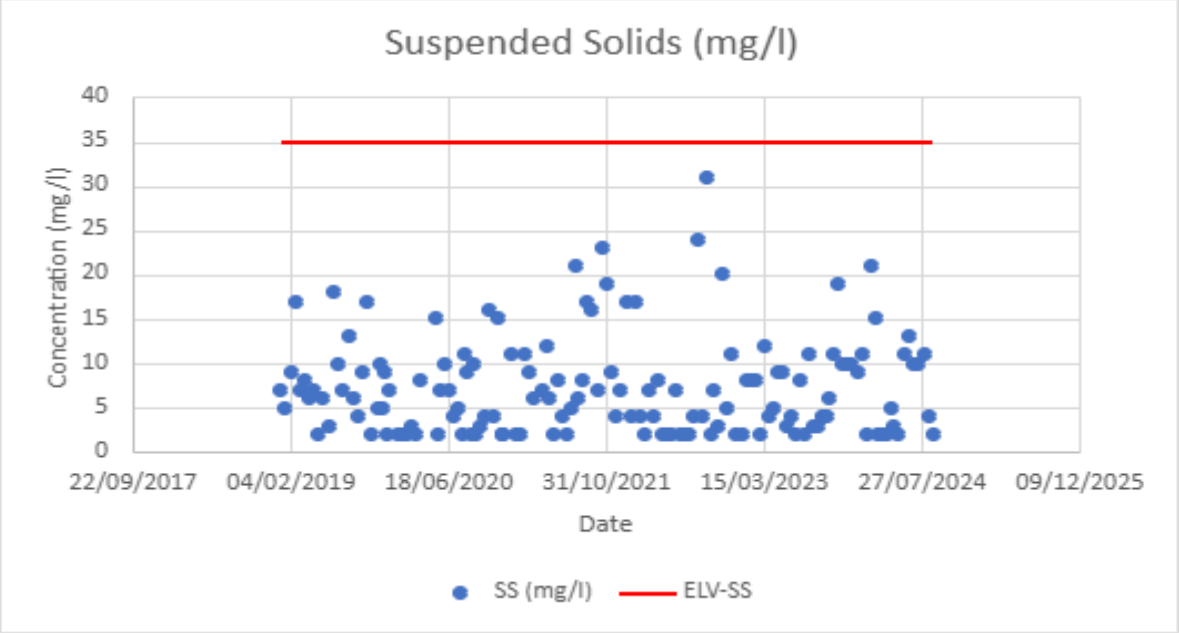


Figure 3-13: Final Effluent Performance at Mutton Island WWTP (SS)

The results demonstrate that the plant's performance is compliant with the EPA licence conditions; the limitation on flow to treatment suggests the facility is not passing forward the full flow range for treatment but is treating the load that it receives. Initial hydraulic capacity assessments suggest there are constraints in the process that limit flow, above which could cause a risk to compliance in future. This requires further detailed assessment.

There is also a risk from saline ingress of rapid changes in salinity causing osmotic shock in the Activated Sludge Process which require further investigation.

3.2.6. Summary Assessment of Current and Future Treatment Risks

Considering the significant risks outlined, Mutton Island WWTP has been assigned specific performance indicators pertaining to hydraulic capacity and compliance with wastewater discharge licensing requirements, without any capital intervention. A red category signifies that immediate investigation and intervention are required due to the identification of a significant strategic need. Amber indicates that a strategic need exists; however, the corresponding intervention involves lower capital requirements. Green denotes that no strategic needs have been identified.

Table 3-4: Galway City (Mutton Island) WWTP Performance Indicators

Mutton Island WWTP	Hydraulic Capacity Strategy Need	Treatment Capacity Strategy Need
Baseline	🟡	🟡
2040	🟠	🟠
2055	🟠	🟠
2080	🟠	🟠

Given that Mutton Island is the most significant treatment asset within the study area, this prompted further investigation as part of the Strategy. As outlined in *Appendix 1: Managing Growth*, more than 90% of the growth within the study area is expected to be treated at this WWTP. Without intervention, the WWTP will reach its capacity by 2040, even under the low growth projections.

Therefore, outcomes of the Strategy were contingent on deciding an appropriate course of action for Mutton Island WWTP. A high-level investigation of the capability of the works to meet the current flow and ELV parameters was undertaken, and to consider whether any short-term improvements to the WWTP should be carried out. Additionally, a comprehensive risk and resilience assessment was conducted to evaluate potential future regulatory risks and determine the available options.

In the short term, there needs to be adjustments to the FFT weir height and settlement configuration to increase FFT in line with agglomeration growth, improvements to the selector process to increase sludge settleability and reduce the digester throughput. These hydraulic adjustments may also result in a reconfiguration of the treatment process and installation of further resilience works (e.g. aeration system, blowers, diffusers, pumping, change to primary and final settlement, and modification of the sludge process). Uisce Éireann have commissioned a project to examine the needs of the resilience upgrade as a result of Strategy findings.

In the medium term, several upcoming legislative changes will impact the Mutton Island WWTP, particularly the rUWWTD, which may affect plant capacity and management practices. New requirements shall include:

- Establishment of IUWWMPs for agglomerations over 100,000PE by 2033. Raising the weir height at the FFT weir is expected to enhance the mitigation of risks associated with the non-binding objective (2% load lost) outlined in Annex V of the recast UWWTD (rUWWTD) and discussed in 2.5.2.

- Mandatory tertiary treatment for larger facilities, of which Mutton Island qualifies, by 2039.
- Quaternary treatment is mandatory for WWTP facilities with a capacity greater than 150,000 PE, with the requirement being phased in between now and 2045. Mutton Island is predicted to fall within this threshold. In addition, given its proximity to designated bathing waters and shellfish waters, the WWTP may also qualify under the risk assessment carried out for WWTPs between 10,000-150,000 PE. Therefore, the requirement for quaternary treatment should be precautionarily screened in for the purposes of the resilience assessment, to ensure that the assessment captures the potential need for this treatment level, should the obligation arise.
- Energy neutrality targets for WWTPs by 2040, with increasing renewable energy usage.
- Enhanced monitoring and reporting requirements.

These legislative changes will need to be considered during the design and planning of future upgrades to ensure compliance and were considered as part of the risk and resilience test.

The high-level review considered these future requirements and developed two main options to address medium to long term needs that considered construction feasibility, operability, site constraints, planning, future licences and wider area requirements. The options are summarised below and should be read in conjunction with the optioneering process outlined in *Appendix 5: Our Approach to Optioneering and Feasible Options Development*. Both options retain Mutton Island as part of Strategy recommendations

1. Increase hydraulic capacity, install alternative compact primary treatment, make modifications to secondary treatment and install advanced tertiary and quaternary treatment process. Upgrade the sludge process to treat all the Galway area population up to 2080; or
2. Reduce the throughput of the plant to approximately 100k PE (in accordance with asset standards and an allowance for appropriate headroom). Install alternative compact primary treatment and Activated Sludge Plant (ASP) extension, with the remaining Galway area population being treated at a new plant. The residual capacity will be determined to reflect network feasibility appraisals on the catchment to be retained at Mutton Island.

Option 1 is not favoured due to complex technology control, maintenance and operability requirements as a long-term solution; however, elements may form part of the recommendations in Option 2 to be considered as part of the short-term resilience upgrade.

Mutton Island WWTP occupies approximately 2.3 hectares of the island's 5-hectare area. A preliminary assessment indicates very limited available space for new infrastructure within the existing site. The phasing of construction in moving from a carbonaceous Activated Sludge Plant to advanced tertiary and quaternary treatment, within a constrained site, also posed significant buildability concerns, whilst operating the current site.

Expanding beyond the site boundary is not considered feasible due to the environmental sensitivity of the area, flooding risks associated with sea level rise and high costs associated with land reclamation and construction. Coastal flood risk modelling indicates no significant risk to the

WWTP site itself, although the causeway may occasionally be overtopped during storms. Further investigation into coastal flood risk is recommended if any upgrades were to be made.

Furthermore, from a network infrastructure perspective, upgrading the infrastructure to treat all the population load to 2080 would represent significant engineering and delivery challenges.

Option 2 retains Mutton Island at a lower capacity with the additional study area load being treated at a new WWTP. This option allows the plant to be refurbished within the constraints of its location, and the reduction in flow and load to be treated will reduce future compliance risks Furthermore, this approach mitigates Mutton Island's exposure and vulnerability to potential regulatory changes and supports continued resilient operation of the facility. The Strategy recommends maintaining the WWTP at reduced capacity for future planning considerations, however an immediate resilience upgrade is required to ensure that it can treat the current and future population up to at least 2040.

A summary of the risk, resilience and performance of the Mutton Island WWTP is as follows:

- **Current Capacity** - In its current configuration, Mutton Island has a capacity of 170,000PE[21] as specified in the Annual Environmental Report. As presented in *Appendix 1 – Managing Growth,* the projected growth in the area that is currently served by Mutton Island WWTP suggests that, *in the absence of a resilience upgrade*, the plant is projected to reach its operational limit by 2040. If housing development accelerates over the next 15 years at the rate specified in the RSES, the facility's capacity may be exceeded before 2040 unless capital investment is undertaken. This may result in the plant's inability to meet its discharge licence requirement, without intervention, therefore highlighting its deteriorating risk status at the 2040 horizon.
- **Risk and Resilience** – Legislative amendments prompted by the recast UWWTD were duly considered. Tertiary and quaternary treatment is mandated at wastewater treatment plants exceeding 150,000 population equivalent (Article 7(1)) by 2039. This requirement poses significant challenges to existing treatment configurations and must be considered in cognisance of anticipated future growth. While the Corrib Estuary is not currently designated as eutrophic, there remains a possibility that it may be classified as a sensitive area with total nitrogen (TN) and total phosphorus (TP) standards implemented within the next 50 years (article 7(2)); this risk was evaluated from a resilience perspective). The plant's design as a carbonaceous treatment facility presents a considerable challenge for meeting these additional requirements, necessitating careful consideration during the optioneering phase. Given the Strategy's projected planning horizon of more than five decades, further tightening of the UWWTD and related environmental directives under the Water Framework Directive should reasonably be anticipated and were factored into decisions.
- **Physical Constraints** – Expansion of site capacity is principally restricted by its island location, with existing infrastructure occupying approximately 2.29 hectares of the total 5-hectare area, resulting in limited available space for further development. The sensitive

[21] Annual Environmental Report 2024 Galway City

positioning of the WWTP, coupled with planning regulations, has further narrowed the options during the optioneering phase, limiting the feasible alternatives for additional wastewater treatment units. Moreover, the evaluation process included consideration of the rUWWTD requirement to implement quaternary treatment for micropollutant removal by 2045.

Considering these factors, it is recommended that a resilience upgrade process be implemented in the short term, to ensure the plant meets its current discharge licence requirements and extends the design life of the wastewater treatment plant (WWTP) to support anticipated growth until the new WWTP is constructed. Engineering evaluations indicate that downsizing the WWTP to approximately 100,000 Population Equivalent (PE), while maintaining appropriate headroom, would effectively manage potential future regulatory risks on a constrained site. The planning horizon of this would be in the medium to long term of the Strategy after the new WWTP is constructed and network diversions are in place. As a result, this decision influenced the optioneering primary screening outcomes (Appendix 5) and established the necessity for a new WWTP to accommodate population growth, provide additional capacity, and facilitate the development of projected IDA loads in the study area and at Athenry when required. The new WWTP should be constructed in a modular fashion to facilitate phased expansion in line with population growth and IDA projections.

As such, a strategic phasing plan is essential to transfer a portion of the existing load produced within the Galway City agglomeration west of the River Corrib to a future site for a **new WWTP.** The location of this new WWTP is to be evaluated during the optioneering process. This phased redirection will allow Mutton Island WWTP to operate at a significantly reduced capacity, ensuring long-term infrastructural resilience and reduce its vulnerability to future change. This phased reduction in capacity at Mutton Island, in parallel with the modular construction of the new WWTP, will allow for additional treatment stage functionality (e.g. such as nitrification / de-nitrification) if and as required to meet any statutory obligations.

The proposed catchment division is illustrated in Figure 3-15: the green section, situated west of the River Corrib, will continue to be treated at Mutton Island, while the blue section is designated for transfer to a new wastewater treatment plant, pending the optioneering process detailed in Appendix 5. The graphic serves an illustrative purpose; the physical catchment boundaries will be established through detailed local appraisals following the adoption of the strategy.

Figure 3-14 provides a summary of the recommendations for Mutton Island WWTP, presenting a delivery roadmap informed by the assessment results.

