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CASTLEMARTYR WASTE WATER AGGLOMERATION

WW DISCHARGE LICENCE REVIEW APPLICATION

ATTACHMENT D.2-1 - Assessment of Impact on Receiving Surface or Ground Water

CONTENTS

EXECUTIVE SUMMARY

The Environmental Protection Agency (EPA) issued a Wastewater Discharge Licence (WWDL) for Castlemartyr Waste Water Agglomeration in 2014 (Reg No. D0134-01). The WWDL was based on a primary discharge to the Kiltha River of 360m^3/day for a population equivalent (PE) of 2,000.

Uisce Éireann propose to upgrade the existing WwTP at Castlemartyr for a design PE of 3,400, with primary discharge flow of 765m^3/day. The WWTP will be designed to meet both the discharge quality standards set out in Urban Waste Water Treatment Regulations (UWWTR), and to a standard which will allow the Kiltha River to meet "Good" status as required by the Water Framework Directive (WFD) and the Surface Water Regulations. The chemical water quality of the receiving watercourse is required by the (WFD) to achieve "Good" status by latest 2027. Chemical quality boundaries that define "Good" status are set out in the Surface Waters Regulations.

The purpose of this assessment is therefore to determine Emission Limit Values (ELVs) for the proposed upgraded WWTP that will allow 'High' status of the receiving watercourse to be maintained or meet 'Good' status at a minimum. This document details the calculation procedure undertaken to determine the ELVs for discharge from the proposed upgraded WWTP.

Waste Assimilative Capacity (WAC) calculations have therefore been carried out. Upstream water quality data for 2018 to 2021 derived from EPA surveillance monitoring (aSW1u: 196366E, 73253N) along with estimates of river flows, were used in the calculations. River flow was estimated from flow duration curves developed for a "donor" site as part of the National Water Resources Plan (NWRP) to estimate the flow rate of the river at Mogeely, approximately 3km upstream of the Castlemartyr WWTP Primary Discharge Point and then extrapolation on the basis of catchment area for the proposed Primary Discharge Point.

A basic sensitivity analysis was carried out to determine if limiting the proportion of downstream allowable concentrations of the environmental quality standard (EQS) would require significant additional investment in the WwTP. The analysis found that the cBOD ELVs did indeed lie on either side of a typical significant investment, but since tertiary treatment is required, the additional capacity to meet the lower cBOD ELV can be incorporated in this and will therefore be capable of complying with the cBOD ELV of 6.63mg/L. For Orthophosphate, Uisce Éireann will provide an effluent quality capable of meeting the ELV of 0.22mg/L as P. The ELV of 0.68mg/L selected for Total Ammonia will require post-secondary treatment to be met.

The outputs of the calculations are summarised in the table below.

Parameter	UWWTD requirements	Proposed ELVs
BOD	25mg/L	6.63mg/L
COD	125mg/L	125mg/L
Suspended Solids	35mg/L	35mg/L
Total Ammonia N	-	0.68mg/L
Orthophosphate P	-	0.22mg/L

Table 1: Summary of Proposed ELVs

1.0 INTRODUCTION

1.1 Description of Proposed Upgraded WwTP

Castlemartyr Wastewater Treatment Plant (WwTP) is located south of Castlemartyr, County Cork and discharges into the River Kiltha, a tributary of the Womanagh River. Uisce Éireann propose to upgrade the existing WwTP. The current WWTP was designed to treat a PE of 2,000 and the upgrade works are proposed to allow the WWTP to treat a PE of 3,400. This will be a full upgrade consisting of new inlet works, storm water holding tank, inlet pumping station, conventional activated sludge plant, clarifiers, tertiary treatment, new outfall, sludge handling and ancillary works including fencing, roadways and drainage.

Urban Wastewater Treatment Directive:

The WWTP will be designed to meet the discharge quality set out in the Urban Wastewater Treatment Directive as implemented into Irish law by the Urban Waste Water Treatment Regulations, 2001 (S.I. No. 254/2001) and subsequent amendments. A PE of 3,400 exceeds the 2,000PE threshold that requires secondary treatment and hence the plant will be required by the UWWTD to achieve 25mg/L BOD, 35mg/LSS and 125mg/L COD discharge concentrations. S.I. No. 254/2001 - Urban Waste Water Treatment Regulations, 2001, specifies that the design, construction and maintenance of a collection system shall be undertaken in accordance with the best technical knowledge not entailing excessive costs, notably regarding;

- Volume and characteristics of urban waste water;
- Prevention of leaks;
- Limitation of pollution of receiving waters due to storm water overflows.

