ATTACHMENT D.2:

ASSESSMENT OF IMPACT ON RECEIVING WATERS

ATTACHMENT D.2.1:

IMPACT ASSESSMENT REPORT
OCTOBER 2024

ATTACHMENT D.2.1: IMPACT ASSESSMENT REPORT, OCTOBER 2024

1. Introduction

This Report provides a summary of the Impact Assessments prepared to determine the impact of the operational discharge, SW001, from the Gweedore agglomeration on the receiving waterbody, the Catheen River, and also addresses the criteria as outlined in **Section D.2**. of the EPA guidance document.

2. Water Environment

The operational discharges (Primary Discharge, SW001) from the Gweedore agglomeration, discharge to the River Catheen (Catheen_010) which is part of the Gweebarra-Sheephaven catchment area (Hydrometric Area 38). This catchment includes the area drained by all streams entering tidal water in Gweebarra River, Sheephaven Bay and between Rossan Point and Fanad Head, Co. Donegal, draining a total area of 1,450km^2.

According to Catchments.ie (at the time of preparing this application (October 2024)), the main significant pressures for at risk river waterbodies within this hydrometric area are anthropogenic pressures, hydromorphology, agriculture, urban run-off, urban waste water, water treatment, industry, forestry, extractive industry, domestic waste water from septic tanks and aquaculture. Only Creeslough and Kerrykeel WwTPs are listed as significant pressures on river waterbodies in the Gweebarra-Sheephaven catchment area.

The WFD status of the Catheen_010 is "Poor" and "At Risk". Significant pressures for the Catheen_010 have been determined, within the 3rd cycle Catchment Report, as mines and quarries, urban run-off (diffuse sources) and domestic waste water (from single house discharges). It should be noted, In 2022, a UÉ project was undertaken, in which 41 no. residential properties were connected to the WwTP via low pressure sewer 'pods' as part of a demonstration project to reduce the reliance on septic tanks in the area. This will decrease the potential for release of untreated wastewater into the environment by enhancing the collection and treatment of wastewater.

Further downstream, the Catheen_010 flows to Gweedore Bay (IE_NW_160_0000). Gweedore Bay has a WFD status of "*High*". The WFD objective is to maintain "*High*" status to 2027. No significant pressures for Gweedore Bay are identified.

The EPA undertake biological monitoring of the River Catheen downstream of the WwTP. Upstream of the WwTP, recent monitoring results for Q values is not available. Downstream of the WwTP at RS38C030200 (*ca.* 1.1 km downstream), the 2021 monitoring reported a Q value of 3 (Poor Status). Kick sampling was taken by an ecologist on the 25th June 2024 to provide an indication of biological water quality *ca*. 20m upstream and *ca.* 100m downstream of the primary discharge location in the Catheen_010. On the basis of the macroinvertebrate assemblage, a Q3 rating would be warranted at the upstream and downstream monitoring locations, indicating "*Poor*" water quality conditions. Refer to **Attachment D.2.2**: Appropriate Assessment (AA) Screening & Natura Impact Statement (NIS) report for further details.

Ambient monitoring data (May 2022 - May 2023 and February 2021 – April 2024) for the Catheen River is presented in **Tables 37, 39** and **41** of the Application Form.

Based on the ambient monitoring results, the average concentration for BOD is indicative of "*High*" water quality at the upstream monitoring location (mean and 95%ile). At the downstream location located *ca.* 30m downstream of the primary discharge location, the mean concentration is within the indicative of "*Good*" status (95%ile only). Further downstream at RS38C030200, *ca*. 1.1km downstream of the primary discharge location, the average concentration of BOD improves and is indicative of "*Good*" water quality (mean and 95%ile).

In terms of Ammonia, the average concentration is indicative of "*Good*" water quality at the upstream monitoring location (mean and 95%ile). The average concentration at the monitoring location located *ca.* 30m downstream of the primary discharge location is not indicative of "*Good"* water quality. Further downstream at RS38C030200, *ca*. 1.1km downstream of the primary discharge location, the average concentration of Ammonia improves and is indicative of "*Good*" water quality (95%ile only).

In relation to Ortho-P, the average concentration is indicative of "*Good*" water quality (95%ile only) at the upstream monitoring location. The average concentration at the downstream monitoring location located *ca.* 30m downstream of the primary discharge location is indicative of "*Moderate*" quality (*i.e.* >0.035 mg/l). Further downstream at RS38C030200, *ca*. 1.1km downstream of the primary discharge location, the average concentration of Ortho-P improves band is indicative of "*Good*" water quality (95%ile only).

There are no drinking water abstraction points, salmonid waters, nutrient sensitive areas or Freshwater Pearl Mussel (*Margaritifera Margaritifera*) catchments) in proximity to the Gweedore agglomeration or downstream of the primary discharge.

The Portarthur, Derrybeg Bathing Water Area is *ca*. 3.8km downstream of the primary discharge. This Bathing Water Area is classified as achieving Excellent Water Quality in 2023 based on the assessment of bacteriological results for the period 2020 to 2023 and therefore it is considered that the primary discharge from the Gweedore agglomeration is not impacting on this downstream Bathing Water Area.

Gweedore Bay is a designated Shellfish Area, the area designated is *ca*. 6km downstream (*via* Gweedore Bay) of the primary discharge. Based on the distance downstream and the scale of the primary discharge, it is considered that Gweedore agglomeration is not impacting on this designated area.

In terms of NHAs/pNHAs, the WwTW does not discharge directly to any NHA / pNHA. The closest site is Gweedore Bay and Islands pNHA (Site Code: 001141) located *ca.* 1.3km d/s. In relation to European sites, the primary discharge point discharges *ca.* 1.3km upstream of the Gweedore Bay and Islands SAC (Site Code: 001141). West Donegal Coast SPA (Site Code: 004150) and West Donegal Islands SPA (Site Code: 004230) are located *ca.* 3.3km and 5.5km, respectively, downstream of the primary discharge point. A combined Appropriate Assessment (AA) Screening Report and Natura Impact Statement (NIS) was prepared in October 2024 to accompany this WWDL Application. The NIS concludes that Primary Discharge (SW001), alone or in-combination with other plans and / or projects will not give rise to adverse effects on the integrity of any European Site, once the prescribed mitigation measures are implemented. Refer to **Section 4** below and **Attachment D.2.2**: AA Screening & Natura Impact Statement.

Based on the above, and operation of the WwTP to the required ELVs, it is considered that there is no environmental risk posed to the receiving water environment as a result of the discharge, SW001, from the WwTP.

Refer also to **Attachment B.5** for a copy of the Environmental Impact Assessment Screening Report for further details on the receiving environment.

3. Waste Assimilative Capacity Calculations

Waste Assimilative Capacity (WAC) calculations have been completed to inform this WWDL application process and to show the impact of the primary discharge from the WwTP on the receiving waterbody, the Catheen River (Catheen_010).

Calculations were carried out to determine the i) Emission Limit Values (ELVs) that would be required to ensure there would be sufficient assimilative capacity for Ammonia, BOD and Ortho-P in the receiving waterbody and ii) to determine the predicted downstream mean and 95%ile concentration from same (see **Table D.2.1**).

The calculations were based on the mean background ambient monitoring data (May 2022 to May 2023) for Ammonia and BOD, and the notionally clean scenario for Ortho-P, the river flow estimation of 0.008 m^3/s (95%ile) and 0.120 m^3/s (30%ile mean) and the projected average effluent flow of 0.00235m^3/s (based on 723 p.e).

Table D.2.1 - Predicted Downstream Concentrations Based on Required ELVs to meet "*Good*" Status for BOD, Ortho-P and Ammonia

Parameter	Required ELVs (mg/l)	Mean Upstream River Conc Note 1	Predicted Downstream 95% Conc (mg/l)	Good Status 95%ile EQS (mg/l) Note 2	Predicted Downstream 30%ile mean Conc. (mg/l)	Good Status mean EQS (mg/l) Note 2
BOD	7	1.250	2.56	≤2.6	1.36	≤1.5
Ortho-P (Notionally Clean)	0.2	0.005	0.049	≤0.075	0.009	≤ 0.035
Total Ammonia	0.4	0.056	0.134	≤0.14	0.062	≤0.065

Note 1: *BOD & Ammonia based on ambient monitoring carried out between May 2022- May 2023. Ortho-P based on the 'Notionally Clean River' background concentration.*
Note 2: *European Union Environmental Objectives (Surface Waters) (Amendment). Regulations 2019 (S.I. No. 77 of 2019)* – Good Status EQS

As shown above, based on the proposed ELVs, the predicted downstream mean and 95%ile concentrations for BOD, Total ammonia and Ortho-P all meet the EQS for Good status. Operation to the required ELVs at the Gweedore WwTP therefore ensures that there would be sufficient assimilative capacity in the receiving water, the Catheen_010 River, to receive the flows and loads associated with the WwTP (10-year design horizon). It would also give effect to the principle of the Combined Approach as defined in Waste Water Discharge (Authorisation) Regulations, 2007 to 2020 in that the proposed ELVs accommodate the Urban Waste Water Regulations, and the status and objectives of the Catheen River.