Figure 3-14: Mutton Island WWTP Recommendations

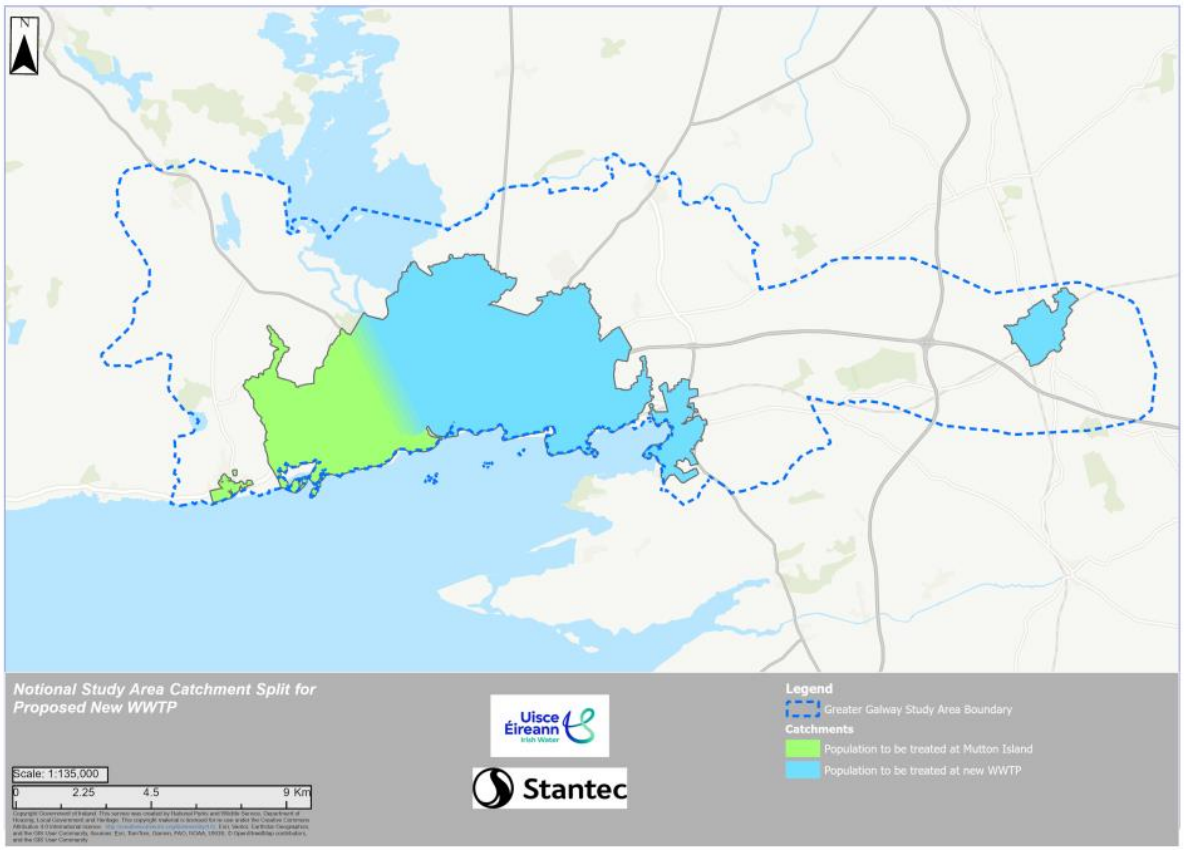


Figure 3-15: Proposed Mutton Island agglomeration split for transfer to new WWTP

3.3 Athenry WWTP

3.3.1. Site Description

Athenry WWTP serves the Athenry agglomeration, which is located approximately 22km east of Galway City and situated on the River Clarin. The Athenry WWTP is located to the south-west of the town within the townland of Prospect, on a site approximately 1 hectare in area, as shown in Figure 3-16. The WWTP discharges effluent to the adjacent River Clarin, which is formed by two adjoining tributaries, the Graigabbey and Cloonkeen River. The river flows south-westwards until it meets the sea at Dunbaulkin Bay which forms part of the Galway Bay Complex SAC and Inner Galway Bay SPA.

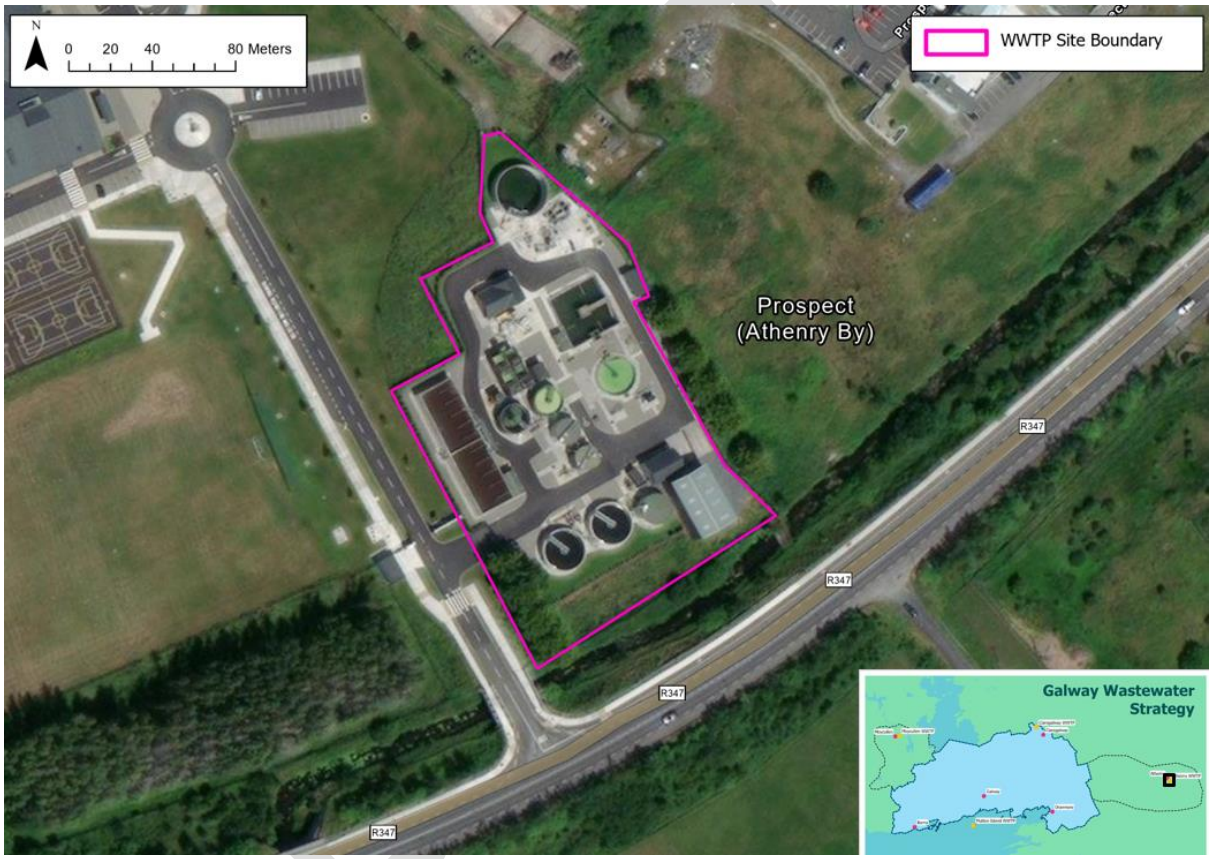


Figure 3-16: Athenry WWTP Site Location

3.3.2. Overview of Treatment Processes

The site treats wastewater using preliminary and secondary treatment processes, as summarised in this section.

The preliminary treatment process screens flow and removes grit separately via a grit trap. The secondary treatment at the plant consists of three streams, however 2 is currently inactive and stream 1 has recently entered service to accommodate catchment growth. Stream 3, currently in operation, uses two aeration tanks and two clarifiers to treat the wastewater. There is also a ferric sulphate dosing system to remove phosphorus. The treated effluent is discharged to the River Clarin via gravity.

During heavy rainfall conditions, a storm pumping station regulates flow to secondary treatment, diverting excess water to storm storage when flow to full treatment (FFT) is exceeded. This storm diversion is post screening and grit removal. A 714m³ storm storage tank temporarily stores excess flow. Two pumps return flow to the treatment stream when inlet flows fall below a certain set point and capacity is available in the treatment stream. If the storm tank capacity is exceeded the storm water overflow discharges to the River Clarin.

3.3.3. Growth Context

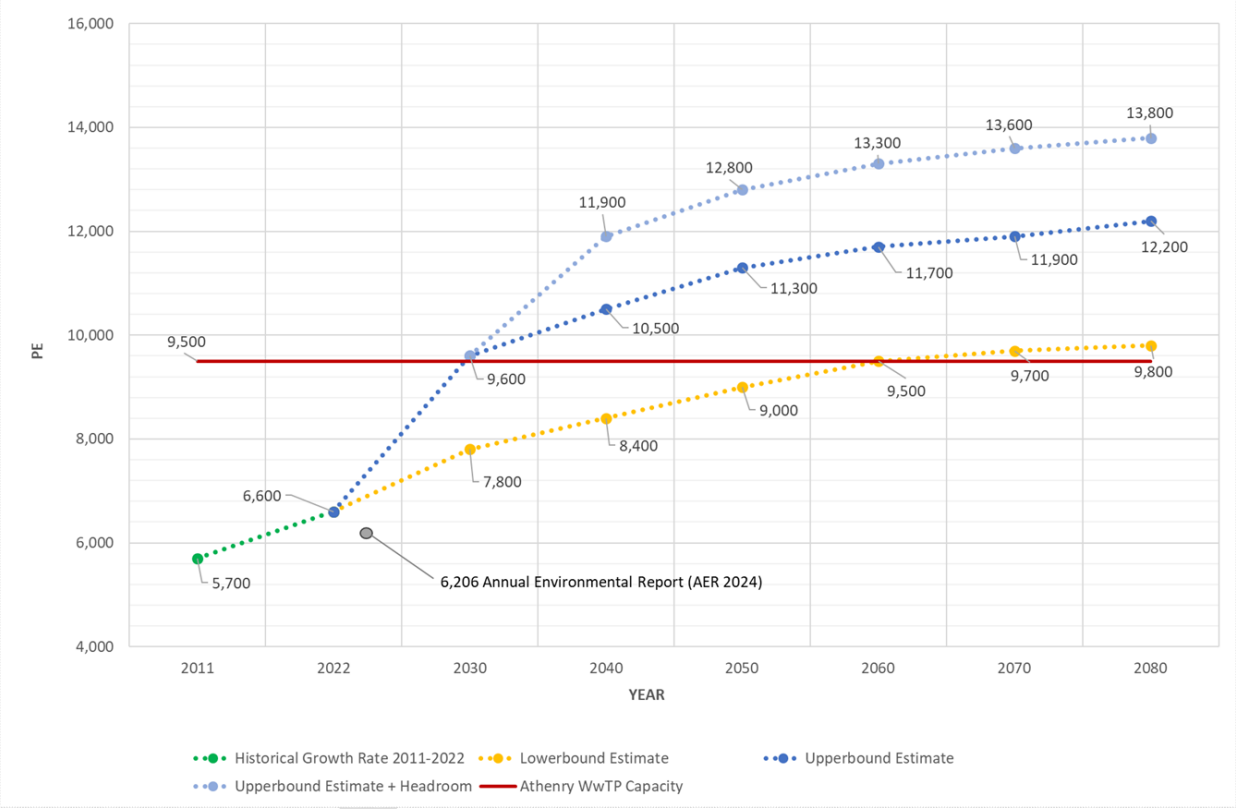


Figure 3-17: Athenry PE Growth Projection

As discussed in *Appendix 1: Managing Growth,* based on upper bound projections, the estimated growth for this agglomeration from 2022 to 2080 indicates an increase of approximately 7,200 PE, equating to more than 200% rise in load. Considering available headroom, by 2080 the wastewater treatment plant (WWTP) may exceed its current design capacity by approximately 45% (4,300 PE).

3.3.4. WWTP Hydraulic Headroom

According to the 2024 AER[22], Athenry WWTP has a plant capacity of 9,500 PE. In 2024, the peak collected load at the WWTP was 6,206 PE, and therefore based on 2024 data, the plant capacity is not being exceeded.

The AER[2] states that the WWTP is designed to treat up to 2,138m^3/day at dry weather flow (DWF), and the peak hydraulic capacity of the plant is 6,413m^3/day at flow to full treatment (FFT).

Figure 3-18 gives a summary of the measured Q90 flows (as a proxy for DWF) to Athenry WWTP and available headroom for 2019-2023. This shows that the WWTP is not treating up to the DWF limit of 2,138m^3/day over the 5-year analysis period. Over the analysis period, headroom has gradually decreased by 36%, however over the analysis period, the plant hydraulic capacity is not currently being exceeded in DWF. These results are to be expected due to the recent growth in the agglomeration and that it has not yet reached its organic capacity limit.

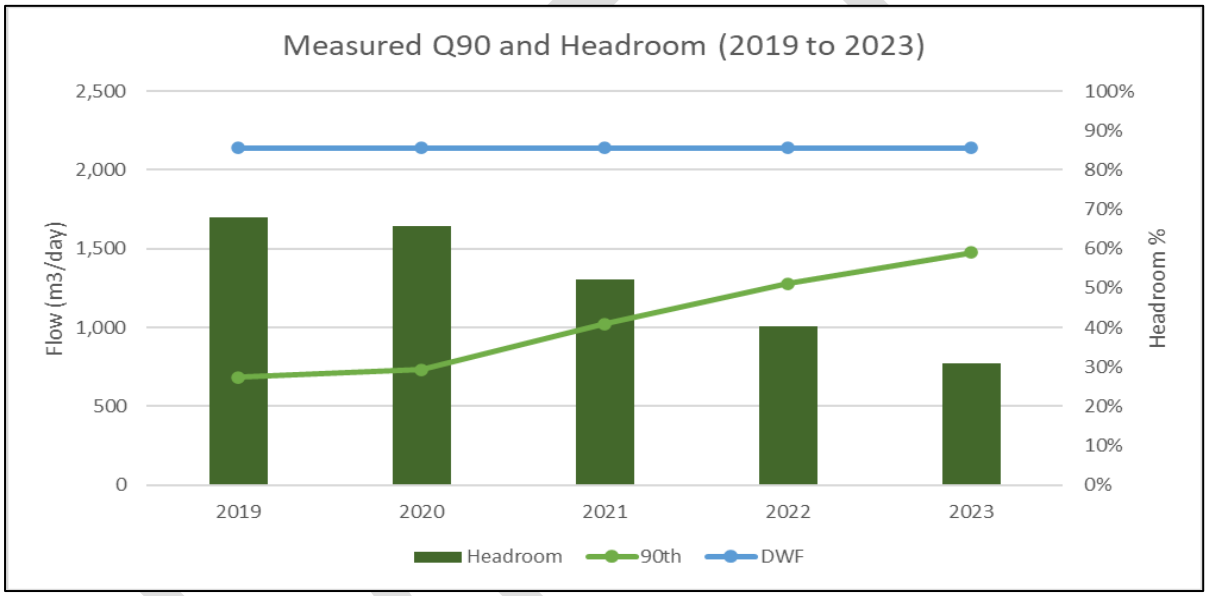


Figure 3-18: Measured Q90 and Headroom at Athenry WWTP (2019-2023)

Figure 3-19 shows the measured FFT against the WWTP's FFT limit of 6,413m^3/day. This shows that the plant is not treating up to its FFT limit, however the average FFT is around 90% of the FFT limit throughout the analysis period.