S.I. No. 254/2001 - Urban Waste Water Treatment Regulations, 2001 require for the following monitoring activities to be performed:

- Discharges from urban waste water treatment plants in accordance with the procedures set out in the Fifth Schedule in order to verify compliance with the requirements of these Regulations, as appropriate, and
- Waters subject to a discharge from an urban waste water treatment plant where it can be expected that the receiving waters will be significantly affected.

Water Framework Directive:

The purpose of carrying out ELV calculations is to determine the effluent discharge conditions required for the receiving watercourse to meet “Good” status, as per guidelines specified by the Water Framework Directive (WFD). By adhering to the proposed ELVs calculated, it can be ensured that WwTP will not prevent the quality of the receiving river water body downstream of the primary discharge point from meeting “Good” status under the WFD and Surface Water Regulations.

Combined Approach to Pollution Control:

Article 10 of The Water Framework Directive (2000/60/EC) states that discharges to waters shall be controlled, by one or more of the following, as set out in existing European Legislation, such as the Integrated Pollution and Prevention Control Directive 96/61/EC, the Urban Waste Water Treatment Directive 91/271/EEC and the Nitrates Directive 91/767/EEC:

- Establishment of emissions limits;
- Emission controls based on best available techniques;
- Use of best environmental practices for diffuse sources.

Wherever the quality objectives of one piece of legislation require stricter conditions to be applied, Member States must ensure that these are achieved. The proposed upgraded primary discharge from Castlemartyr WwTP will comply with the above approach, in that requirements of all relevant directives are met, including Water Framework Directive and Urban Waste Water Treatment Directive.

1.2 EPA Wastewater Discharge Licence

It is noted that the Environmental Protection Agency (EPA) issued a Wastewater Discharge Licence (WWDL) for Castlemartyr WW agglomeration in 2014 (Reg No. D0134-01). The WWDL was based on a daily discharge from the primary discharge point to the Kiltha River of 360m^3/day for a population equivalent (PE) of 2,000.

1.3 Water Framework Directive

The Water Framework Directive (WFD) has been transposed into Irish Law. In broad terms, the WFD aims to protect or enhance all waters and to achieve "Good" status for all waters by December 2015. The maximum allowable concentrations, known as EQSs (Environmental Quality Standards) in waters classified as being “Good” status are defined in the European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 (SI No.77 of 2019), known as the Surface Water Regulations.

According to the Weser Ruling (C-461/13), each quality element (related to the biological, hydromorphological and physio-chemical quality characteristics specific to each type of water body) as well as the ecological status of the water body as a whole will be classified based on the five status classifications. Under the rule of “one out all out”, the ecological status of the body of water is determined based on its poorest quality element, therefore the waterbody must attain ‘Good’ status as described in each piece of applicable legislation for the waterbody to be classified as ‘Good’ overall (i..e. deterioration of the recipient’s status for a single quality element or substance is not allowed).

1.4 River Basin Management Plan

Information on the River Basin Management Plan (2018-2021), Draft River Basin Management Plan(2022-2027), and associated information on the catchments available on www.catchments.ie wasreviewed:

- The RBMP sets out the measures that are necessary to protect and restore water quality in Ireland.

The overall aim of the plan is to ensure that Irelands natural waters are sustainably management and that freshwater resources are protected so as to maintain and improve Ireland's water environment. The Draft 3rd cycle plan identifies that based on 2013-2018 data, 53% of surface waters are in 'Good' or 'High' ecological status while the remaining 47% are in 'Unsatisfactory' ecological status.

- Continued investment in wastewater infrastructure is highlighted as one of the key actions in the plans. The Womanagh River is identified as an Area for Action (AFA), with a Restoration objective, though there is no specific reference to Castlemartyr WwTP upgrade as a measure/action.