In summary, operation to the required ELVs tabled above would ensure that the discharge from the WwTP contributes towards achieving *"Good"* status of the Catheen_010 in accordance with the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 (S.I. No. 77 of 2019) and would ensure that there is no environmental risk posed to the receiving water environment as a result of the discharge from the WwTP.

It is acknowledged however that the WwTP, which was registered to UÉ in 202, currently cannot consistently meet the required ELVs (based on current plant performance as per

the "Wastewater Treatment plant monitoring data" included in **Attachment C1**), and upgrade works are therefore required. The Gweedore agglomeration is included in Uisce Éireann's Strategic Plan. Strategic assessments are ongoing and further funding approval is required to advance the proposed upgrade works. The timeframe for completion of any upgrade works to meet the proposed ELVs is currently unknown at the time of preparing this WWDL application.

4. Appropriate Assessment

A combined Appropriate Assessment (AA) Screening and Natura Impact Statement (NIS) Report was prepared in October 2024 to accompany this WWDL application. The Report will enable the EPA, as the Competent Authority, to conduct an AA Screening Determination and Stage 2 AA in respect of the Gweedore agglomeration operational discharge, SW001, for the purposes of the European Union (Waste Water Discharge) Regulations 2007 to 2020.

The AA Screening of the operational discharge assessed whether the discharge activity, alone or in combination with other plans and projects, is likely to have significant effects on a European Site(s) in view of best scientific knowledge and the conservation objectives of the site(s). Based on the information set out in the AA Screening, and the documentation referenced therein, it was concluded that the likelihood of significant effects to the Gweedore Bay and Islands SAC, West Donegal Coast SPA and West Donegal Islands SPA cannot be excluded, and a Stage Two AA and the preparation of a NIS was required.

The NIS has concluded, upon the implementation of proposed measures/recommendations, that the operational discharge from the Gweedore agglomeration will not prevent the achievement of the conservation objectives of the qualifying interests of the Gweedore Bay and Islands SAC, West Donegal Coast SPA, West Donegal Islands SPA or any other European Site, in view of these site's conservation objectives and that the Conservation Status of the Annex I habitats, Annex II species, or Annex I bird species will not be compromised by the agglomeration discharges either directly, indirectly or cumulatively.

The combined AA Screening and NIS will enable the EPA, as the Competent Authority, to formally conduct an AA Screening and AA in respect of the Gweedore agglomeration operational discharge, for the purposes of the European Union (Waste Water Discharge) Regulations 2007 to 2020.

Please refer to **Attachment D.2.2** for a copy the AA Screening and NIS Report (October 2024).

5. Environmental Impact Assessment

An Environmental Impact Assessment (EIA) Screening Report (October 2024) has been prepared to form an opinion as to whether or not the operational activities from the Gweedore agglomeration (*i.e.,* the operational discharge from the Gweedore agglomeration in so far as they relate to the risk of environmental pollution of the receiving waters, the Catheen River (Catheen_010) should be subject to Environmental Impact Assessment (EIA) and if so, whether an Environmental Impact Assessment Report (EIAR) should be prepared in respect of it.

Based on the information as contained in the EIA Screening Report (see **Attachment B.5**), it is Uisce Éireann's opinion that there is no significant and realistic doubt in regard to the likelihood of significant effects on the environment arising from the operational discharges

from the Gweedore WwTW in so far as they relate to the risk of environmental pollution of the receiving waters) and it is considered that an EIA is not required for the authorisation to which this application relates by virtue of its nature, size and location.

6. Priority Substance Assessment Report

An assessment of the potential for impacts on receiving waters from priority substances in the Primary Discharge (SW001) has been carried out using the PRTR reporting tool. The assessment considers the Primary Discharge relevant to surface water Environmental Quality Standards (EQS) for priority substances (as contained in the above tool), as set out in the European Communities Environmental Objectives (Surface Waters) Regulations 2009, as amended.

It was concluded that with dilution, of the substances listed in the Specific Pollutants, Priority and Priority Hazardous Substances as outlined in the Surface Water Regulations, and as contained in the PRTR reporting tool, only benzo[a]pyrene is likely to be present in the effluent discharge to the Catheen River, at concentrations above the specified standards as per European Communities Environmental Objectives (Surface Waters) Regulations 2009, as amended (now S.I No. 77 of 2019). Benzo[a]pyrene is a polycyclic aromatic hydrocarbon (PAH), which is identified at EU level as ubiquitous, and occurs widely in the environment on a global scale.

Based on the results of this desk top study and the nature of the discharge, it can be confidently determined that no further analysis of the Primary Discharge, based on the Guidance on the Screening for Priority Substances for Waste Water Discharge Licences, issued by the EPA, is required.

This Report is contained in **Attachment D.2.3**: Priority Substance Assessment Report.

7. Shellfish Waters

There are no designated shellfish waters in the immediate vicinity of the Gweedore agglomeration operational discharges. Gweedore WwTP primary discharge discharges *ca*. 6km upstream of the Gweedore Bay designated shellfish waters. Due to the distance between the designated shellfish waters and the scale of the primary discharge, the overall risk of the Gweedore discharge to the Gweedore Bay designated shellfish waters is considered negligible.

8. Bathing Waters

As noted above in **Section 2**, the Portarthur, Derrybeg Bathing Water Area is *ca*. 3.8km downstream of the primary discharge. A Bathing Water Profile was prepared for Portarthur, Derrybeg Bathing Water Area in 2020 which identified the Catheen River catchment with its significant portion of the residential, commercial and industrial properties in the Bunbeg area, with varying standards of on-site wastewater treatment systems, as a potential pressure posing a "*Low*" risk.

The Portarthur, Derrybeg Bathing Water Area is *ca.* 3.8km downstream of the primary discharge. This Bathing Water Area is classified as achieving Excellent Water Quality in 2023 based on the assessment of bacteriological results for the period 2020 to 2023 and therefore it is considered that the overall risk from the Gweedore discharge to the Portarthur, Derrybeg Bathing Water Area is considered negligible.

9. River Flow Estimation

The 95%ile river flow estimation for the Catheen River has been calculated by Uisce Éireann as 0.008m^3/s. See **Attachment D.2.4** Low Flow Estimation Report.

10. Combined Approach

The Waste Water Discharge Authorisation under the European Union (Waste Water Discharge) Regulations 2007 to 2020, specify that a '*combined approach'* in relation to licensing of waste water works must be taken, whereby the emission limits for the discharge are established on the basis of the stricter of either or both, the limits and controls required under the Urban Waste Water Treatment Regulations, 2001, as amended, and the limits determined under statute or Directive for the purpose of achieving the environmental objectives established for surface waters, groundwater or protected areas for the water body into which the discharge is made.

Operation to the required ELVs at the Gweedore WwTP would give effect to the principle of the Combined Approach as defined in Waste Water Discharge (Authorisation) Regulations, 2007 to 2020 in that they accommodate the Urban Waste Water Regulations and the status of the receiving waterbody, the Catheen River (Catheen_010) and downstream waterbodies. It is acknowledged that the WwTP currently cannot consistently meet the proposed ELVs, however the Gweedore agglomeration is included in Uisce Éireann's Strategic Plan. Strategic assessments are ongoing and further funding approval is required to advance the proposed upgrade works. The timeframe for completion of any upgrade works to meet the proposed ELVs is currently unknown at the time of preparing this WWDL application.

11. Compliance with Relevant National or EU Legislation

As per **Attachment B.6**, Uisce Éireann is committed to ensuring that water services infrastructure operates in a manner that supports the achievement of the water body objectives under the Water Framework Directive. It is acknowledged that the Gweedore WwTP currently cannot consistently meet the proposed ELVs however the Gweedore agglomeration is included in Uisce Éireann's Strategic Plan.

Operation to the required ELVs will ensure that the operational discharge, SW001, from the Gweedore agglomeration contributes towards the Catheen_010 achieving "*Good"* status and would ensure that there is no environmental risk posed to the receiving water environment as a result of the discharge from the agglomeration.

12. Data Sources

The following data sources were used to complete this application.

- Online data available on held by the NPWS, the EPA and Uisce Éireann:
    - www.npws.ie
    - epawebapp.epa.ie
    - gis.epa.ie/EPAMaps
    - catchments.ie
- GIS data for European site boundaries obtained in digital format online from European Environmental Agency
- Uisce Éireann / Donegal County Council Monitoring & Sampling Data

13. Cumulative and In Combination Effects

The combined AA Screening and NIS Report (October 2024) addresses cumulative and in-combination effects. Refer to **Attachment D.2.2**.