[22] D0193-01_2024_AER

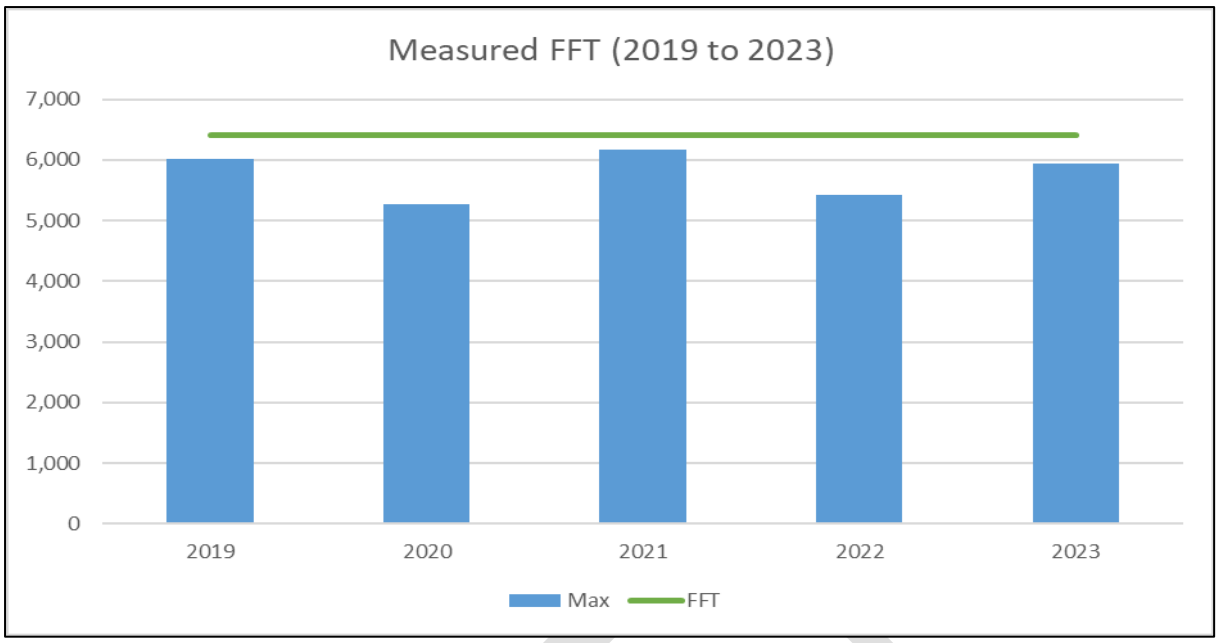


Figure 3-19: Measured FFT at Athenry WWTP (2019-2023)

3.3.5. WWTP Treatment Risks

The Wastewater Discharge Licence (WWDL) for Athenry WWTP details the emission limit values (ELVs) for the WWTP. These are given in Table 3-5. Final effluent samples graphed against these ELVs are shown in Figure 3-20 to Figure 3-23. The ammonium and orthophosphate limits at this WWTP are particularly challenging and are representative of the sensitive nature of the receiving waterbody. Raw data for the effluent Suspended Solids was unavailable, so no ELV graph is available for that parameter.

Table 3-5: Athenry WWTP ELVs

Parameter	WWDL ELV (Schedule A)
COD	125mg/l
Suspended Solids	35mg/l
BOD (5 Days)	6mg/l
pH	6.0 - 9.0
Ammonia Total (N)	0.4mg/l
Orthophosphate	0.2mg/l
Temperature (Celsius)	25°

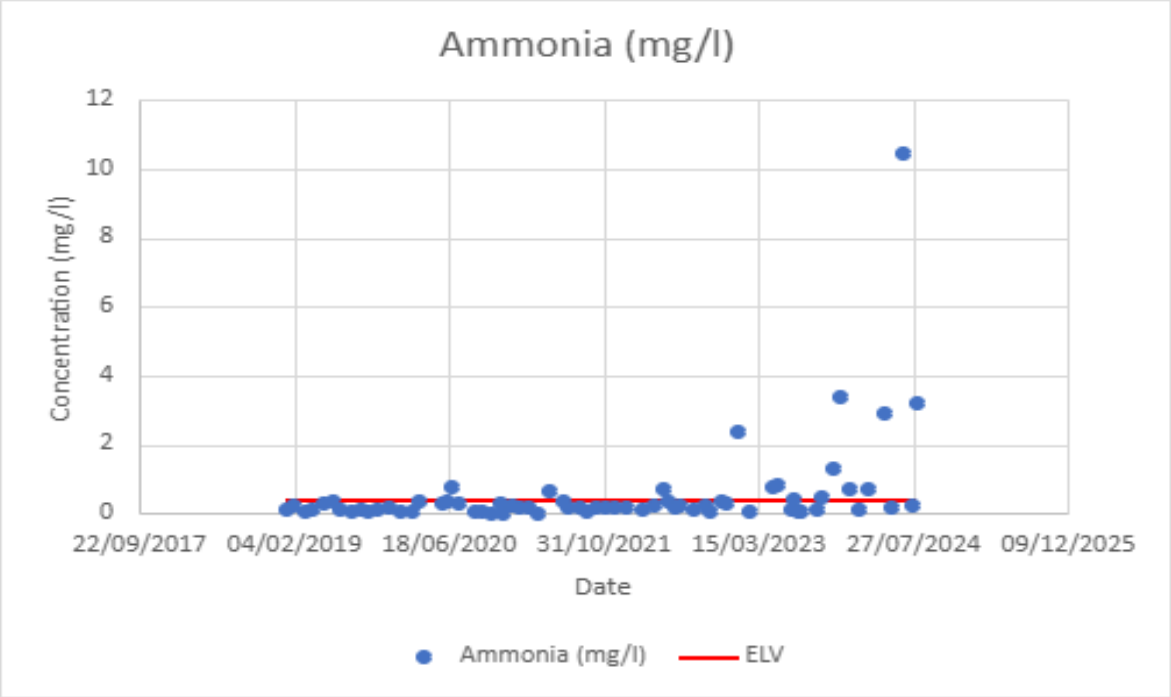


Figure 3-20: Concentration and Treatment Efficacy for Ammonia at Athenry WWTP

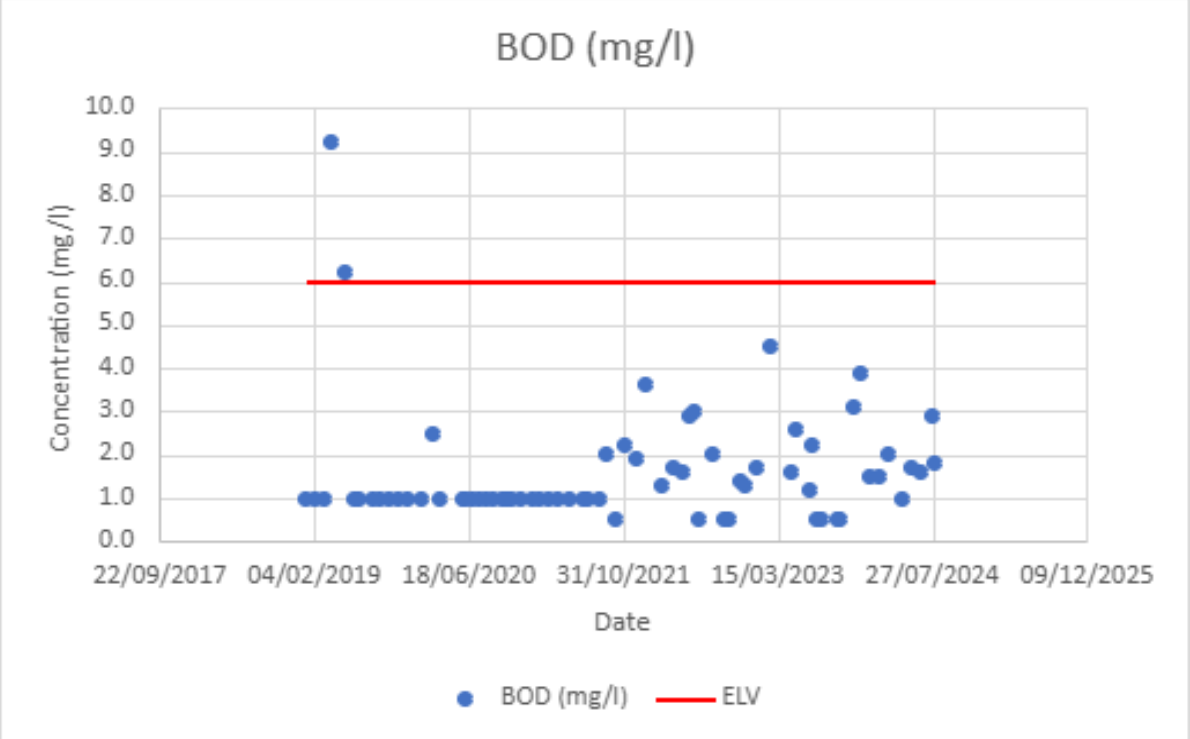


Figure 3-21: Concentration and Treatment Efficacy for BOD at Athenry WWTP

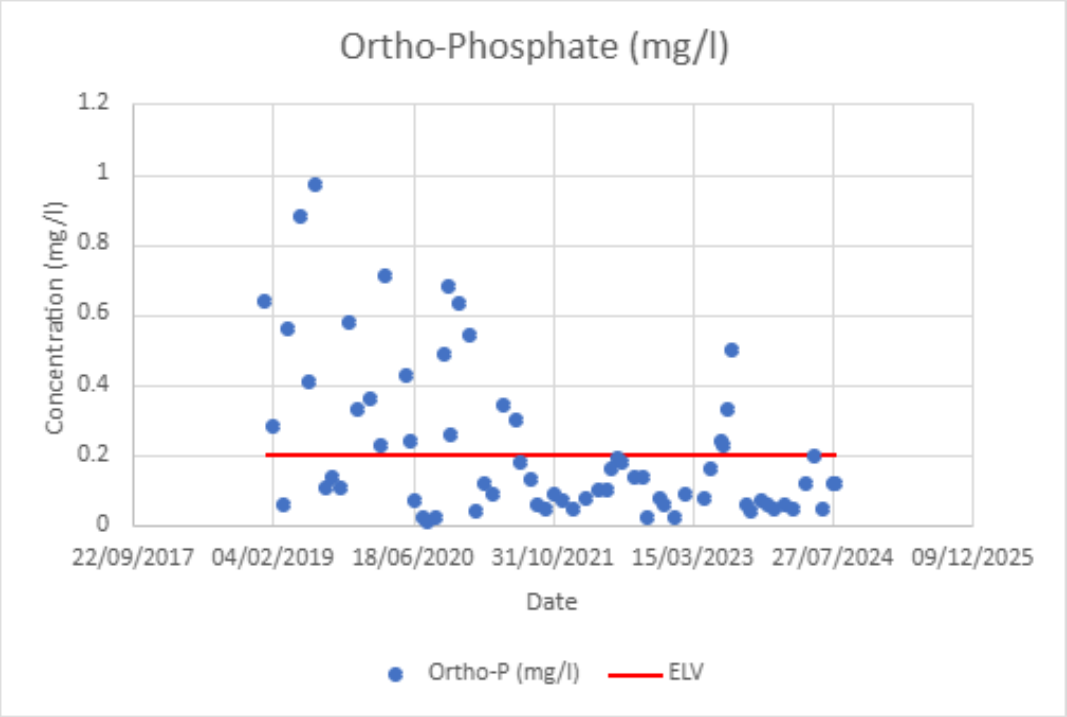


Figure 3-22: Concentration and Treatment Efficacy for Orthophosphate at Athenry WWTP