1.5 Purpose of Current Assessment

The Ambient Monitoring Results (2013 – 2018) indicate that the receiving water (Kiltha River) is not in compliance with the European Communities Environmental Objectives (Surface Water) Regulations, 2009, as amended. Upstream and Downstream of the Primary Discharge Location (SW001), the Kiltha River has achieved "Moderate" WFD status (2013– 2018). The WFD objective and timeframe is to restore 'Good' ecological status by 2015, or by the latest 2027.

The purpose of this assessment is therefore to determine the discharge conditions for the proposed upgraded WWTP, that would be required to allow the receiving watercourse to meet "Good" status and to confirm if the conditions are compatible with the intended design of the proposed upgraded WWTP. This report details the investigation and calculations carried out to determine the required discharge conditions, known as Emission Limit Values (ELVs) for the proposed upgraded WwTP effluent stream. The ELV's have been calculated to ensure that the discharge from Castlemartyr WwTP complies with the Combined Approach, in that requirements of all relevant directives are met.

1.6 Trends in Ambient Water Quality

A basic assessment of the trend in 3 key parameters of ambient water quality data, namely, BOD, ammonia and ortho-P between 2014 and 2020 was made. The purpose of this analysis is to identify any upward or downward trends in the water quality of the Kiltha River over recent years. For example, if there were a discernible downward trend in BOD concentration, then the WAC for BOD would be based on historical data that did not reflect current or potentially future baseline concentration. Ambient monitoring data was exported from monitoring station RS19W011000. The data was plotted (Figure 1) to determine if any such trends existed.

The data set for BOD and Ammonia present weak upward trends, while the respective analysis for Ortho-P presents a weak downward trend. Given that R^2 values for each trend line are all less than 0.04 suggests that the data has poor fit to the data. On the basis of this analysis, it is therefore acceptable to calculate ELV's based on water quality data extracted for 3-years previous as a significant increase or decrease in ambient water quality monitoring parameters due to existing pressures is not observed.