14. Mixing zone or transitional areas of exceedance

Based on the 95%ile River flow (0.008m^3/s), and the Gweedore WwTP average flow (0.002m^3/s), there are 4 dilutions estimated immediately in the proximity of the discharge point.

15. Dilutions and retention times for lakes

Not applicable. No discharges to lakes.

16. The impact of the discharges on any environmental media other than those into which the emissions are to be made

Not applicable. No other relevant media into which the emissions are to be made.

17. Groundwater Details

Not applicable. No discharge to ground waters.

18. High Status Waterbodies

Gweedore Bay coastal waterbody, located *ca.* 1.2km downstream of the primary discharge point, is classed as "*High*" WFD status. The WFD objective is to maintain "*High*". No significant pressures for Gweedore Bay are identified.

19. Fresh Water Pearl Mussels

There are no Designated Freshwater Pearl Mussel (FWPM) Waterbodies downstream of the primary discharge from the Gweedore WwTP.

20. Impacts on Transboundary / Territory of other States

The operational discharge to which this application relates will not result in transboundary impacts or impacts on the territory of other states.

21. For waste water treatment plants with coastal discharges, provide evidence that the end of the discharge pipe is below the mean spring tide low water line

Not applicable. Discharge is not to a coastal waterbody.

ATTACHMENT D.2.3:

PRIORITY SUBSTANCE ASSESSMENT REPORT AUGUST 2024

Priority Substances Assessment

Agglomeration Name:	**Gweedore**
Licence Register No.	**TBC**

Table of Contents

1 Introduction

This report has been prepared for the Gweedore agglomeration, in County Donegal, to inform a Waste Water Discharge Licence (WWDL) Application.

This desk top study has been undertaken to determine the necessity, if any, for further analysis of the discharge based on the *Guidance on the Screening for Priority Substances for Waste Water Discharge Licences*, issued by the EPA.

Relevant inputs to the Gweedore Waste Water Treatment Plant (WwTP) and estimates for the emissions from the relevant discharge point have been taken into account in the preparation of this report.

2 Desktop Study

2.1 Assessment of Analysis Required

A. Review of all industrial inputs into WWTP

A review of available online mapping and EPA licensed facilities was undertaken to determine the non-domestic discharge types being received at the Gweedore WwTP. In addition, all planning applications, since 2019, were reviewed to determine the associated non-domestic discharges being sent to the Gweedore WwTP. The Uisce Éireann Technical Assessment Manual Sectoral Profile Data was reviewed to determine the potentially dangerous substances which could be released to sewer from industrial inputs.

There are currently no IPC/IE licensed industries (with permitted process effluent emissions), Section 16, or waste licenses discharging to the agglomeration or to the River Catheen upstream or downstream of the primary discharge location. It is noted that as the WwTP was relatively recently registered to UÉ (July 2021), and assessments by UÉ of the Industries in Gwedore /(Údarás Na Gaeltachta) industrial estate are required under Section 16 and 22 of the Local Government (Water Pollution) Acts 1977 and 1990 (as amended). It is for this reason, that the projected 10 year industrial wastewater inputs the WwTP is estimated to be 170 p.e.

B. Discharge monitoring

No primary discharge monitoring for the possible presence of Specific Pollutants, Priority and Priority Hazardous Substances as outlined in Table 10, 11 and 12 of European Communities Environmental Objectives (Surface Waters) Regulations 2009, as amended, is available for this agglomeration.

C. Downstream monitoring location's participation in relevant monitoring programme

There is no priority substances monitoring data for the primary discharge downstream ambient monitoring location, the Catheen River.

D. Participation in PRTR reporting

Estimated data from the PRTR reporting tool was required for this desktop assessment as measured data was unavailable for parameters in Appendix 1.

2.2 Review Outcome of Desktop Study

Following the desktop study, all parameters in Appendix 1 have been assessed to establish any potential impact on the receiving waters. Priority substance measured concentrations in the primary discharge were not available for all parameters. Therefore, estimated concentrations were assessed. This desktop study is considered to provide partial characterisation of the wastewater.

3 Assessment of Significance and Recommendations

An assessment of the potential for impacts on receiving waters from priority substances in the Primary Discharge (SW001) has been carried out using the PRTR reporting tool. The assessment considers the Primary Discharge relevant to surface water Environmental Quality Standards (EQS) for priority substances (as contained in the above tool), as set out in the European Communities Environmental Objectives (Surface Waters) Regulations 2009, as amended. Based on the estimated data, benzo[a]pyrene was identified as potentially being higher than the required EQS, after dilution.

Does the assessment use the Desk Top Study Method or Screening Analysis to determine if the discharge contains the parameters in Appendix 1 of the EPA guidance	Desk Top Study
Does the assessment include a review of licensed / authorised inputs to the works?	Yes
Does the assessment include a review of other (unauthorised) inputs to the works?	Yes
Does the report include an assessment of the significance of the results where a listed material is present in the discharge? (e.g., impact on the relevant EQS standard for the receiving water)	Yes
Does the assessment identify that priority substances may be impacting the receiving water?	Yes, benzo[a]pyrene
Does the Improvement Programme for the agglomeration include the elimination / reduction of all priority substances identified as having an impact on receiving water quality?	Not applicable

4 Conclusion

An assessment of the potential for impacts on receiving waters from priority substances in the Primary Discharge (SW001) has been carried out to inform this WWDL application. The assessment considered the Primary Discharge relevant to the surface waters Environmental Quality Standards (EQS) for priority substances (as per the Surface Waters Regulations), as listed in the EPA *Guidance on the Screening for Priority Substances for Waste Water Discharge Licences* (2011) and those which are listed in the PRTR tool.

It can be concluded that, after dilution, of the substances listed in the Specific Pollutants, Priority and Priority Hazardous Substances, only benzo[a]pyrene is likely to be present in the effluent discharge to

the Catheen River, at concentrations above the standards in European Communities Environmental Objectives (Surface Waters) Regulations 2009, as amended.

However, given that there are no IPC / IE licenced facilities of process effluent discharges to the Gweedore WwTP, there are no significant producers identified in the agglomeration. Furthermore, lead is ubiquitous in the environment due to widespread human use.

Based on the results of this desk top study, it can be determined that **no further analysis** of the discharge, based on the *Guidance on the Screening for Priority Substances for Waste Water Discharge Licences*, issued by the EPA, is required.

Appendix 1 – Screening of Parameters for Priority Substances

AA: Annual Average
MAC: Maximum Allowable Concentration
EQS: Environmental Quality Standards
Dilution factor in receiving water: 4 dilutions estimated immediately in the proximity of the discharge point (based on the Catheen_010 River 95%ile flow 0.008 m^3/s and the WwTP average flow DWF 0.002 m^3/s)

No.	Compound	Group of compounds	AA-EQS Inland SW (µg/l)	AA-EQS Other SW (µg/l)	Estimated Conc. (µg/l)[1]	Data Source	Sample Date (if applicable)	Effluent Concentration above AA concentration (Yes/No)	Effluent Concentration above AA concentration after dilution (Yes/No)
1	Benzene	VOCs	10	8	0.01682	PRTR Electronic Toolset	N/A	No	No
2	Carbon tetrachloride	VOCs	12	12	0.00000	PRTR Electronic Toolset	N/A	No	No
3	1,2-Dichloroethane	VOCs	10	10	0.00000	PRTR Electronic Toolset	N/A	No	No
4	Dichloromethane	VOCs	20	20	0.04545	PRTR Electronic Toolset	N/A	No	No
5	Tetrachloroethylene	VOCs	10	10	0.05909	PRTR Electronic Toolset	N/A	No	No
6	Trichloroethylene	VOCs	10	10	0.00000	PRTR Electronic Toolset	N/A	No	No
7	Trichlorobenzenes	VOCs	0.4	0.4	0.00000	PRTR Electronic Toolset	N/A	No	No
8	Trichloromethane	VOCs	2.5	2.5	0.00000	PRTR Electronic Toolset	N/A	No	No
9	Xylenes (all isomers)	VOCs	10	10	0.11591	PRTR Electronic Toolset	N/A	No	No

No.	Compound	Group of compounds	AA-EQS Inland SW (µg/l)	AA-EQS Other SW (µg/l)	Estimated Conc. (µg/l)[1]	Data Source	Sample Date (if applicable)	Effluent Concentration above AA concentration (Yes/No)	Effluent Concentration above AA concentration after dilution (Yes/No)
10	Ethyl Benzene	VOCs	n/a	n/a	0.01659	PRTR Electronic Toolset	N/A	N/A	N/A
11	Toluene	VOCs	10	10	0.49325	PRTR Electronic Toolset	N/A	No	No
12	Naphthlene[1]	PAHs	2	2	0.00400	PRTR Electronic Toolset	N/A	No	No
13	Fluoranthene[1]	PAHs	0.0063	0.0063	0.00234	PRTR Electronic Toolset	N/A	No	No
14	Benzo[k]fluoranthene[2]	PAHs	MAC of 0.017	MAC of 0.017	0.00200	PRTR Electronic Toolset	N/A	No	No
15	Benzo[ghi]perylene[2]	PAHs	MAC of 8.2 x 10^{-3}	MAC of 8.2 x 10^{-4}	0.00200	PRTR Electronic Toolset	N/A	No	No
16	Indeno[1,2,3-c,d]pyrene[2]	PAHs			0.00220	PRTR Electronic Toolset	N/A	No	No
17	Benzo[b]fluoranthene[2]	PAHs	MAC of 0.017	MAC of 0.017	0.00200	PRTR Electronic Toolset	N/A	No	No
18	Benzo[a]pyrene	PAHs	1.7 x 10^{-4}	1.7 x 10^{-4}	0.00200	PRTR Electronic Toolset	N/A	Yes	**Yes**
19	Di(2-ethylhexyl)phthalate (DEHP)	Plasticiser	1.3	1.3	0.91727	PRTR Electronic Toolset	N/A	No	No
20	Isodrin[3]	Pesticides	∑=0.01	∑=0.005	0.00000	PRTR Electronic Toolset	N/A	No	No

[1] The EQS for these substances shall take effect from 22 December 2015

[2] No indicative parameter is provided for this group of substances

[3] ∑ of Aldrin, Dieldrin, Endrin and Isodrin.