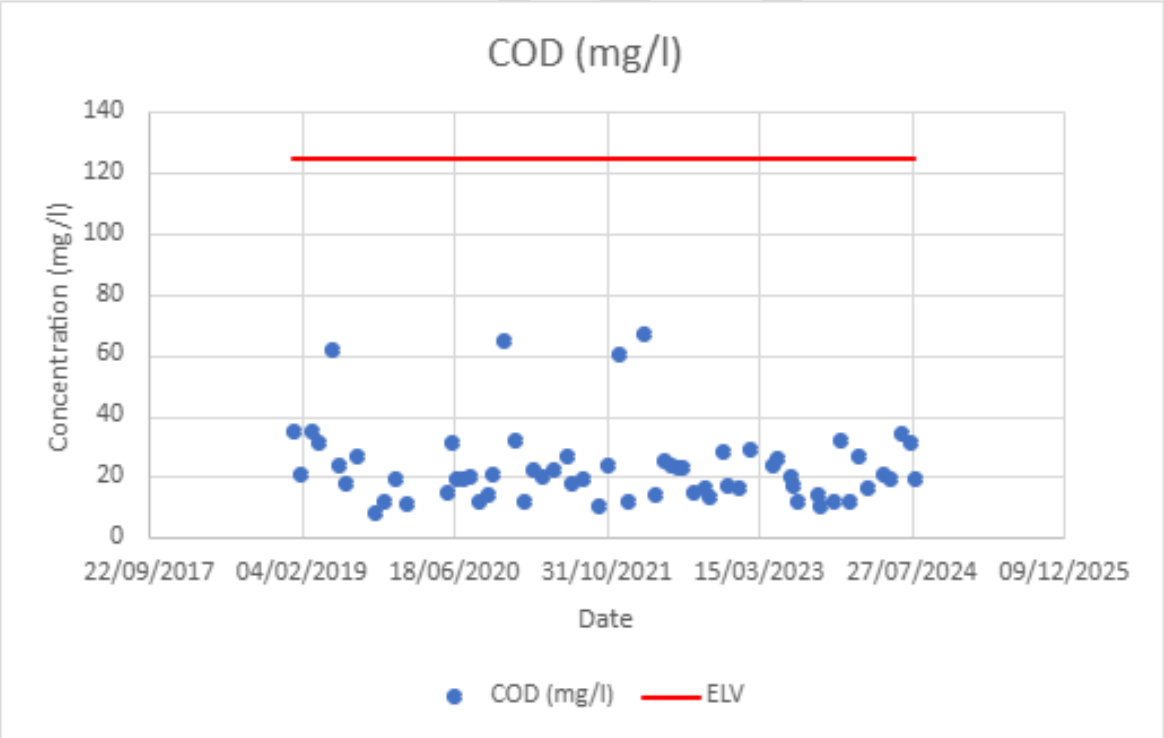


Figure 3-23: Concentration and Treatment Efficacy for COD at Athenry WWTP

3.3.6. Summary Assessment of Current and Future Treatment Risks

Athenry has been assigned specific performance indicators pertaining to hydraulic capacity and compliance with wastewater discharge licensing requirements, without any capital intervention. A red category signifies that immediate investigation and intervention are required due to the identification of a significant strategic need. Amber indicates that a strategic need exists; however, the corresponding intervention involves lower capital requirements. Green denotes that no strategic needs have been identified. Similarly to Mutton Island, Athenry WWTP constitutes significant risk that needs addressed during optioneering.

Table 3-6: Athenry WWTP Performance Indicators

Athenry WWTP	Hydraulic Capacity Strategy Need	Treatment Capacity Strategy Need
Baseline	🟡	🟡
2040	🟠	🟠
2055	🟠	🟠
2080	🟠	🟠

In its current configuration, Athenry has a capability up to 9,500PE as specified in the Annual Environmental Report. If housing development accelerates over the next 15 years at the rate specified in the RSES, the facility's capacity may be exceeded by 2030 unless capital investment is undertaken. This may result in the plant's inability to meet its discharge licence requirement, without intervention, therefore highlighting its deteriorating risk status at the 2040 horizon. It is expected that the plant will exceed its operational limit during the timeframe of the Strategy.

Athenry WWTP currently has a design capacity of 9,500 PE on a circa 1 ha. site. However, it currently operates at a lower capacity with some treatment streams offline awaiting the growth in the agglomeration. The site layout has a vacant process stream (secondary treatment Stream 2 and disused shed), presenting immediate opportunities for retrofit or infill expansion without encroaching on external land. Any additional treatment capacity up to 10,000 PE can proceed under existing planning exemptions (Class 58(g)), so long as the built area increase is ≤ 10% and structure heights remain unchanged. Capacity upgrades beyond 10,000 PE, may require planning consent, which will require consideration as part of Strategy optioneering and implementation timelines.

Therefore, there are two main options for Athenry WWTP that consider the construction feasibility, operability, site constraints, future permits and wider area requirements:

1. Refurbish and expand the existing and redundant treatment assets to create a treatment profile that can meet current and future needs
2. Transfer the Athenry WWTP flow and load to a new location and build a new WWTP that meets current and future regulatory requirements and growth projections for the wider Galway area. This option may include an interim solution whereby the load is transferred to the marine outfall proposed for the New WWTP to protect the local sensitive water course with consideration to short-term growth projections.

Option 1 presents several challenges; therefore Option 2 is the preferred option due to the sensitive nature of the current receiving waterbody, likely stringent future permits and constructability, operability, planning and biodiversity risk of trying to expand at the current site. Some factors that were considered in this decision are noted below:

- **Flood vulnerability** along the River Clarin's banks, with minor fluvial extents affecting southern process areas (1:100-year floodplain), and
- **Land constraints** should new process units be required the site is constrained by a school to the North and West and with a river and major road to the south.
- **Treatment Standards - dilution available** in the River Clarin is low and water quality modelling indicates significant constraints in assimilative capacity. The downstream reach from the WWTP is poor WFD status and sits within a karst region, giving rise to significant concern about ongoing treatment at the site. Furthermore, water quality modelling indicates that treatment standards for the WWTP in future, to accommodate future design capacity, would not be viable using existing known technologies.
- **Regulatory resilience –** although the site is currently below the 10,000 PE in the rUWWTD and the Corrib Estuary is not designated as a sensitive area; the assessment considers potential future changes. The growth for the WWTP will go over 10,000PE during the Strategy's planning horizon therefore the risk of tertiary treatment standards presents a further vulnerability that needs to be considered.

Figure 3-24 provides a summary of the recommendations for Athenry WWTP, presenting a delivery roadmap informed by the assessment results. The load from Athenry should be transferred to a new WWTP around the 2040 design horizon. For further information please reference Appendix 5.

Figure 3-24: Athenry WWTP Recommendations

3.4 Claregalway WWTP

3.4.1. Site Description

Claregalway WWTP serves the Claregalway agglomeration, which is located on the River Clare approximately 10km northeast of Galway City. The Claregalway WWTP is situated west of the village and operates alongside the Claregalway WWPS, as shown in Figure 3-25. The treated effluent flows to the River Clare which is a designated Special Area of Conservation (SAC) and down river to Lough Corrib which is also an SAC and Special Protection Area (SPA).

Figure 3-25: Claregalway WWTP Site Location

3.4.2. Overview of Treatment Processes

The site treats wastewater using preliminary and secondary treatment processes, as summarised in this section and the site process flow diagram shown in

The preliminary treatment involves screening, grit removal, and odour control. After preliminary treatment, secondary treatment is carried out using three Sequencing Batch Reactors (SBRs) each with 677m^3 capacity, this involves filling, aeration, settling and decanting phases. There is also a ferric sulphate dosing system to remove phosphorus. The treated effluent passes through a disc filter screen which removes any remaining particles before discharge to the River Clare through a secure outfall pipe.

There is no storm discharge or storage at Claregalway WWTP as the catchment is fully separate, and therefore minimal storm water enters the network upstream of the WWTP. There is a localised

report of river ingress into the system via low lying manholes which can surcharge during high river flows. To manage emergencies, the Claregalway WWPS has a 300m^3 emergency storage capacity. This storage is typically used during power outages or other emergencies. Recently, the river ingress issues in the Claregalway catchment meant that the WWTP received dilute flows, and the emergency storage at the WWPS was utilised.

3.4.3. Growth Context

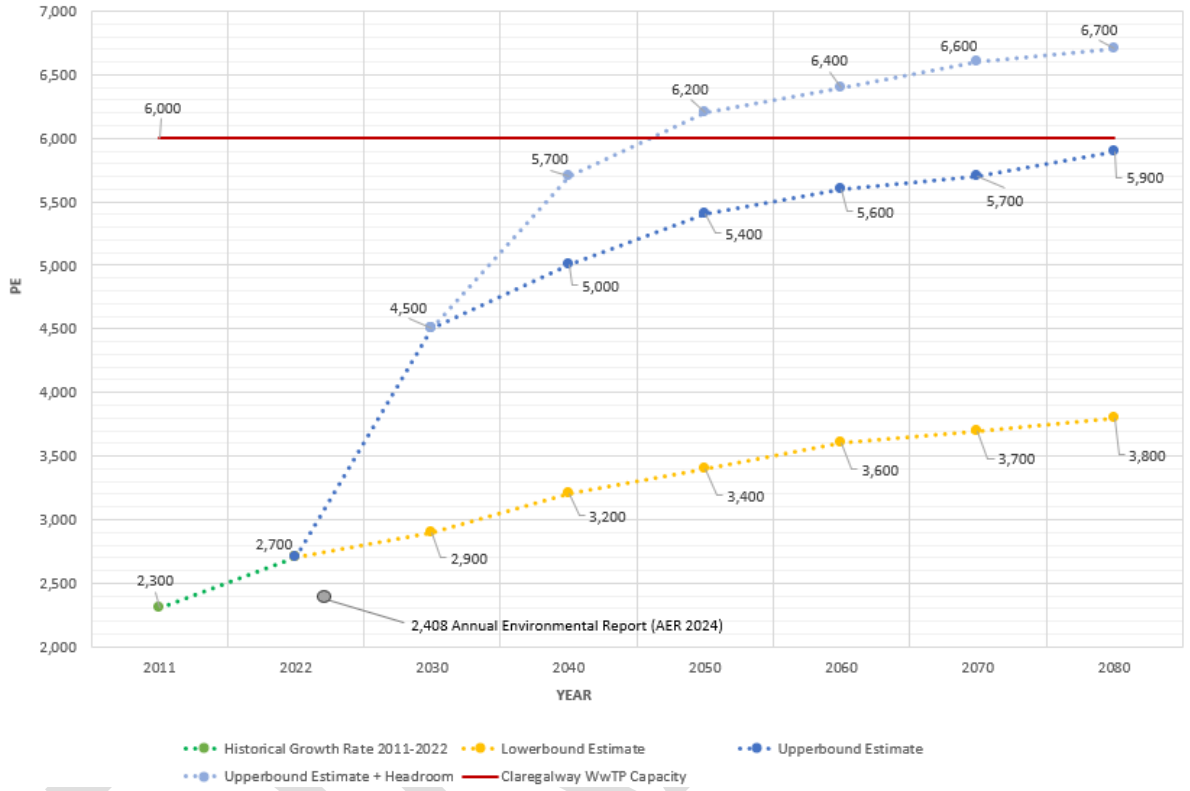


Figure 3-26: Claregalway PE Growth Projection

As discussed in *Appendix 1: Managing Growth,* based on upper bound projections, the estimated growth for this agglomeration from 2022 to 2080 indicates an increase of approximately 4,000 PE, equating to a nearly 250% rise in capacity. Considering available headroom, by 2080 the wastewater treatment plant (WWTP) may exceed its design capacity by 14%.

3.4.4. WWTP Hydraulic Headroom

According to the 2024 AER[23], Claregalway WWTP has a plant capacity of 6,000 PE. In 2024, the peak collected load at the WWTP was 2,408 PE, and therefore based on 2024 data, the plant capacity is not being exceeded.

No flow conditions are given in the permit for the site; however, the AER[3] states that the WWTP is designed to treat up to 1,200m^3/day at dry weather flow (DWF), and the peak hydraulic capacity of the plant is 3,600m^3/day at flow to full treatment (FFT).

[23] D0543-01_2024_AER

Figure 3-27 gives a summary of the measured Q90 flows to Claregalway WWTP and available headroom for 2019-2023. This shows that the WWTP is not treating up to the DWF limit of 1,200m³/day over the 5-year analysis period. Over the analysis period, the plant has around 80% headroom capacity.

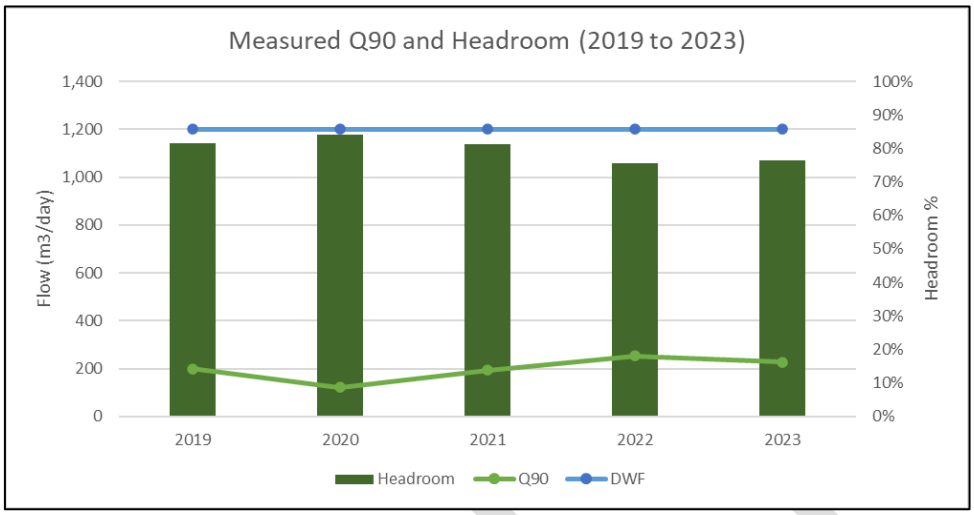


Figure 3-27:: Measured Q90 and Headroom at Claregalway WWTP (2019-2023)

Figure 3-28 shows the measured FFT against the WWTP's FFT limit of 3,600m³/day. This shows that the plant is not treating up to its FFT limit.