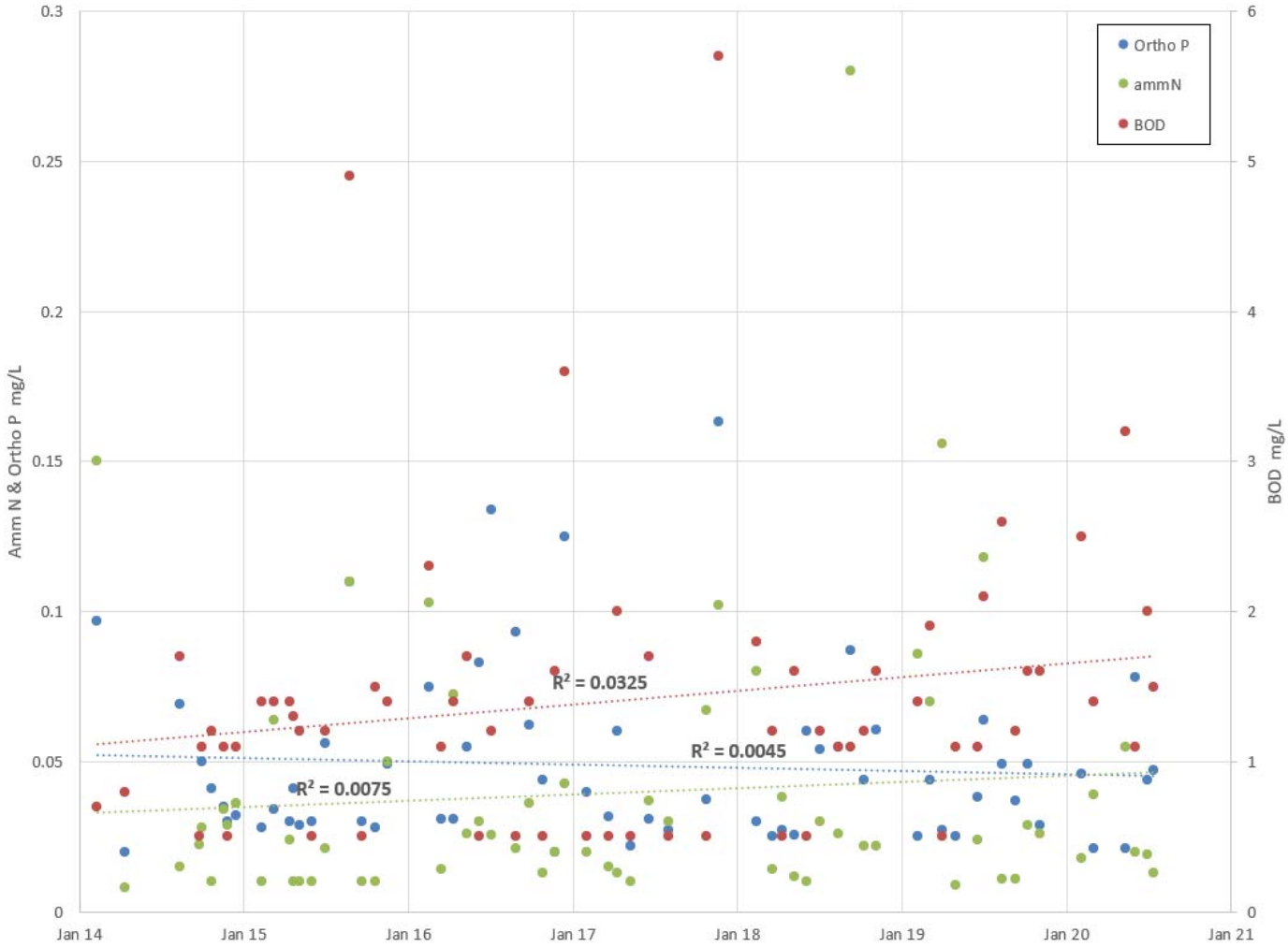

Figure 1: Trends in BOD, Ammonia and Ortho-P concentrations in the Kiltha River, upstream of the WWTP Primary Discharge Location at Castlemartyr Bridge 2014 - 2020

2.0 METHODOLOGY

2.1 Mass Balance Calculation

In order to determine the required discharge quality, the Waste Assimilative Capacity (WAC) of the receiving watercourse must be calculated. The WAC of a watercourse is a function of its flow (dry weather flow, 95-percentile flow or median flow) and its background physicochemical quality. It examines the ability of a water body to absorb additional pollutants without impacting on the overall quality of the water body.

The WAC is calculated from the mass balance between the receiving watercourse upstream of the Primary Discharge Point (SW001), the treated effluent from the WWTP and the receiving watercourse downstream of the Primary Discharge Point (SW001).

Therefore

$$Q_E C_E + Q_R C_R = Q_T C_T$$

Where:

Q_E = characteristic flow of wastewater treatment plant m^3/day

C_E = allowable concentration of parameter in effluent from wastewater treatment plant mg/L

Q_R = relevant flow of receiving watercourse upstream of discharge m^3/day

C_R = concentration of parameter in watercourse upstream of discharge mg/L

Q_T = combined flow of receiving watercourse upstream of discharge and effluent from wastewater treatment plant m^3/day.

C_T = concentration of parameter in watercourse downstream of discharge mg/L. See below for a discussion of the limits set on the downstream concentration of each parameter.

Q_E, Q_R, C_R, are known. Q_T is simply the sum of Q_E and Q_R.

The units here are m^3/day and mg/L.

For receiving watercourses where the dilution factor is large, the addition of the effluent flow rate to the flow rate of the receiving watercourse is negligible – the daily loading could simply be added to the upstream load in the river to give the downstream loading. However, the dilution rate is relatively low here and it has been included in the calculations.

C_E is to be determined.

It can be shown that

$$C_E = \frac{Q_R}{Q_E}(C_T - C_R) + C_T \qquad (1)$$

2.2 River Flow to be Used in Calculation

The assimilative capacity has been calculated on the basis of the 95-percentile (95%ile) flow rate of the watercourse (0.09442m^3/s), that being the flow rate which is exceeded for 95% of the time.

2.3 Discharge Flow to be Used in Calculation

The flow rate to be used in calculating loadings discharged to the watercourse is the average daily flow to the WWTP during a period without rain, known as Dry Weather Flow (DWF), which is the characteristic flow of the WWTP. The DWF of the proposed upgraded WWTP has been calculated as 765m^3/day.