No.	Compound	Group of compounds	AA-EQS Inland SW (µg/l)	AA-EQS Other SW (µg/l)	Estimated Conc. (µg/l)[1]	Data Source	Sample Date (if applicable)	Effluent Concentration above AA concentration (Yes/No)	Effluent Concentration above AA concentration after dilution (Yes/No)
21	Dieldrin[3]	Pesticides			0.00000	PRTR Electronic Toolset	N/A	No	No
22	Diuron	Pesticides	0.2	0.2	0.02636	PRTR Electronic Toolset	N/A	No	No
23	Isoproturon	Pesticides	0.3	0.3	0.00750	PRTR Electronic Toolset	N/A	No	No
24	Atrazine	Pesticides	0.6	0.6	0.01045	PRTR Electronic Toolset	N/A	No	No
25	Simazine	Pesticides	1	1	0.01409	PRTR Electronic Toolset	N/A	No	No
26	Glyphosate	Pesticides	60	-	1.53273	PRTR Electronic Toolset	N/A	No	No
27	Mecoprop	Pesticides	n/a	n/a	0.10705	PRTR Electronic Toolset	N/A	N/A	N/A
28	2,4-D	Pesticides	n/a	n/a	0.05102	PRTR Electronic Toolset	N/A	N/A	N/A
29	MCPA	Pesticides	n/a	n/a	0.08864	PRTR Electronic Toolset	N/A	N/A	N/A
30	Linuron	Pesticides	0.7	0.7	0.00000	PRTR Electronic Toolset	N/A	No	No
31	Dichlobenil	Pesticides	n/a	n/a	0.00430	PRTR Electronic Toolset	N/A	N/A	N/A
32	2,6-Dichlorobenzamide	Pesticides	n/a	n/a	0.08045	PRTR Electronic Toolset	N/A	N/A	N/A
33	PCBs	PCBs	n/a	n/a	0.00000	PRTR Electronic Toolset	N/A	N/A	N/A

No.	Compound	Group of compounds	AA-EQS Inland SW (µg/l)	AA-EQS Other SW (µg/l)	Estimated Conc. (µg/l)[1]	Data Source	Sample Date (if applicable)	Effluent Concentration above AA concentration (Yes/No)	Effluent Concentration above AA concentration after dilution (Yes/No)
34	Phenols (as Total C)	Phenols	8	8	0.90978	PRTR Electronic Toolset	N/A	No	No
35	Lead	Metals	1.2	1.3	3.03939	PRTR Electronic Toolset	N/A	Yes	No
36	Arsenic	Metals	25	20	0.56667	PRTR Electronic Toolset	N/A	No	No
37	Copper	Metals	5 or **30**[2]	5	3.00000	PRTR Electronic Toolset	N/A	No	No
38	Zinc	Metals	8 or 50 or **100**[3]	40	49.36364	PRTR Electronic Toolset	N/A	No	No
39	Cadmium	Metals	0.08 or 0.09 or 0.15 or 0.25[4]	0.2	0.26667	PRTR Electronic Toolset	N/A	Yes	No
40	Mercury	Metals	MAC of 0.07	MAC of 0.07	0.00000	PRTR Electronic Toolset	N/A	No	No
41	Chromium VI	Metals	3.4	0.6	0.80000	PRTR Electronic Toolset	N/A	No	No
42	Selenium	Metals	n/a	n/a	0.00000	PRTR Electronic Toolset	N/A	N/A	N/A
43	Antimony	Metals	n/a	n/a	0.15455	PRTR Electronic Toolset	N/A	N/A	N/A
44	Molybdenum	Metals	n/a	n/a	0.00000	PRTR Electronic Toolset	N/A	N/A	N/A
45	Tin	Metals	n/a	n/a	0.14444	PRTR Electronic Toolset	N/A	N/A	N/A

No.	Compound	Group of compounds	AA-EQS Inland SW (µg/l)	AA-EQS Other SW (µg/l)	Estimated Conc. (µg/l)[1]	Data Source	Sample Date (if applicable)	Effluent Concentration above AA concentration (Yes/No)	Effluent Concentration above AA concentration after dilution (Yes/No)
46	Barium	Metals	n/a	n/a	13.24444	PRTR Electronic Toolset	N/A	N/A	N/A
47	Boron	Metals	n/a	n/a	61.11111	PRTR Electronic Toolset	N/A	N/A	N/A
48	Cobalt	Metals	n/a	n/a	0.17576	PRTR Electronic Toolset	N/A	N/A	N/A
49	Vanadium	Metals	n/a	n/a	2.72727	PRTR Electronic Toolset	N/A	N/A	N/A
50	Nickel	Metals	4	8.6	4.25758	PRTR Electronic Toolset	N/A	Yes	No
51	Fluoride	General	500	1,500	235	PRTR Electronic Toolset	N/A	No	No
52	Chloride	General	n/a	n/a	54120	PRTR Electronic Toolset	N/A	N/A	N/A
53	TOC	General	n/a	n/a	9219.77273	PRTR Electronic Toolset	N/A	N/A	N/A
54	Cyanide	General	10	10	2.93182	PRTR Electronic Toolset	N/A	No	No
	Conductivity	General	n/a	n/a	-	PRTR Electronic Toolset	N/A	N/A	N/A
	Hardness (mg/l $CaCO_3$)	General	n/a	n/a	202	PRTR Electronic Toolset	N/A	N/A	N/A
	pH	General	n/a	n/a	-	PRTR Electronic Toolset	N/A	N/A	N/A

Notes:

1. Where measured values are available these should be used instead of estimated values from PRTR tool.
2. In the case of Copper, the value 5 applies where the water hardness measured in mg/l $CaCO_3$ is less than or equal to 100; the value 30 applies where the water hardness exceeds 100 mg/l $CaCO_3$. Estimated $CaCO_3$ value > 100 where no sampling data available (based on PRTR tool)
3. In the case of Zinc, the standard shall be 8 µg/l for water hardness with annual average values less than or equal to 10 mg/l $CaCO_3$, 50 µg/l for water hardness greater than 10 mg/l $CaCO_3$ and less than or equal to 100 mg/l $CaCO_3$ and 100 µg/l elsewhere. Estimated $CaCO_3$ value > 100 where no sampling data available
4. For Cadmium and its compounds the EQS values vary dependent upon the hardness of the water as specified in five class categories (Class 1: <40 mg CaCO3/l, Class 2: 40 to <50 mg CaCO3/l, Class 3: 50 to <100 mg CaCO3/l, Class 4: 100 to <200 mg CaCO3/l and Class 5: >200 mg CaCO3/l)

ATTACHMENT D.2.4:

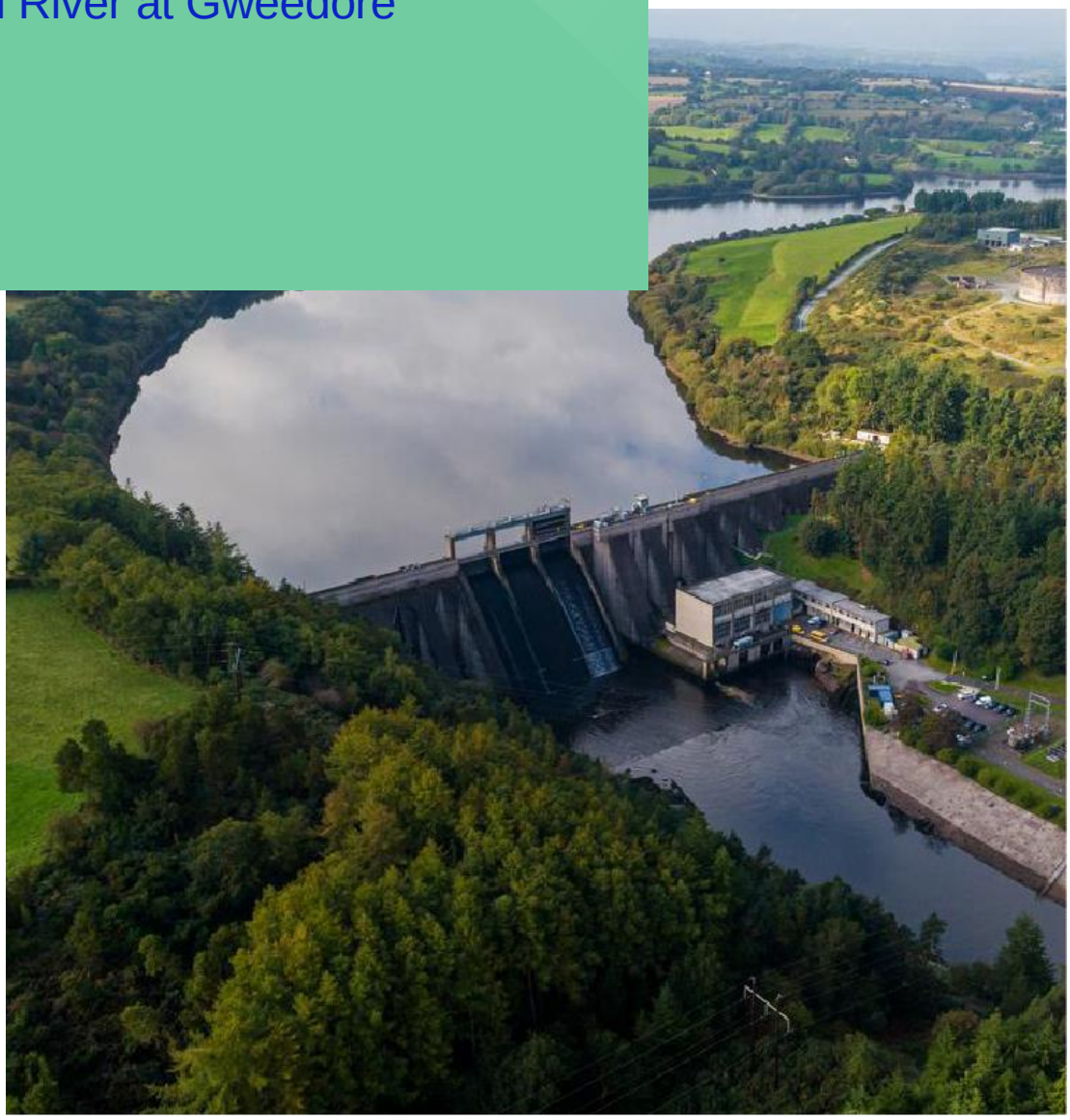
LOW FLOW HYDROLOGICAL ASSESSMENT REPORT
February 2024

February 2024

Report

Uisce Éireann Hydrological Analysis

Catheen River at Gweedore



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Quality Assurance

Revision Number	Description of Change	Author(s)	Approved By	Date of Approval
01	**First Issue**	**S Waite**	**R. Kane**	**21/10/2024**

Table of contents

1 Introduction

River flow estimates are required by Uisce Éireann for the purposes of assimilative capacity calculations for treated wastewater discharges from Gweedore Wastewater Treatment Plant (WWTP) to the Catheen River. These calculations are carried out with reference to non-flood (low flow) conditions, with particular emphasis on the Q_{95} low flow condition and the Q_{30} annual average (mean) flow condition. The following report sets out the calculation of low to annual average flow conditions for the watercourse at the existing discharge point.

2 Site Location and Local River Flow Gauges

Gweedore WWTP currently discharges treated wastewater to the Catheen River in Derrybeg at Irish National Grid Reference (INGR) 182110 424825. Future upgrades to the WWTP are planned which will increase the capacity of the site to serve more than 3,000 population equivalent. It is therefore necessary to carry out wastewater assimilative capacity calculations to determine the potential impacts on water quality in the Catheen River and calculate appropriate Environmental Limit Values (ELVs) for final treated effluent from the WWTP. The catchment area at the discharge point is 2.46km^2.

There are two continuous river flow gauges in the study area. The Gweedore River flow gauge is located at the Electricity Supply Board (ESB) hydroelectric dam where water is diverted from the Clady River to the Gweedore River estuary via the Clady Headrace Canal. The gauging station measures the flow passed downstream to the Clady River. The Gweedore River is also gauged near the outflow from Lough Anure, which is a large online lake upstream of Crolly. In addition, a continuous river flow gauge was installed on the Catheen River immediately upstream of the existing WWTP discharge point by Uisce Éireann in 2022. The grid references and watercourse catchment area at the river flow gauging locations are given in Table 2 and the locations are shown in Figure 1.

Table 1: River Flow Gauging Locations

Gauge Location	INGR	Watercourse Catchment Area (km^2)
Catheen River at Gweedore WWTP	182113 424794	2.46
Clady River at Gweedore Dam	185343 422446	78.58
Gweedore River at Lough Anure	182369 417737	36.76

The gauge on the Catheen River can be used to calculate river flow statistics for the Catheen River at the WWTP because the increase in catchment area between the gauge and the existing discharge point is insignificant. However, the record at this gauge is very short (Section 3) so the flow statistics will need to be adjusted with reference to a longer local continuous gauge record.

Flows in the Clady River downstream of Lough Nacung are managed for hydropower and data from the ESB gauge at Gweedore Dam will be required to determine the pass forward flows downstream to Bunbeg. These data have been requested but have not yet been provided, therefore data from this site cannot be used to inform flow calculations for the Catheen River.

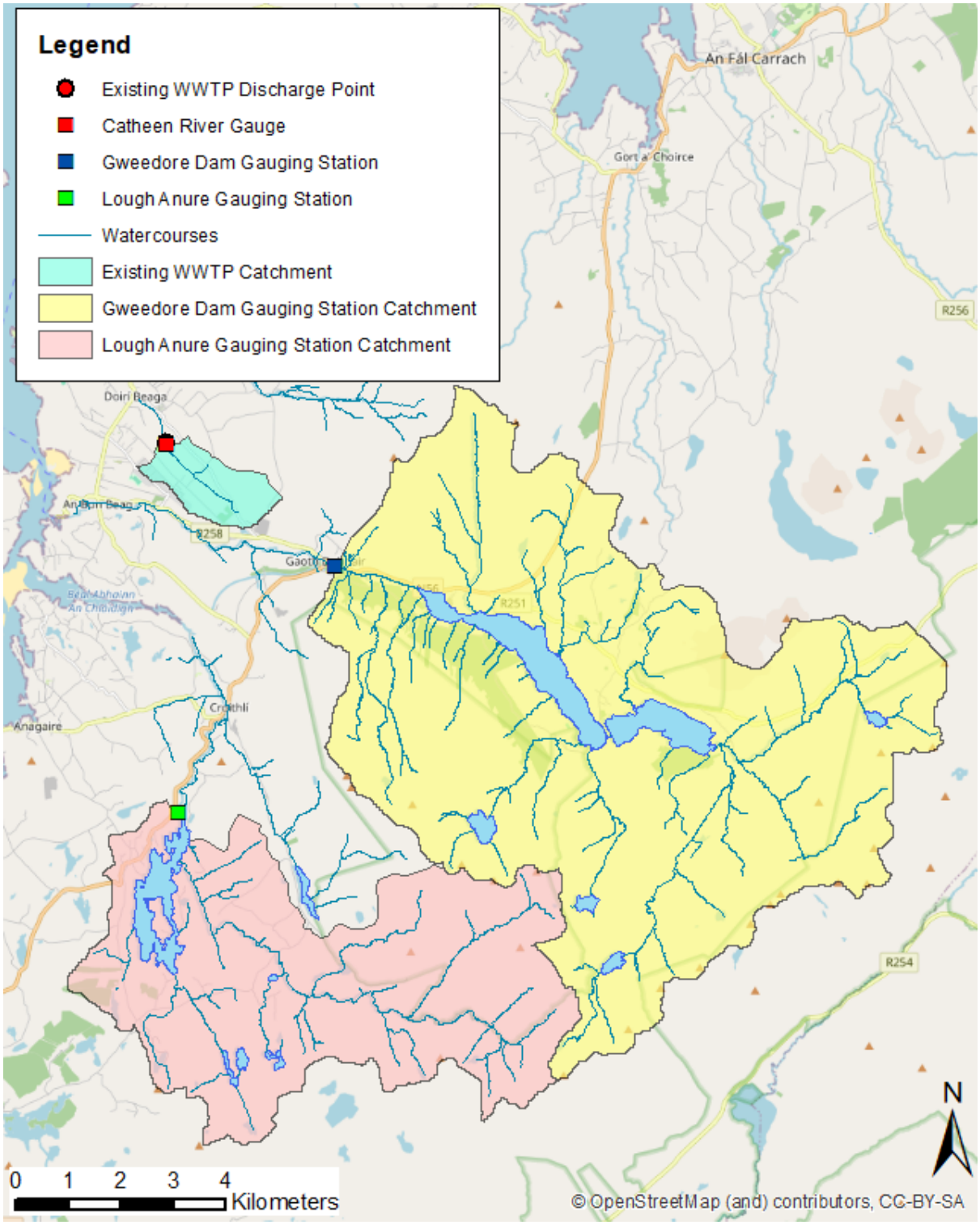

Figure 1: Study Area and Key Locations

3 River Flow Data

3.1 Catheen River Flow Data

The Catheen River flow gauge was installed on behalf of Uisce Éireann in 2022 to monitor river flows upstream of Gweedore WWTP. A flow gauging weir with low flow section was installed on behalf of Donegal County Council and is maintained by Capital Water Services. The rating was calculated based on spot flow gauging and theoretical weir flow calculations. Flow data are recorded at 15 minute intervals and have been converted into a daily mean flow timeseries for the purposes of this calculation. The record begins in November 2022 and runs to August 2023 with no gaps. The timeseries is shown in Figure 2.