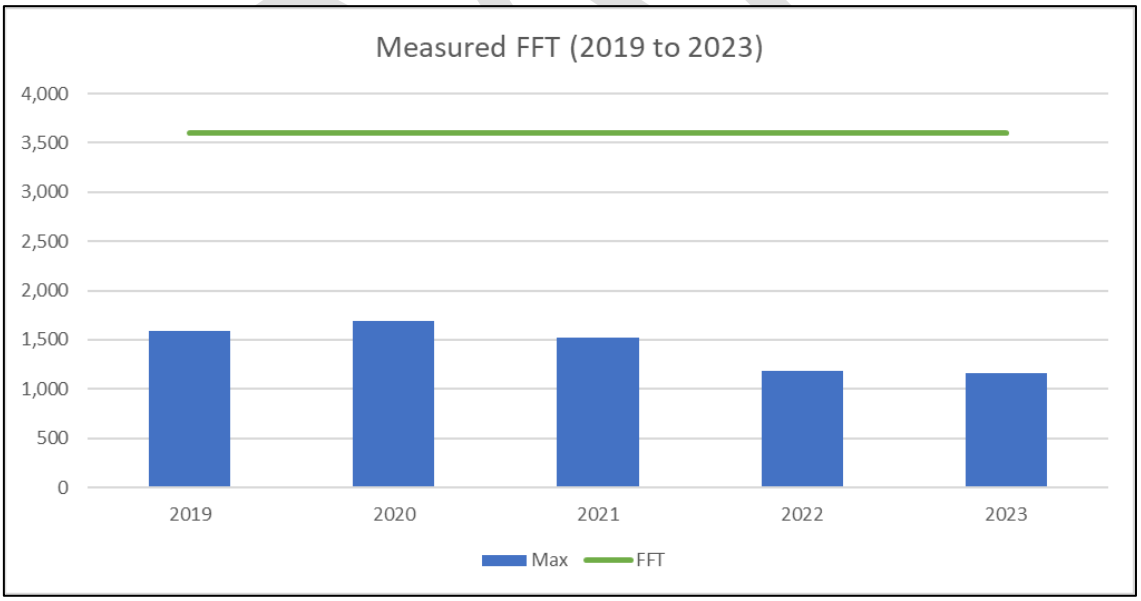


Figure 3-28: Measured FFT at Claregalway WWTP (2019-2023)

3.4.5. WWTP Treatment Risks

The Wastewater Discharge Licence (WWDL) for Claregalway WWTP details the emission limit values (ELVs) for the WWTP. These are given in Table 3-7. Raw data for the effluent Suspended Solids was unavailable, so no ELV graph is available for that parameter.

Table 3-7: Claregalway WWTP ELVs

Parameter	WWDL ELV (Schedule A)
COD	125mg/l
Suspended Solids	35mg/l
BOD (5 Days)	25mg/l
pH	6.0 - 9.0
Ammonia Total (N)	10mg/l
Orthophosphate	9mg/l

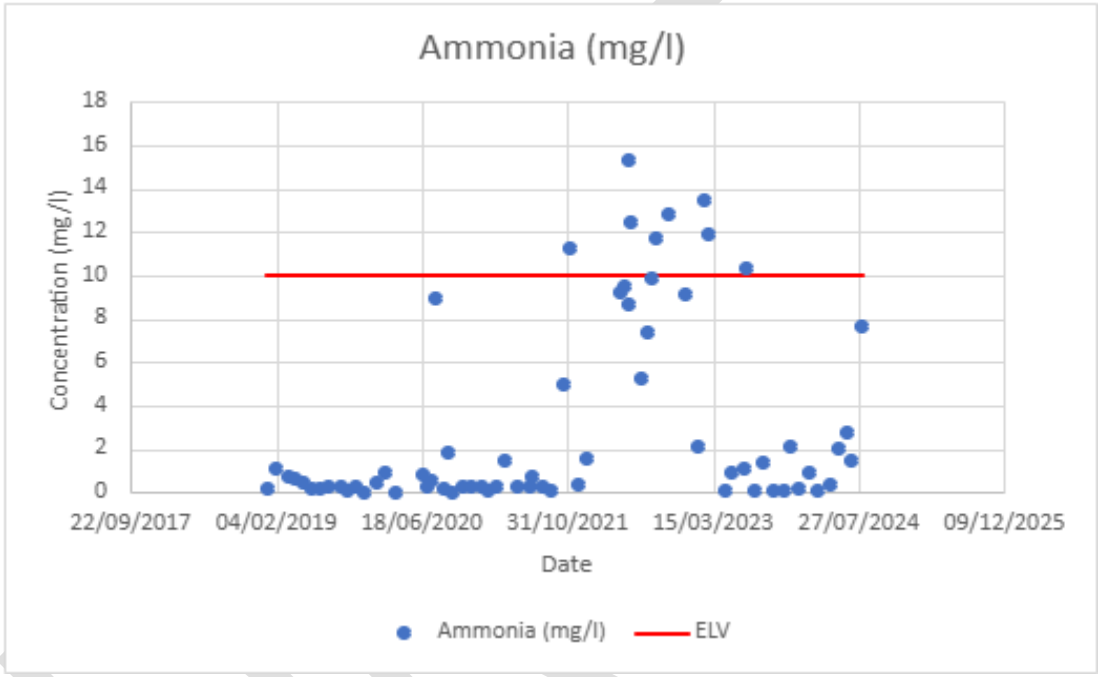


Figure 3-29: Concentration and Treatment Efficacy for Ammonia at Claregalway WWTP

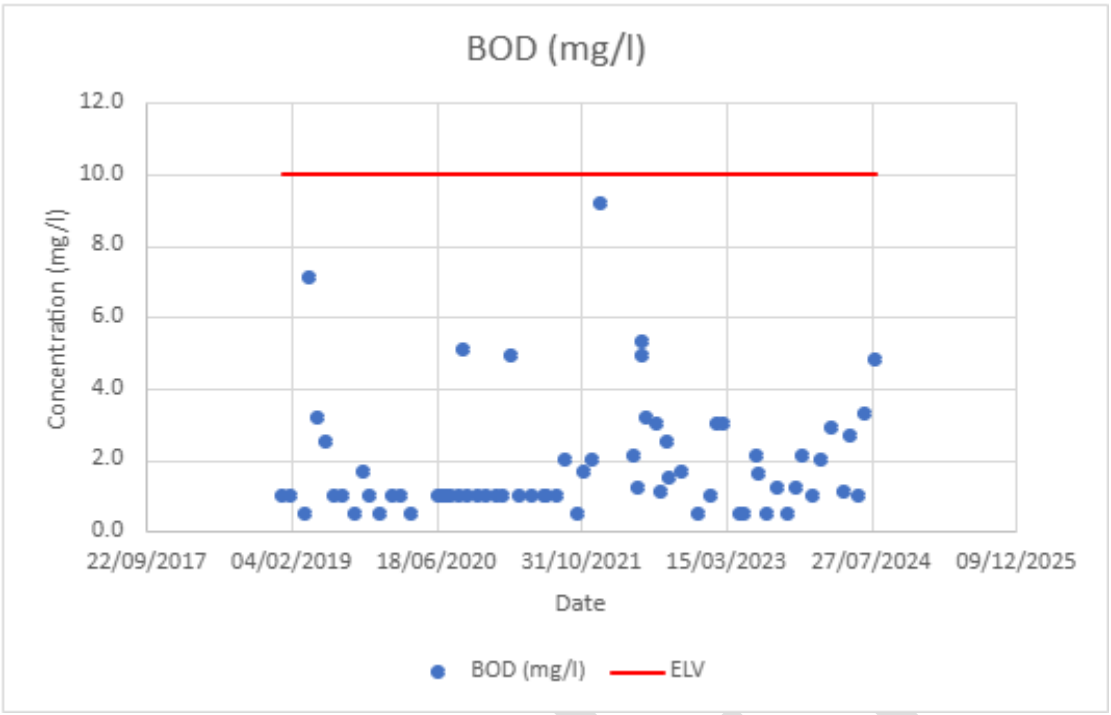


Figure 3-30: Concentration and Treatment Efficacy for BOD at Claregalway WWTP

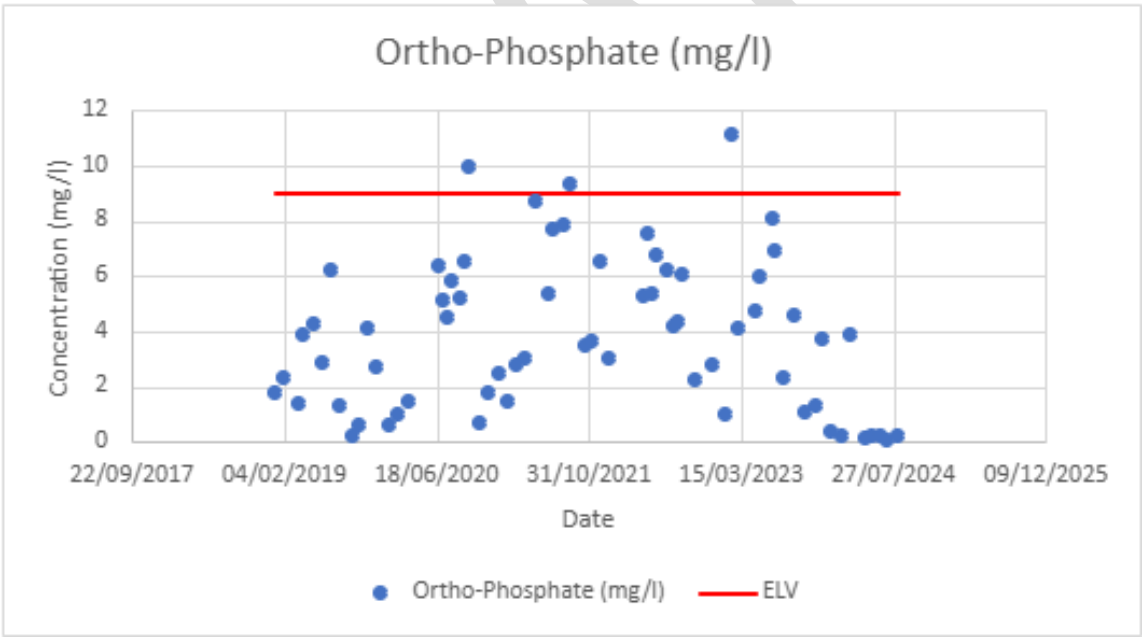


Figure 3-31: Concentration and Treatment Efficacy for Orthophosphate at Claregalway WWTP

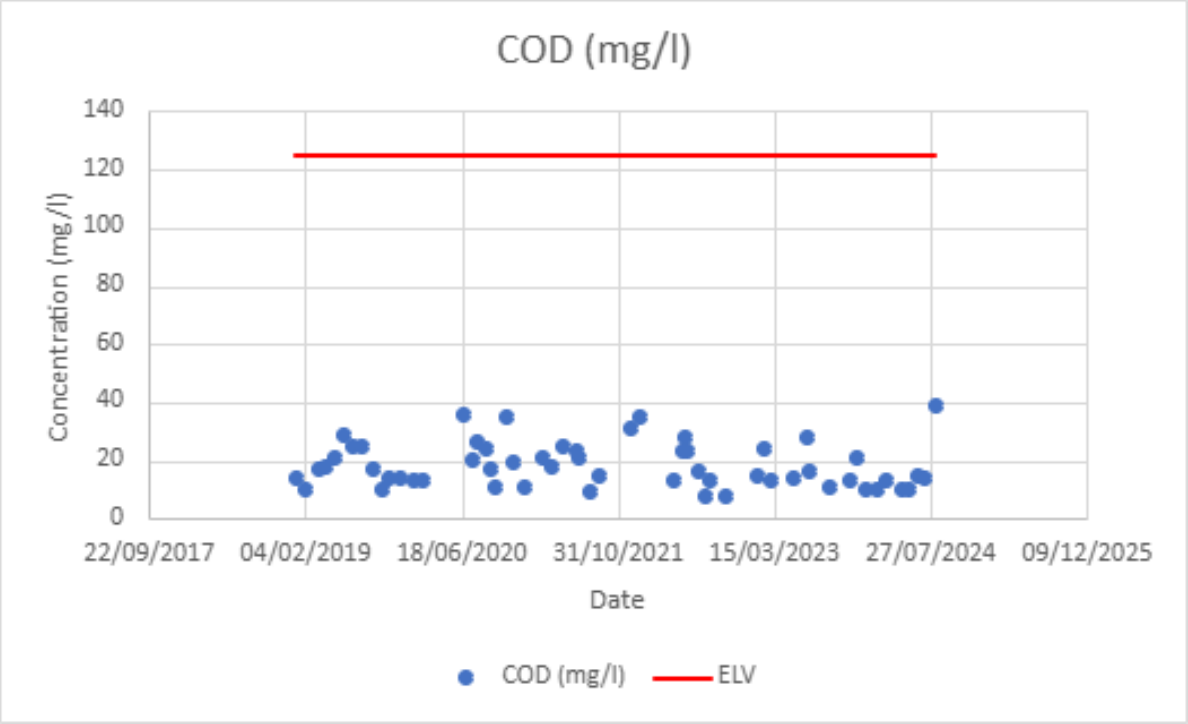


Figure 3-32: Concentration and Treatment Efficacy for COD at Claregalway WWTP

3.4.6. Summary Assessment of Current and Future Treatment Risks

Claregalway has been assigned specific performance indicators pertaining to hydraulic capacity and compliance with wastewater discharge licensing requirements, without any capital intervention. A red category signifies that immediate investigation and intervention are required due to the identification of a significant strategic need. Amber indicates that a strategic need exists; however, the corresponding intervention involves lower capital requirements. Green denotes that no strategic needs have been identified. Green denotes that no needs have been identified.