3.0 RIVER FLOW RATE

Flow duration curves developed by Uisce Éireann as part of the National Water Resources Plan (NWRP), based on data obtained from an upstream river monitoring point at Mogeely, allowed for hydrological estimates of the river flow rate at the Primary Discharge Point (SW001). This was carried out using gauge 19032 Glashaboy as a donor catchment because it has similar catchment characteristics as the target site. It also has similar geology (sandstone, conglomerate and siltstone) and recharge, and has 30 years of hydrological data available. The 95%ile flow at Mogeely was determined to be 0.0665m^3/s. Applying a flow-per-unit-area approach to scale the flow from Mogeely to Castlemartyr results in an estimated flow rate of 0.09442m^3/s at the Primary Discharge Point (SW001). The flow rate of the Kiltha River at the Primary Discharge Point (SW001) was also estimated using EPA's Hydrotool, as verification of this value. Details of the calculation are contained in Appendix B.

The Kiltha River at Mogeely is marked by the red cross number 1 and the proposed point of Primary Discharge from the upgraded WWTP is marked by the red cross number 2 on Figure 2 below:

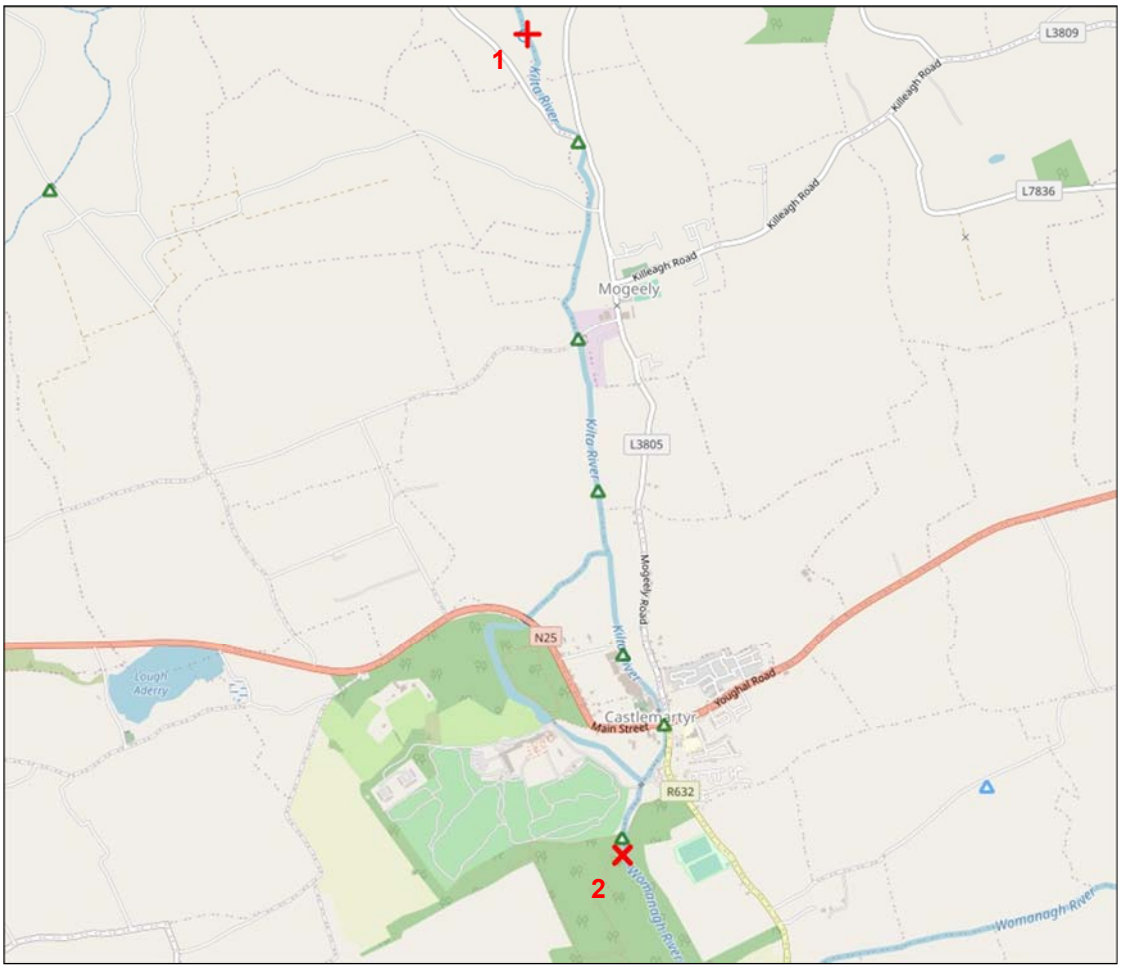

Figure 2: Location of River Flow Estimate and Proposed Primary Discharge Points (SW001), taken from https://gis.epa.ie/EPAMaps/Water