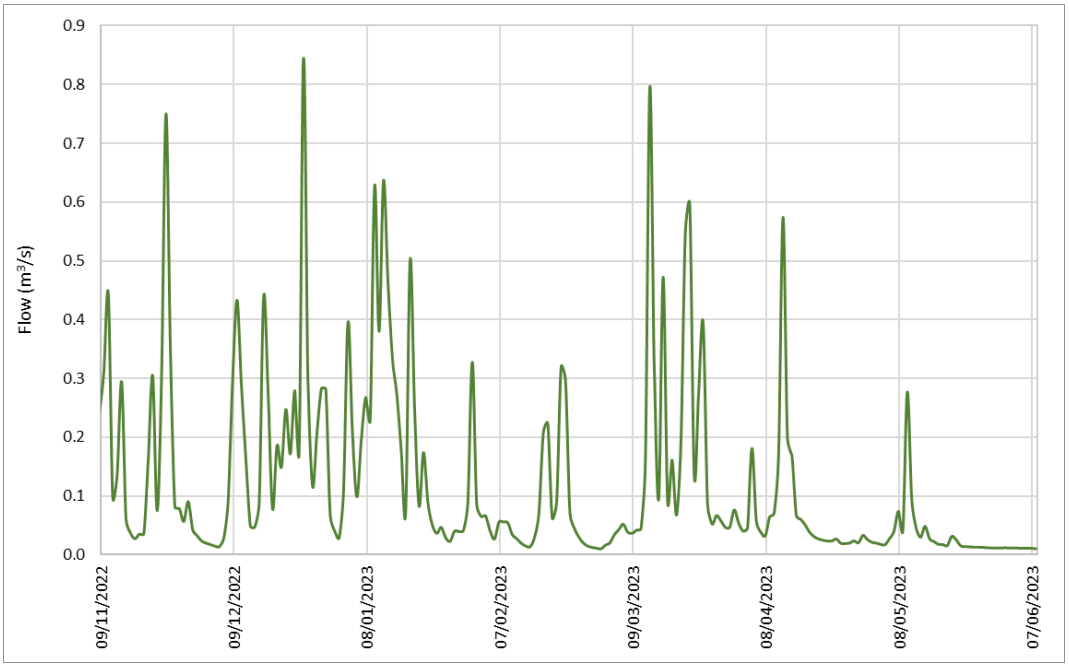

Figure 2: Catheen River at Gweedore WWTP River Flow Timeseries (2022-2023 Daily Mean Flow)

The gauge data can be used to produce a flow duration curve for the Catheen River at Gweedore WWTP (Figure 3). The irregular shape of this curve is due to the short gauge record length, as less than 1 year. The flow duration curve will need to be adjusted with reference to data from a longer local gauge record to account for the short duration of the flow gauging on the Katheen River and to allow for calculation of accurate flow statistics for the River at the WWTP.

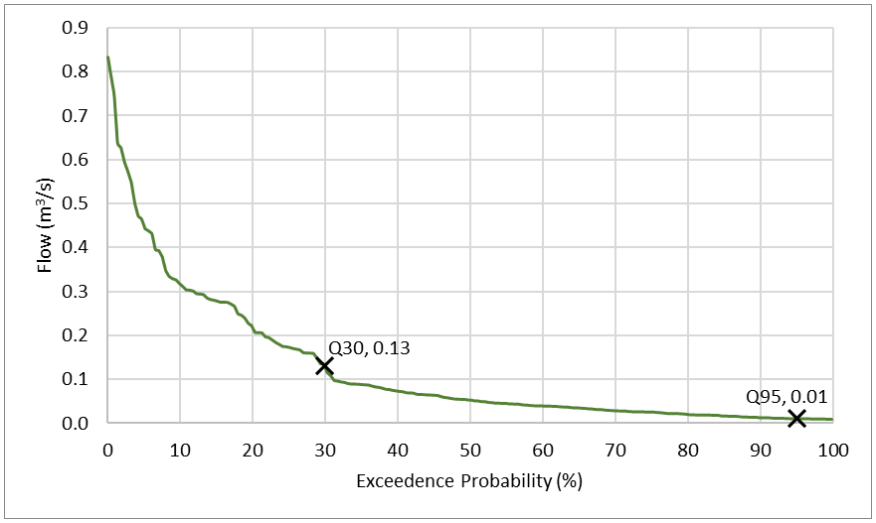

Figure 3: Daily Mean Flow Duration Curve and Key Flow Percentiles for the Catheen River at Gweedore WWTP (2022-2023)

3.2 Gweedore River Flow Data

Flows on the Gweedore River at monitored at Lough Anure, 4.31km upstream of the potential future discharge point at Crolly. Table 3-2 sets out details of the gauging station and flow data and the daily mean flow data timeseries is shown in Figure 3-4. The annual flow data and flow percentiles at the gauge are provided in Appendix A.

Table 3-1: Lough Anure Gauging Station Details

Station Number	38071
Station Name	L. Anure
Waterbody	L Anure
Site Owner	Environmental Protection Agency
Grid Reference	182369 417737
River Basin District	North Western
Catchment Area (km^2)	36.76
Data Start Date	27/11/1975
Data End Date	07/06/2023
Daily Data Percent Complete	97.2

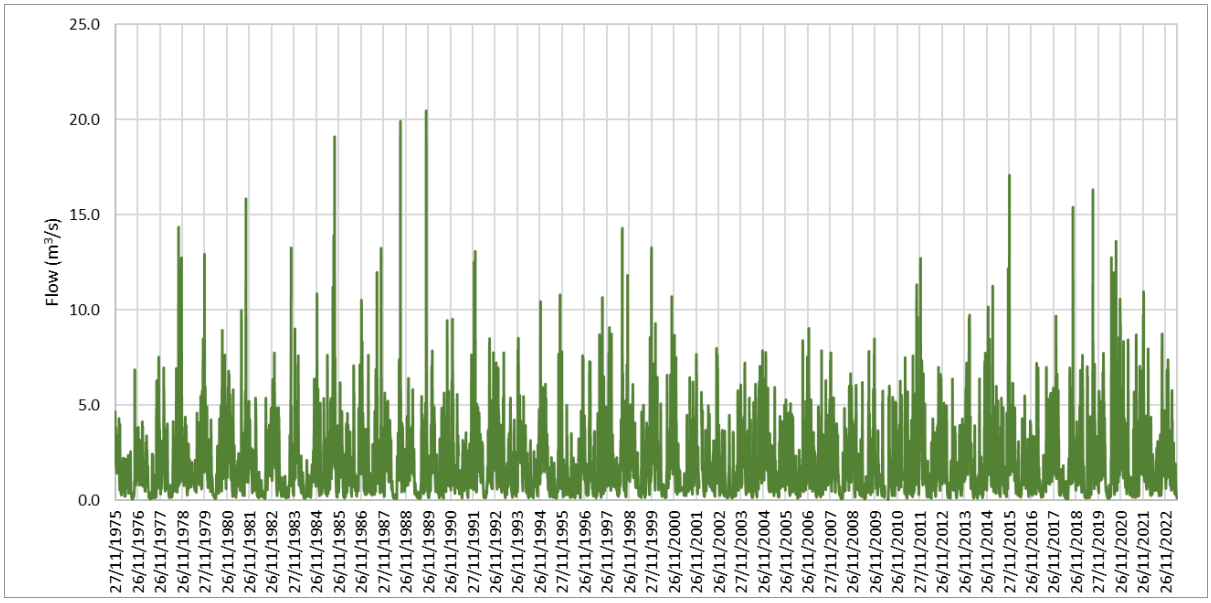

Figure 4: Gweedore River at Lough Anure River Flow Timeseries (1975-2023 Daily Mean Flow)

The Lough Anure gauge records flows passing from Lough Anure to the Gweedore River downstream. The record is largely complete with no significant missing data and the quality flags contained within the high resolution flow record shows that flows have been calculated from measured level using a single rating across the entire period of the record. The majority of the data are marked as of good quality, although extreme low flows below 0.049m^3/s ($Q_{99.99}$) and above 9.3m^3/s ($Q_{0.4}$) are extrapolated. There is no evidence of long term drift in the annual low flow statistics and the gauge is described as having a stable rating on the Environmental Protection Agency (EPA) page for this gauge.[1] The Gweedore River catchment at Lough Anure is essentially rural with no WWTP serving more than 500 population equivalent, no known abstractions or significant abstraction pressures and no large impoundments or reservoirs. There are not considered to be any anthropogenic influences on gauged river flows at this site.