Table 3-8: Claregalway WWTP Performance Indicators

Claregalway WWTP	Hydraulic Capacity Strategy Need	Treatment Capacity Strategy Need
Baseline	●	●
2040	●	●
2055	●	●
2080	●	●

The WWTP site spans circa 2 hectares, with 1 hectare of available greenfield space for future infrastructure or renewable energy projects. In 2008 Part 8 Planning Approval covered a phased expansion to 9,000 PE (initially 6,000 PE, with an upgrade path).

Data for Ireland's Catchment Flood Risk Assessment and Management (CFRAM) programme indicates the site falls partially within 1:10-year (high probability) and 1:100-year (medium

probability) flood extents, with the majority in the 1:1,000-year flood zones. It is recommended that any future process units that may be required are designed with this in consideration.

Water quality modelling demonstrates that treatment and discharge to the existing location will remain feasible through 2080 using presently available technologies. There are no anticipated regulatory obligations linked to the recast UWWTD at this site, as projected population growth is expected to remain below the threshold of 10,000 PE so the WWTP is resilient from a regulatory standpoint and has available space to expand if there were future tightening of regulatory standards.

There are two main options for Claregalway WWTP that consider the construction feasibility, operability, site constraints, future permits and wider area requirements:

1. Optimise and expand the existing treatment assets to create a treatment profile that can meet current and future needs
2. Transfer the Claregalway WWTP flow and load to a new location and build a new WWTP that meets current and future regulatory requirements and growth projections for the wider Galway area.

Option 1 is the preferred option due to the WWTP being a foul only system that has the potential to be able to expand to meet future requirements. The licence conditions are readily achievable and the plant would benefit from having more load being received at the works, in a balanced fashion, to allow the biological process to operate more efficiently.

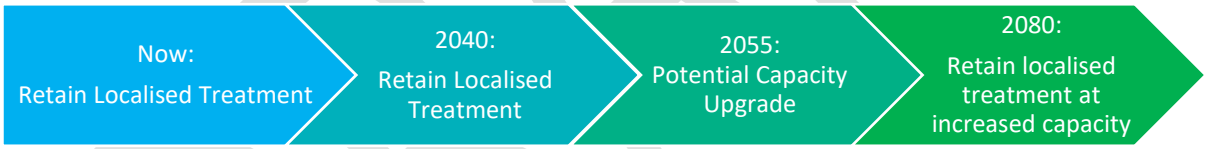


Figure 3-33: Claregalway WWTP Recommendations

3.5 Moycullen WWTP

3.5.1. Site Description

The Moycullen WWTP is located east of Moycullen village in County Galway, and has a main treatment site of 0.86 ha, shown in Figure 3-34. The plant effluent discharges into the Ballyquirke Canal, which flows into Ballyquirke Lake and downstream to Lough Corrib which is also an SAC and Special Protection Area (SPA). There is a separate portion of land to the east of the WWTP where treatment flows cross the N59 bypass and discharge to a reed bed adjacent to the Ballycuirke Canal. Beside the WWTP there is a storm storage wetland that is owned by Galway County Council and is used for storage and treatment of separated storm water.

Figure 3-34: Moycullen WWTP Site Location

Figure 3-35: Ballyquirke Canal

3.5.2. Overview of Treatment Processes

Moycullen WWTP treats wastewater using preliminary treatment, secondary treatment (via activated sludge), and chemical phosphorus removal, as summarised in this section.

The preliminary treatment includes screening and grit removal. Secondary treatment uses two aeration tanks with an FBDA system, allowing oxygen to be introduced for biological treatment. The aerated water is then sent to final settlement clarifiers where solid waste is separated. A chemical dosing system, using ferric sulphate, is used to remove phosphates from the treated water before it moves to the next stage. After settlement, the treated water flows to a final effluent chamber and is then sent through a reed bed system for tertiary treatment. The regulatory sample point is upstream of the reedbed. From here, the effluent is discharged into the Ballyquirke Canal. There is also sludge thickening and dewatering facilities on site.

During heavy rainfall conditions, excess diluted wastewater from high inflows is stored in a stormwater tank with a capacity of 381m³. This tank is equipped with pumps to return stormwater to the system once the rainfall has abated and process conditions allow for the return of the stored flow.

3.5.3. Growth Context

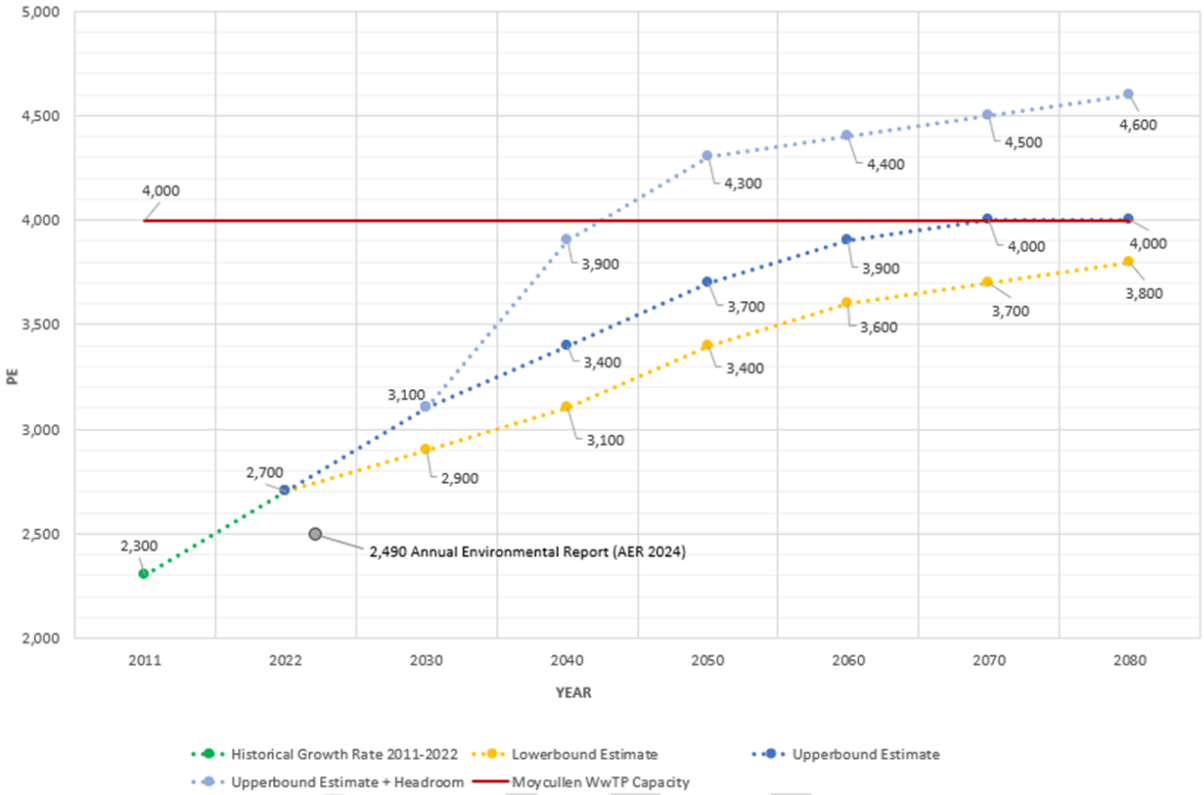


Figure 3-36: Moycullen PE Growth Projection

As discussed in *Appendix 1: Managing Growth,* based on upper bound projections, the estimated growth for this agglomeration from 2022 to 2080 indicates an increase of approximately 2,000 PE, equating to a nearly 170% rise in load. Considering available headroom, by 2080 the wastewater treatment plant (WWTP) may exceed its design capacity by 15%.

3.5.4. WWTP Hydraulic Headroom

According to the 2024 AER[24], Moycullen WWTP has a plant capacity of 4,000 PE. In 2024, the peak collected load at the WWTP was 2,490 PE, and therefore based on 2024 data, the plant capacity is not being exceeded.

The AER states that the WWTP is designed to treat up to 720m^3/day at dry weather flow (DWF), and the peak hydraulic capacity of the plant is 2,160m^3/day at flow to full treatment (FFT).

No flow monitoring is installed at the inlet works to measure total inlet flow. There is a flow meter prior to activated sludge process and prior to the discharge to the tertiary reedbeds. Flow measurement on the site is unreliable and consequently, it is not possible to determine the full volume of flow entering the WWTP to ascertain hydraulic headroom. Furthermore, overflows from the storm tank are mixed with final effluent prior to flow measurement and sampling. The flow measurement in this channel is not to an MCERTS standard so is therefore deemed unreliable (Figure 3-37).

Figure 3-37: Moycullen final effluent area velocity meter

This arrangement gives unreliable final effluent flow and quality readings as there is no separate flow meter on the storm tank overflow.

[24] D0191-01_2024_AER

3.5.5. WWTP Water Quality Risk

The Wastewater Discharge Licence (WWDL) for Moycullen WWTP details the emission limit values (ELVs) for the WWTP. These are given in Table 3-9. Raw data for the effluent Suspended Solids was unavailable, so no ELV graph is available for that parameter.

Table 3-9: Moycullen WWTP ELVs

Parameter	WWDL ELV (Schedule A)
COD	125mg/l
Suspended Solids	35mg/l
BOD (5 Days)	10mg/l
pH	6.0 - 9.0
Ammonia Total (N)	1mg/l
Orthophosphate	0.5mg/l