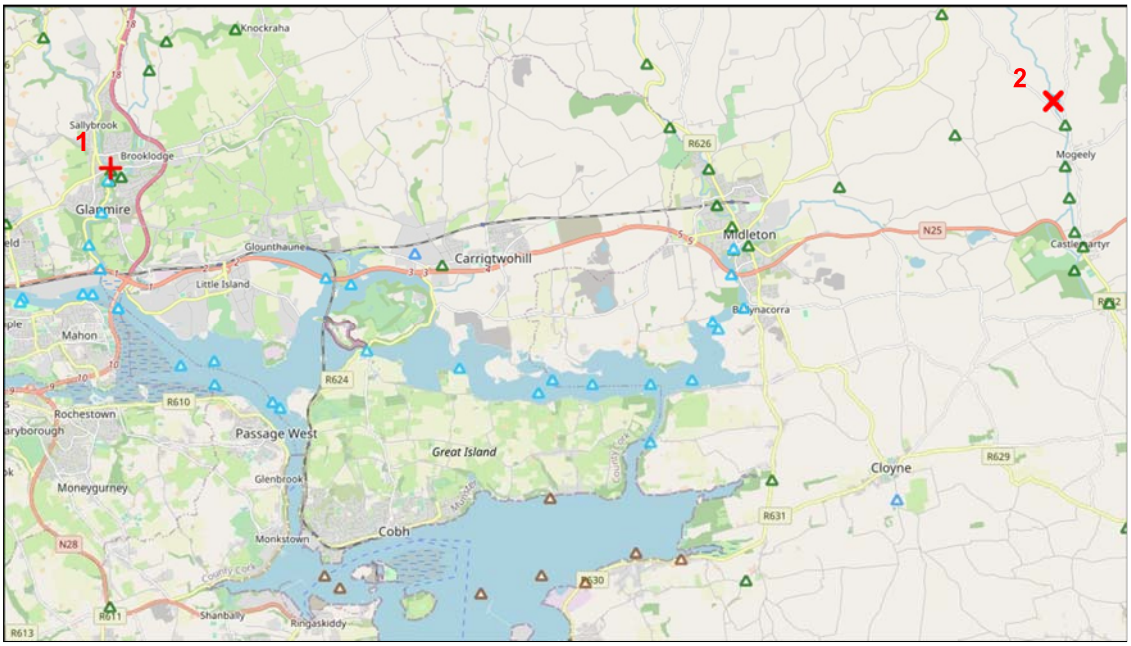

Figure 3: Location of Donor Site (1) and Point where the flow was estimated at Mogeely (2)

4.0 BASELINE WATER QUALITY

4.1 Source of Baseline (Ambient) Water Quality Data

Ideally, a robust dataset for a point on the receiving watercourse immediately upstream of the Primary Discharge Point would be available to determine baseline water quality data for the WAC calculation. There is in fact, a monitoring station at the bridge in Castlemartyr itself, known as National Water Monitoring Station RS19W011000. Routine surveillance data collected from this site is available for export from the EPA website over a time period beginning in 2014 to the present date. The location of the monitoring station is shown below (red cross) in an extract from the EPA website on Figure 4 below.