Following review of the Lough Anure gauge record, the entire gauge record has been used to produce the daily mean flow duration curve and flow percentiles shown in Figure 5.

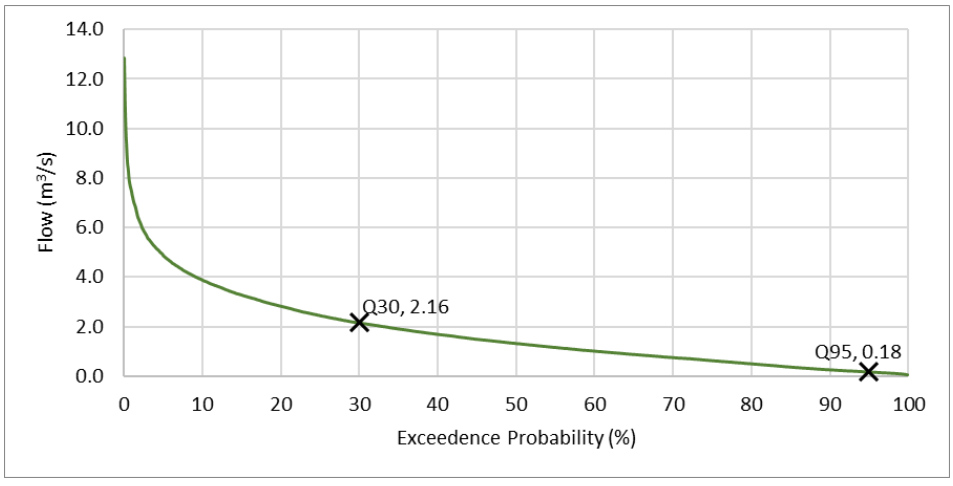

Figure 5: Daily Mean Flow Duration Curve and Key Flow Percentiles for the Gweedore River at Lough Anure (1975-2023)

[1] https://epawebapp.epa.ie/hydronet/#38071, accessed 15 June 2023

4 RIVER FLOW CALCULATION

4.1 Catheen River Flow Statistics

The gauged flow record from the gauge installed on the Catheen River is not of sufficient length to allow construction of a reliable flow duration curve using this gauge in isolation. However, the record is long enough to construct a short record flow duration curve for the Catheen River at Gweedore WWTP, which makes maximum use of local observed flow data. The short record flow duration curve can then be adjusted to produce a long record flow duration curve using data from a local gauged catchment.

The only gauged river catchments which are local to the Catheen River are the Gweedore River at Lough Anure or the Clady River at Gweedore Dam. The record from the Clady River cannot be used to adjust the flow duration curve from the Catheen River because the Clady River record comprises only the pass forward flow the Clady River and these flows are artificially controlled. The Anure catchment has been appraised for use in adjusting the flow statistics for the Catheen River and is considered to be the most appropriate catchment for this process. The catchments of both the Catheen River and the Gweedore River are dominated by peat and poorly drained soils and neither catchment contains areas of conduit karst limestone geology. The Gweedore River catchment is expected to receive additional rainfall because it includes areas of higher elevation, however rainfall totals in both catchments are high based on Hydrotool catchment descriptors for the area[2]. There will be significantly greater attenuation of flows by reservoirs and lakes at the Lough Anure gauge, however this gauge is only being used to adjust the flow duration curve for the Catheen River and not to directly estimate flows at Gweedore WWTP through scaling. The use of the Lough Anure gauge is justified because it is the closest gauged catchment and more similar gauged catchments would be located at greater geographic distance and may experience significantly different rainfall events over the period of the Catheen River gauge record.

The following flow data have been used in this analysis to produce a scaled flow duration curve from the continuous flow record data for the Catheen and Gweedore Rivers:

- The daily mean gauged flow record calculated for the Catheen River (Section 3.1)
- Daily mean flow data from Lough Anure for the period of the Catheen River gauge, and:
- The entire continuous flow data from the Lough Anure gauge (see Section 3.2)

The daily mean flow data from the Lough Anure gauge taken during the period of the Catheen River flow measurements cover a range of flow conditions of 0.113-7.345m^3/s $Q_{98.7}$-Q_1. The mean and median of this period of the Lough Anure gauge record are 1.92m^3/s and 1.51m^3/s compared with mean and median flows of 1.79m^3/s and 1.33m^3/s from the whole gauge record. The period of the Catheen River flow gauge therefore coincides with periods of extreme low flow and high flows at Lough Anure, although flows were generally above the long term average. Using the Lough Anure gauge record to adjust the Catheen River flow duration curve will account for the above average recorded in this catchment in 2022-2023.

[2] Hydrotool flow estimation point 38_946 used for the Gweedore River at Lough Anure and 38_3674 used for the Catheen River (adjacent catchment as there is no separate set of catchment characteristics for the Catheen River catchment)

The Catheen River flow data and the overlapping section of the daily mean flow record at Lough Anure have been used to generate short record flow duration curves for both gauge locations. The ratio of the short record flow duration curve to the long record flow duration curve calculated from the entire continuous record at Lough Anure have then been calculated for each percentile point. These ratios have then been applied to each percentile point on the Catheen River short record flow duration curve to calculate the final adjusted flow duration curve for the Catheen River. This approach takes account of all on-site measured flow data for the Catheen River as well as a long term flows recorded in a local catchment.

The short flow duration curves are shown in Figure 3-1 and the long and short record flow duration curves for Lough Anure are compared in Figure 3-2. The short record and final adjusted flow duration curve for the Catheen River is shown in Figure 3-3. The Q_{95} flow was 0.011m^3/s prior to adjustment and is reduced to 0.008m^3/s (8l/s). The Q_{30} flow is reduced from 0.14m^3/s to 0.12m^3/s.

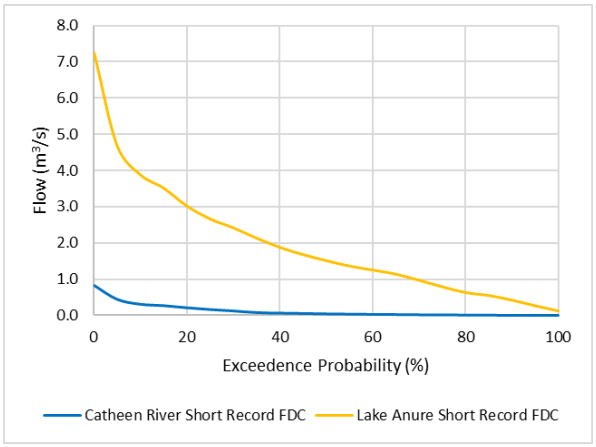

Figure 6: Short Record Flow Duration Curves for the Catheen and Gweedore Rivers

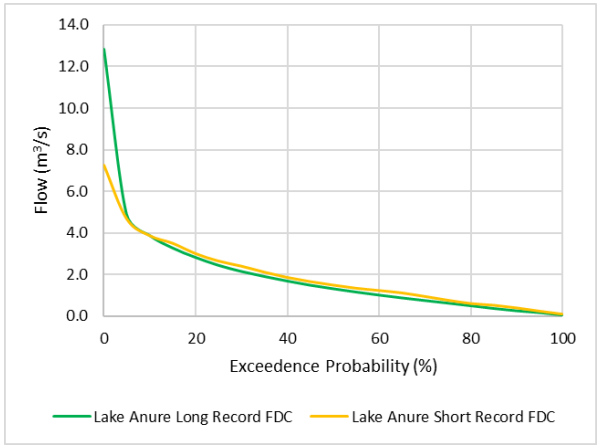

Figure 7: Short and Long Record Flow Duration Curve for the Gweedore River

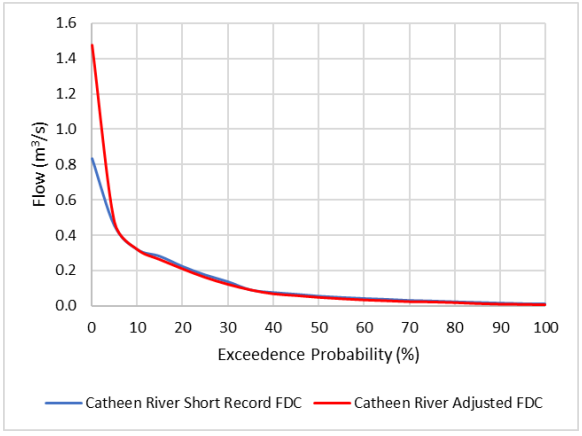

Figure 8: Short Record and Adjusted Flow Duration Curves for the Catheen Rivers

5 Summary and Flow Duration Curve

The above analysis has provided a Q_{95} flow estimate of 0.008m^3/s and a Q_{30} flow estimate of 0.12m^3/s for the Catheen River at the existing Gweedore WWTP discharge point.