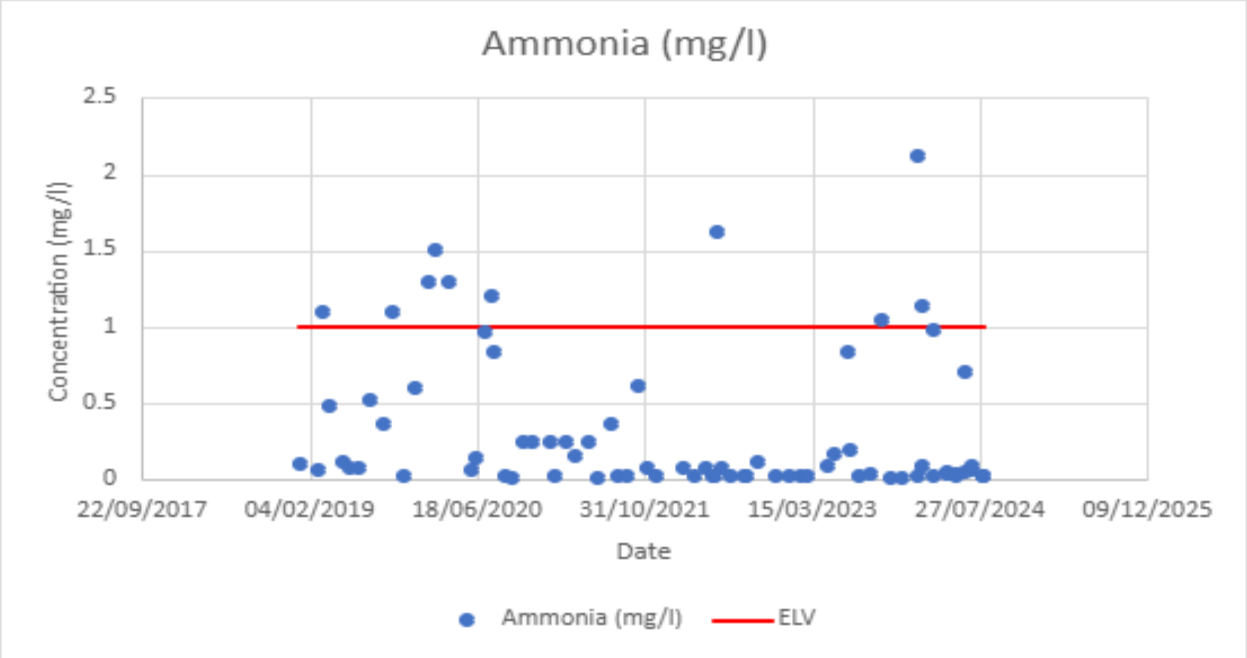


Figure 3-38: Concentration and Treatment Efficacy for Ammonia at Moycullen WWTP

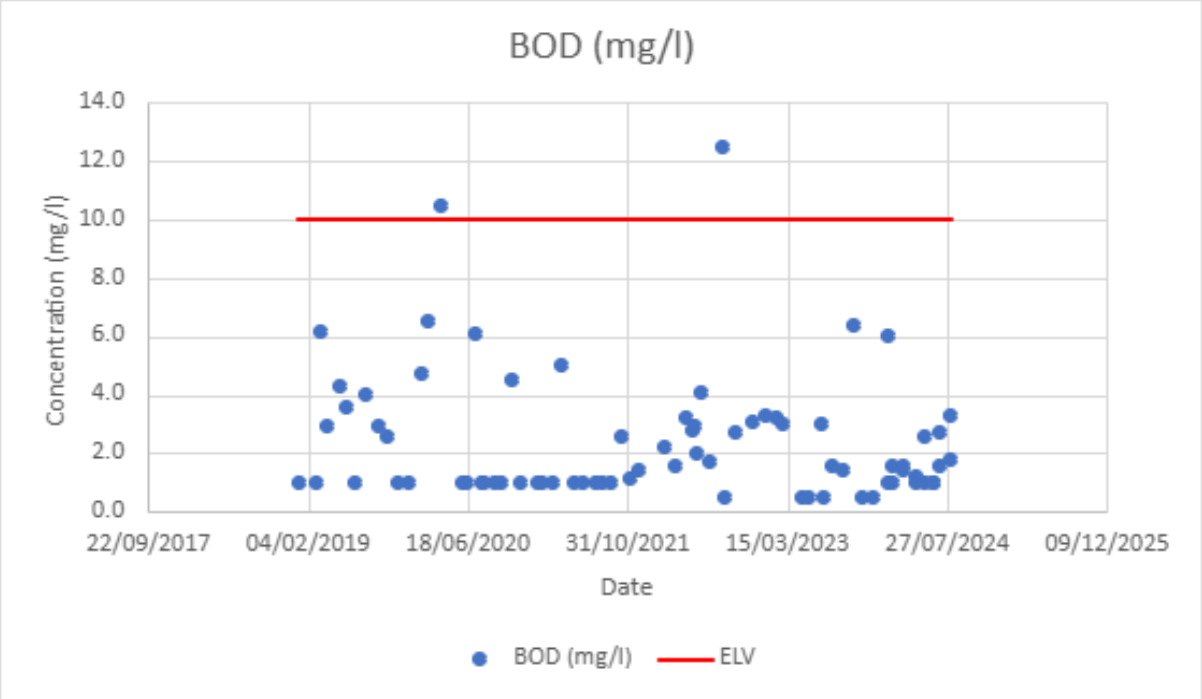


Figure 3-39: Concentration and Treatment Efficacy for BOD at Moycullen WWTP

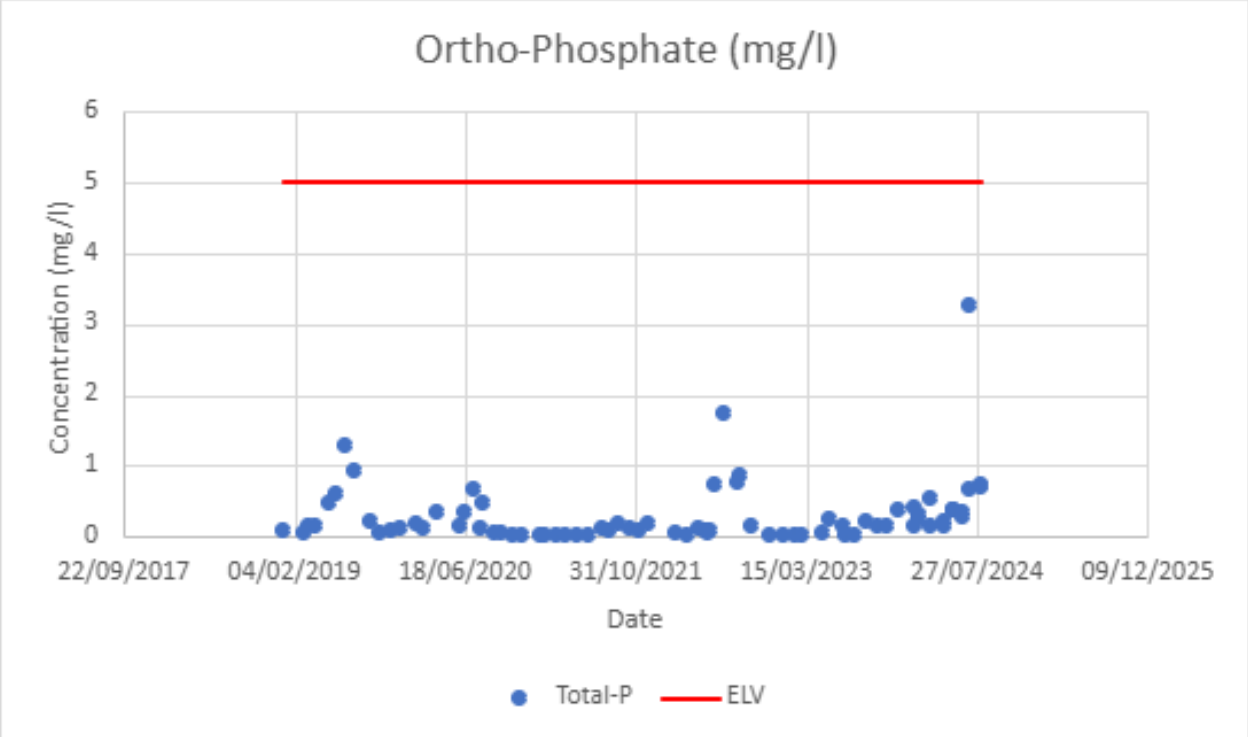


Figure 3-40: Concentration and Treatment Efficacy for Orthophosphate at Moycullen WWTP

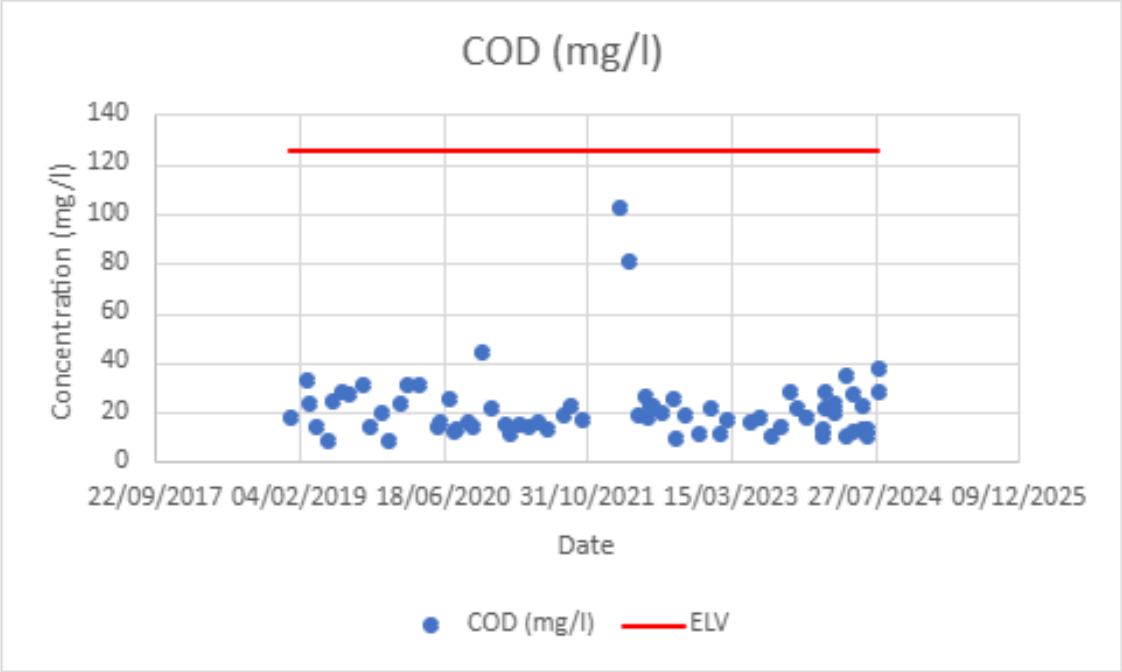


Figure 3-41: Concentration and Treatment Efficacy for COD at Moycullen WWTP

3.5.6. Summary Assessment of Current and Future Treatment Risks

Moycullen has been assigned specific performance indicators pertaining to hydraulic capacity and compliance with wastewater discharge licensing requirements, without any capital intervention. A red category signifies that immediate investigation and intervention are required due to the identification of a significant strategic need. Amber indicates that a strategic need exists; however, the corresponding intervention involves lower capital requirements. Green denotes that no strategic needs have been identified. Green denotes that no needs have been identified.

Table 3-10: Moycullen WWTP Performance Indicators

Mutton Island WWTP	Hydraulic Capacity Strategy Need	Treatment Capacity Strategy Need
Baseline	●	●
2040	●	●
2055	●	●
2080	●	●

It is strongly advised that the WWTP implement flow measurement systems compliant with industry standards, such as MCERTS. This approach would enhance asset management by enabling comprehensive and accurate monitoring of the WWTP throughout the Strategy period. Although the assessment for Moycullen shows no immediate needs identified for the WWTP, there are exceedances for ammonia that should be investigated at an appraisal level. To compliment this appraisal a better understanding of treatment flows is required to accurately determine if there are any immediate needs. For purposes of the Strategy, any needs that could arise from this

detailed assessment are likely to require base maintenance upgrades and are not detrimental to Strategy outcomes.

Furthermore, what is critical to note is that further modelling (both network and water quality) is recommended for this agglomeration to determine any future potential ELV requirements (see *Appendix 4: Impact on Water Quality*). Additionally, the potential impact of the reedbed (post-final effluent sampling) on final effluent concentrations should be evaluated, and further data collection is required to ensure that final effluent measurements are representative for modelling purposes. This modelling assessment should be carried out in parallel with the detailed assessment of WWTP to ensure accurate timing of any resilience upgrade and avoid nugatory expenditure (see *Appendix 5: Our Approach to Optioneering and Feasible Option Development*). Current water quality modelling assessments demonstrates that treatment and discharge to the existing location will remain feasible through 2080 using presently available treatment technologies. However, the exact ELV limits will require further modelling assessments and attainment of WFD Good Status in the Ballycuirke Canal is contingent upon significant enhancements in upstream water quality.

There are no anticipated regulatory obligations linked to the recast UWWTD at this site, as projected population growth is expected to remain below the threshold of 10,000 PE so the WWTP is resilient from a regulatory standpoint and has available space to expand if there were future tightening of regulatory standards.

In terms of flood risk the location is classified as having a low flood risk. Portions of the site are situated within both the 1:100 and 1:1,000-year flood boundaries. Mitigation measures should be considered in any future upgrades. The reed bed site is marked as a "Low Confidence" flood zone in SAR Seasonal flood maps, likely due to adjacent waterbody influence. Further assessment may be needed to confirm flood risks. Therefore, there are two main options for Moycullen WWTP that consider the construction feasibility, operability, site constraints, future permits and wider area requirements:

1. Optimise and expand the existing treatment assets to create a treatment profile that can meet current and future needs
2. Transfer the Moycullen WWTP flow and load to a new location and build a new WWTP that meets current and future regulatory requirements and growth projections for the wider Galway area.

Option 1 is the preferred option as the current site has capacity up to 2055, using the growth projections, and should be monitored to ascertain any required upgrades. Evaluating using all the assets, including the reed bed system, should be considered in any future plant configuration.

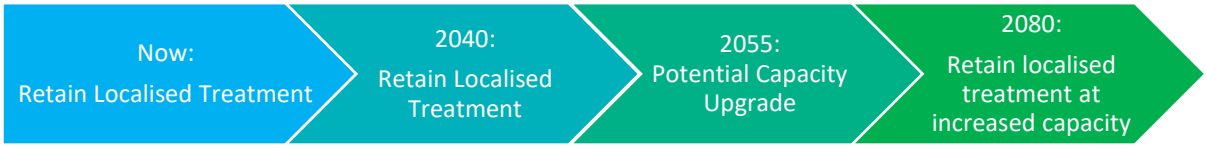


Figure 3-42: Moycullen WWTP Recommendations

3.6 WWTP Summary

The tables and figures below provide a summary of the performance of the four WWTPs, along with recommended actions based on the assessment conducted. These will require consideration during the primary screening phase of the optioneering process conducted within *Appendix 5: Our Approach to Optioneering and Feasible Option Development.*

Table 3-11: Galway City (Mutton Island) WWTP Performance Indicators

Mutton Island WWTP	Hydraulic Capacity Strategy Need	Treatment Capacity Strategy Need
Baseline	🟡	🟡
2040	🟠	🟠
2055	🟠	🟠
2080	🟠	🟠

Table 3-12: Athenry WWTP Performance Indicators

Athenry WWTP	Hydraulic Capacity Strategy Need	Treatment Capacity Strategy Need
Baseline	🟡	🟡
2040	🟠	🟠
2055	🟠	🟠
2080	🟠	🟠

Table 3-13: Claregalway WWTP Performance Indicators

Claregalway WWTP	Hydraulic Capacity Strategy Need	Treatment Capacity Strategy Need
Baseline	🟢	🟢
2040	🟢	🟢
2055	🟡	🟡
2080	🟡	🟡

Table 3-14: Moycullen WWTP Performance Indicators

Claregalway WWTP	Hydraulic Capacity Strategy Need	Treatment Capacity Strategy Need
Baseline	🟢	🟢
2040	🟢	🟢
2055	🟡	🟡
2080	🟡	🟡

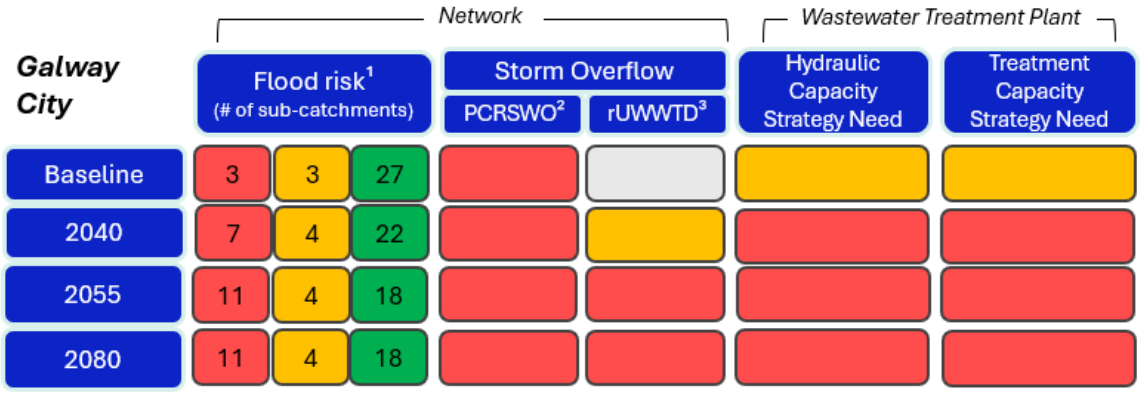
4. Performance Indicators Summary

The wastewater systems in the GWS study area comprises a mixture of combined, separate, and partially separate sewer systems. The study area has 29 SWOs, mostly located in the Galway City area where the networks are mostly combined. The SWOs environmental and flood risk performance indicators have been assessed in section 2. The *current* environmental performance has been assessed against the four criteria within the Procedures and Criteria in Relation to SWOs (PCRSWOs). In addition to the above, an assessment against the *future* requirements within the recast Urban Wastewater Treatment Directive, specifically the indicative non-binding objective outlined within Annex V. This is based on the "load lost" discharged from SWOs within qualifying agglomerations.