The river flow gauges used to obtain this flow estimate are not located immediately downstream of the discharge point and therefore the flow estimates do not need to be corrected to account for the contribution of the discharge to river flows. The calculated flow percentiles can be used in wastewater assimilative capacity calculations to inform discharge permit applications.

Wastewater assimilative capacity calculations are usually carried out using Q_{95} and Q_{30} flow estimates only. However, more complex analyses using methods such as Monte Carlo analysis require flow values over the entire flow duration curve. The flow duration curves for the Catheen River are provided in Table 4 and have have been calculated using the flow duration curve adjustment process shown in Section 4.1.

Table 2: Flow Duration Curve Values for the Catheen River

Flow Exceedance Probability (%)	Catheen River Flow (m^3/s)
0.01	1.48
5	0.48
10	0.32
15	0.26
20	0.21
25	0.16
30	0.12
35	0.090
40	0.068
45	0.058
50	0.048
55	0.040
60	0.033
65	0.028
70	0.023
75	0.022
80	0.018
85	0.013
90	0.009
95	0.008
99.9	0.006

6 APPENDIX A – Annual River Flow Statistics for the Gweedore River at Lough Anure

Year	% missing	Flow (m^3/s)												
		Max	Min	Q_5	Q_{10}	Q_{20}	Q_{30}	Q_{40}	Q_{50}	Q_{60}	Q_{70}	Q_{80}	Q_{90}	Q_{95}
1975	23	4.64	0.06	3.09	2.24	1.74	1.39	1.06	0.85	0.65	0.33			
1976	0.5	6.85	0.07	3.17	2.82	2.22	1.81	1.41	1.13	0.91	0.53	0.26	0.15	0.12
1977	4	14.3	0.14	4.59	3.65	2.84	2.13	1.69	1.22	0.85	0.61	0.42	0.20	0.16
1978	1	12.5	0.26	3.78	2.94	2.28	1.92	1.58	1.35	1.18	1.05	0.89	0.70	0.51
1979	0	12.8	0.08	5.10	4.30	2.94	2.28	1.83	1.35	1.05	0.77	0.53	0.24	0.12
1980	0	9.91	0.15	5.26	4.38	3.22	2.63	2.09	1.68	1.34	1.06	0.74	0.38	0.26
1981	8	15.8	0.08	4.48	3.13	2.29	1.66	1.19	0.79	0.47	0.30	0.21	0.09	
1982	0	7.73	0.12	4.37	3.77	3.15	2.28	1.63	1.05	0.69	0.53	0.35	0.20	0.17
1983	1	13.3	0.10	4.83	3.57	2.18	1.53	1.23	0.98	0.74	0.45	0.32	0.17	0.11
1984	0	18.6	0.22	5.92	4.95	3.52	2.79	2.17	1.72	1.25	1.01	0.74	0.50	0.35
1985	0	7.42	0.12	4.02	3.37	2.42	1.96	1.48	1.28	1.08	0.83	0.54	0.25	0.19
1986	0	11.9	0.27	5.50	4.26	3.19	2.51	1.79	1.32	1.03	0.86	0.69	0.50	0.40
1987	2	19.7	0.08	4.86	3.69	2.93	2.31	1.93	1.61	1.16	0.62	0.26	0.11	0.09
1988	0	6.38	0.09	3.70	3.09	2.37	1.94	1.64	1.32	0.90	0.61	0.36	0.17	0.13
1989	0	20.3	0.10	5.29	4.36	3.14	2.31	1.80	1.42	1.04	0.73	0.45	0.22	0.15
1990	2	9.51	0.11	4.98	3.64	2.55	1.95	1.57	1.30	1.01	0.82	0.64	0.38	0.18
1991	5	13.1	0.12	5.24	4.07	3.04	2.49	2.02	1.69	1.29	0.98	0.56	0.18	0.12
1992	0	7.75	0.13	4.91	4.15	3.22	2.60	2.00	1.51	1.19	0.91	0.64	0.42	0.29
1993	0	8.43	0.13	4.47	3.76	2.72	2.18	1.67	1.30	0.98	0.69	0.38	0.22	0.18
1994	0	10.4	0.10	4.45	3.86	2.70	2.22	1.65	1.26	0.92	0.65	0.40	0.20	0.15
1995	2	10.8	0.12	3.46	2.57	1.84	1.44	1.13	0.89	0.68	0.47	0.33	0.19	0.14
1996	0	10.6	0.13	4.84	3.63	2.60	2.03	1.52	1.17	0.90	0.72	0.39	0.27	0.23
1997	0	14.3	0.20	4.98	4.10	3.08	2.29	1.89	1.58	1.24	0.98	0.78	0.50	0.29
1998	0	11.8	0.14	4.54	3.79	2.77	2.14	1.79	1.56	1.26	0.88	0.50	0.28	0.22
1999	0	13.3	0.13	5.68	4.65	3.32	2.57	2.09	1.62	1.24	0.78	0.58	0.32	0.24
2000	13	10.7	0.24	5.04	3.93	2.87	1.92	1.46	1.12	0.76	0.53	0.38		
2001	10	7.65	0.11	4.57	3.29	2.47	1.86	1.51	1.21	0.92	0.72	0.45	0.19	
2002	0	7.88	0.11	3.62	3.10	2.10	1.49	1.16	0.93	0.61	0.36	0.23	0.16	0.13
2003	0	7.19	0.13	4.68	3.78	2.83	2.12	1.72	1.31	0.97	0.73	0.55	0.30	0.20
2004	0	7.84	0.16	4.85	3.96	2.89	2.29	1.74	1.46	1.17	0.85	0.67	0.47	0.26
2005	0	8.35	0.10	3.57	2.91	2.34	1.84	1.52	1.24	1.00	0.78	0.55	0.35	0.27
2006	0	9.01	0.16	5.16	4.26	3.33	2.45	2.07	1.56	1.17	0.83	0.62	0.34	0.23
2007	0	7.74	0.06	4.25	3.32	2.50	2.07	1.76	1.42	1.18	0.92	0.58	0.18	0.10
2008	0.3	7.80	0.06	4.93	4.21	2.99	2.15	1.70	1.18	0.92	0.72	0.48	0.27	0.17
2009	19	8.48	0.04	4.68	3.62	2.19	1.52	1.14	0.81	0.55	0.31	0.05		
2010	8	7.52	0.11	4.35	3.65	2.56	1.96	1.49	1.08	0.80	0.55	0.35	0.14	
2011	0	12.6	0.09	5.58	4.37	3.41	2.43	1.89	1.37	1.04	0.88	0.65	0.28	0.19
2012	0	6.99	0.10	4.53	3.75	2.79	2.06	1.71	1.30	1.05	0.79	0.58	0.20	0.15
2013	0	9.72	0.11	4.79	3.92	2.90	2.18	1.50	1.12	0.76	0.58	0.34	0.20	0.15
2014	0	11.2	0.19	5.51	4.45	3.63	2.91	2.08	1.70	1.28	1.01	0.81	0.54	0.39
2015	0	17.0	0.16	5.40	4.14	3.00	2.25	1.84	1.46	1.20	0.87	0.60	0.31	0.25
2016	0	7.17	0.15	4.29	3.36	2.38	1.72	1.27	1.03	0.85	0.69	0.46	0.26	0.22
2017	0	9.66	0.07	5.39	4.24	3.27	2.57	1.78	1.38	1.03	0.65	0.39	0.18	0.10
2018	0	16.3	0.11	6.04	4.15	2.84	2.12	1.65	1.33	1.05	0.77	0.52	0.17	0.14
2019	0	13.5	0.08	5.50	4.47	3.32	2.55	2.00	1.58	1.18	0.71	0.43	0.23	0.13
2020	0	10.5	0.14	6.14	4.31	3.32	2.48	1.85	1.32	0.97	0.74	0.52	0.28	0.22
2021	0	10.8	0.24	5.20	4.09	2.80	2.27	1.69	1.37	1.04	0.78	0.63	0.40	0.31
2022	32	8.69	0.11	4.71	3.72	2.75	1.92	1.42	1.03	0.53				