Wastewater treatment performance indicators have been discussed within section 3. These give an overview of each WWTP, their current and potential ELVs and any associated hydraulic and performance risks. An assessment of future risk and resilience of each WWTP was undertaken to make a recommendation on the treatment profile of each WWTP to inform the optioneering process conducted within *Appendix 5: Our Approach to Optioneering and Feasible Option Development.*

These findings are detailed throughout the report and the outcomes are summarised in the figures below:

Galway City Performance Indicators Summary



1. Red, Amber, Green corresponds to High, Medium and Low flood risk respectively. The number in the box denotes the number of subcatchments affected in the model.
2. This is an assessment against current SWO performance criteria (PCRSWOs)
3. This is a future assessment against the indicative non-binding objective within Annex 5 of the rUWWTD (2% Load Lost Objective)

Figure 4-1: Summary of the Key Performance Indicators for Galway City Agglomeration

Overall, Galway City presents significant risks which must be addressed as a priority. The agglomeration has several concerns related to network and treatment performance without any intervention:

Network Flood Risk: Flood risk from foul / combined sewer manholes has been evaluated. Galway City contains several subcatchments with medium (orange) to high (red) flood risk in the baseline model with risk in subcatchments increasing in the future. A subcatchment is a discrete

drainage boundary that represents an area within a sewer network model. Flood risk categories are described further in section 2.6.

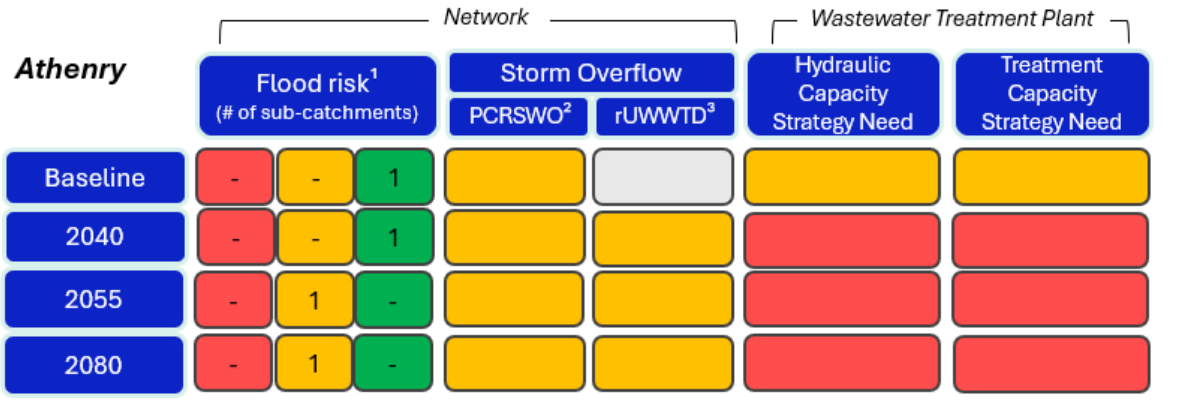
Network Environmental Risk: in relation to current environmental performance criteria, risks have been identified in relation to aesthetic and an SWO operating in dry weather conditions. In future, there are risks related to non-conformance with the non-binding indicative target outlined in Annex V of the rUWWTD. Further details are explained within section 2.4.1.

WWTP Performance: Mutton Island WWTP, which serves the Galway City agglomeration, is currently operating within its designated capacity. However, without intervention and in line with estimated growth projections, Mutton Island WWTP may reach its current capacity by 2040. A detailed assessment of WWTP performance was conducted within section 3.2. Considering regulatory risk and resilience, and the physical expansion constraints of the current WWTP, it is not considered feasible for the plant to accommodate the forecasted growth of this Strategy in the medium to long term. Therefore, it is recommended that a new WWTP, that will treat a proportion of the existing Mutton Island WWTP load, is required in the medium term (c. 2040). In the short term and covering the intervening period before the new WWTP comes into operation, it is recommended that a resilience upgrade be implemented to ensure the plant meets its current discharge licence requirements and extends the design life of the wastewater treatment plant (WWTP) to support anticipated growth until a new WWTP is constructed. The diversion of load from this downsized Mutton Island WWTP to a new WWTP will be required to service the long-term growth demands of the study area and provide resilience to tightening regulatory standards at both WWTP locations.

Based on this risk analysis, the following recommendations were made for consideration within *Appendix 5: Our Approach to Optioneering and Feasible Option Development.*

Figure 4-2: Mutton Island WWTP Recommendations

Athenry Performance Indicators Summary



1. Red, Amber, Green corresponds to High, Medium and Low flood risk respectively. The number in the box denotes the number of subcatchments affected in the model.
2. This is an assessment against current SWO performance criteria (PCRSWOs)
3. This is a future assessment against the indicative non-binding objective within Annex 5 of the rUWWTD (2% Load Lost Objective)

Figure 4-3: Summary of the Key Performance Indicators for Athenry Agglomeration

Athenry catchment presents risks both in the baseline with risk increasing in future. The ability for treatment to increase in line with growth and ensure that the current receiving water body is protected presents a challenge:

Network Flood Risk: Athenry has low (green) but not negligible flood risk up to the 2055 horizon, where the risk increases without any strategic intervention.

Network Environmental Risk: in relation to current environmental performance criteria, there is an increasing risk from intermittent discharges to water quality in line with agglomeration growth. Modelling demonstrated that intermittent discharges are not at risk of causing ecological harm to the River Clarin, based on Fundamental Intermittent Standards (FIS), however, the UPM High Polluting Standards (which aren't legal targets in Ireland) suggest that the intermittent discharges may potentially have an ecological impact on the receiving watercourse. For this reason, the network is given medium risk status in relation to intermittent discharges. In relation to non-conformance with the non-binding objective outlined in Annex V of the rUWWTD the agglomeration is a risk.

WWTP Performance: In its current configuration, Athenry WWTP has a treatment capability up to 9,500PE as specified in the Annual Environmental Report. If housing development accelerates over the next 15 years at the rate specified in the RSES, the facility's capacity may be exceeded by 2030 unless capital investment is undertaken. This may result in the plant's inability to meet its discharge licence requirement, without intervention, therefore highlighting its deteriorating risk status at the 2040 horizon. There is limited dilution available in the River Clarin and water quality modelling indicates significant constraints in assimilative capacity. The downstream reach from the WWTP is "poor" WFD status and sits within a karst region, giving rise to significant concern about ongoing treatment at the site. Furthermore, water quality modelling indicates that treatment standards for the WWTP in future, to accommodate future design capacity, would not be viable using existing known technologies. The load from Athenry should be transferred to a new WWTP around the 2040 design horizon.

Based on this risk analysis, the following recommendations were made for consideration within *Appendix 5: Our Approach to Optioneering and Feasible Option Development:*

Figure 4-4: Athenry WWTP Recommendations

Claregalway Performance Indicators Summary

	Network					Wastewater Treatment Plant	
Claregalway	Flood risk[1] (# of sub-catchments)			Storm Overflow		Hydraulic Capacity Strategy Need	Treatment Capacity Strategy Need
				PCRSWO[2]	rUWWTD[3]		
Baseline	-	-	1	N/A	N/A		
2040	-	-	1	N/A	N/A		
2055	-	-	1	N/A	N/A		
2080	-	-	1	N/A	N/A		

1. *Red, Amber, Green corresponds to High, Medium and Low flood risk respectively. The number in the box denotes the number of subcatchments affected in the model.*
2. *This is an assessment against current SWO performance criteria (PCRSWOs)*
3. *This is a future assessment against the indicative non-binding objective within Annex 5 of the rUWWTD (2% Load Lost Objective)*

Figure 4-5: Summary of the Key Performance Indicators for Claregalway Agglomeration

Network Flood Risk: Claregalway has low (green) but not negligible flood risk which does not increase in line with catchment growth.

Network Environmental Risk: there are no SWOs within this agglomeration therefore there is no current or future risks.

WWTP Performance: The network is a foul only system and the WWTP has the potential to expand to meet future growth and regulatory requirements growth requirements. From the 2055 horizon a capacity increase need was identified. The current and future estimated licence conditions are readily achievable with known current technologies. Currently the plant would benefit from having more biological load being received for treatment, in a balanced fashion, to allow the biological process to operate more efficiently.

Based on this risk analysis, the following recommendations were made for consideration within *Appendix 5: Our Approach to Optioneering and Feasible Option Development:*

Figure 4-6: Claregalway WWTP Recommendations

Moycullen Performance Indicators Summary

Moycullen	Network					Wastewater Treatment Plant	
	Flood risk[1] (# of sub-catchments)			Storm Overflow		Hydraulic Capacity Strategy Need	Treatment Capacity Strategy Need
				PCRSWO[2]	rUWWTD[3]		
Baseline	-	-	1		N/A		
2040	-	-	1		N/A		
2055	-	-	1		N/A		
2080	-	-	1		N/A		

1. Red, Amber, Green corresponds to High, Medium and Low flood risk respectively. The number in the box denotes the number of subcatchments affected in the model.
2. This is an assessment against current SWO performance criteria (PCRSWOs)
3. This is a future assessment against the indicative non-binding objective within Annex 5 of the rUWWTD (2% Load Lost Objective)

Figure 4-7: Summary of the Key Performance Indicators for Moycullen Agglomeration

Network Flood Risk: Moycullen has low (green) but not negligible flood risk which does not increase in line with catchment growth.

Network Environmental Risk: there is one SWO within this agglomeration at the WWTP. Sewer network modelling[25] demonstrates that the SWO discharges may require aesthetic screening, however, the frequency and volume of discharges can be considered negligible. There have also been no verified complaints in this area therefore it has been classified as low risk. For assessment under the rUWWTD, the assessment is currently classified as green as it is below 10,000 PE[26].

WWTP Performance: Although the assessment for Moycullen shows no immediate strategic needs identified for the WWTP, there are exceedances for ammonia that should be investigated at an appraisal level. To compliment this appraisal, a better understanding of treatment flows is required to accurately determine if there are any immediate needs and should be subject to further modelling. For purposes of the Strategy, any needs that could arise from this detailed

[25] Further modelling is recommended in Moycullen

[26] Subject to Article 18 risk assessment.

assessment are likely to require base maintenance upgrades and are not detrimental to Strategy outcomes and recommendations.

Based on this risk analysis, the following recommendations were made for consideration within *Appendix 5: Our Approach to Optioneering and Feasible Option Development:*

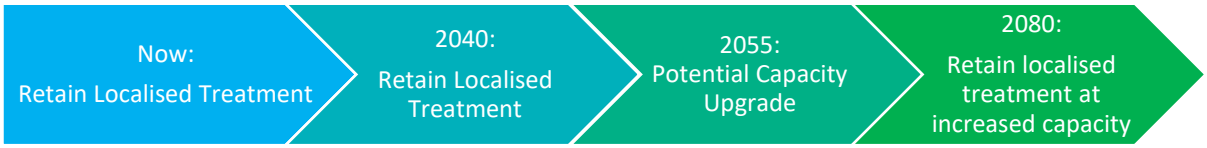


Figure 4-8: Moycullen WWTP Recommendations

Annex 1 – List of Subcatchments within Study Area

Agglomeration	Sub-Catchment	
Galway City	1	Roscam
	2	Merlin Park & Doughiska
	3	Murrough
	4	Ballyloughane
	5	Renmore
	6	Lough Atalia
	7	Baile an Choiste
	8	Castlepark
	9	Monivea Road & Mervue
	10	Mervue
	11	Ballybrit/Parkmore
	12	Riverside & Tuam Road
	13	Dun na Coiribe
	14	Ballinfoile & Headford Road
	15	Liosbaun Industrial Estate
	16	Waterworks & Dyke Road
	17	City Centre
	18	Dual Lines
	19	Taylors Hill
	20	Westside
	21	NUIG & Upper Newcastle
	22	Earl's Island
	23	Nuns Island
	24	Dominick Street
	25	Parkavera
	26	Western Knocknacarra
	27	Eastern Knocknacarra
	28	Salthill
	29	Grattan Road
	30	Lower Newcastle & Claddagh
	31	Bearna
	32	Oranmore
Moycullen	33	Moycullen
Athenry	34	Athenry
Claregalway	35	Claregalway

--o-- End of Report --o--