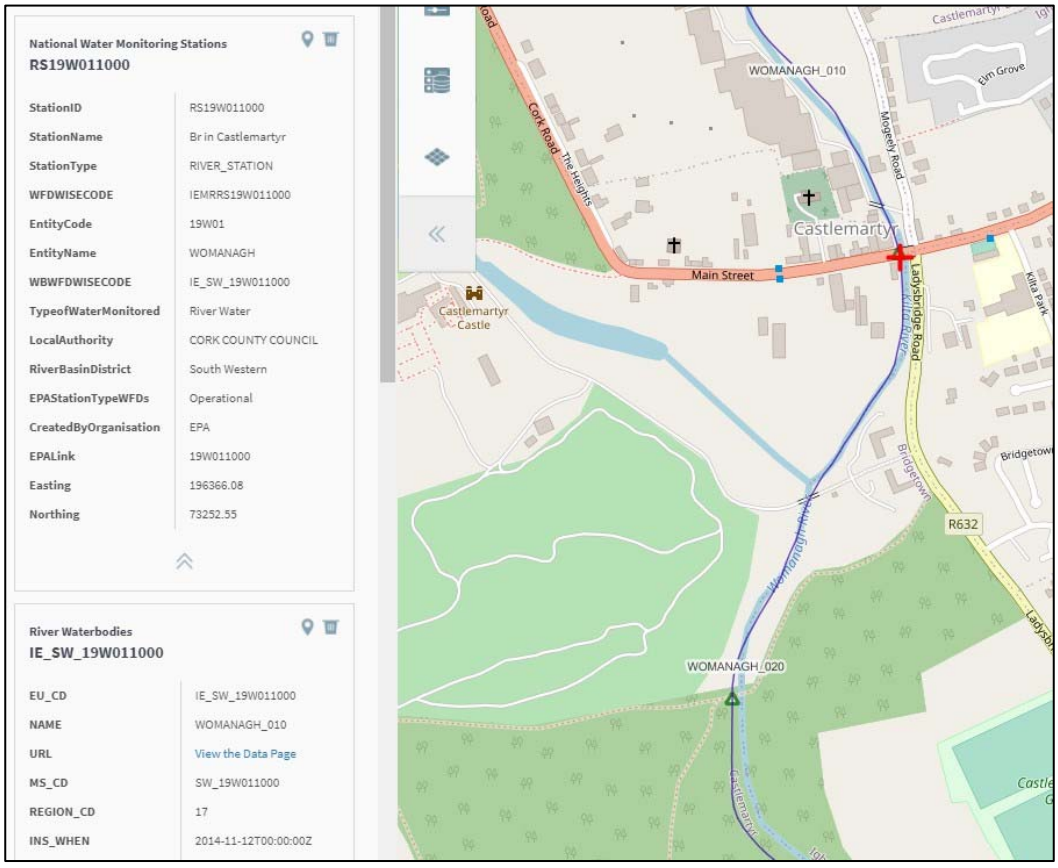

Figure 4: National Water Monitoring Station RS19W011000 taken from https://gis.epa.ie/EPAMaps/Water

It was noted that there is a tributary flow downstream of the monitoring point. The tributary flow may have different chemical characteristics to the river at Castlemartyr Bridge. However, this tributary flow is an abstraction from the upstream river itself and is used as a feature in the ornamental gardens of the Castlemartyr Resort and has been a hydrological feature for many decades. It is therefore reasonable to accept the data for the river at Castlemartyr Bridge as representative of the river at the Primary Discharge Point (SW001).

Chemical data for the National Monitoring Station RS19W011000 were exported from the EPA website in an excel format. The spreadsheet provided parameter concentrations and also reported results which were used when concentrations fell below the limit of detection. The extracted data is reproduced in full in Appendix A. Table 2 presents the mean values for data collected over a 3-year period from September 2018 to September 2021 for concentrations of Total Ammonia, Orthophosphate, Suspended Solids, BOD and COD at the monitoring point, upstream of the Primary Discharge Point (SW001). The mean values as determined through statistical analysis of the exported data set, along with EQS limits, were used as input to the mass balance for determination of parameter ELV's.

	BOD (mg/L)	COD (mg/L)	SS (mg/L)	Total Ammonia (mg/L)	Ortho-P (mg/L)
Mean Upstream Chemical Conditions	1.5	14.4	8.4	0.051	0.041
WFD Mean Conditions for 'Good' status	≤1.5	-	-	≤0.065	≤0.035
WFD 95%ile Conditions for 'Good' status	≤2.6	-	-	≤0.140	≤0.075

Table 2: Summary of Upstream Chemical Conditions 2018 – 2021

4.2 Catchment Pressures

The upstream water quality (Monitoring location: 196366E, 73253N) is classified as 'Moderate' under WFD status boundaries (2013-2018). This is assumed to include the contribution from a discharge of wastewater from a WwTP within an industrial facility with IED Licence P0817-01, which is located approximately 2.5km upstream of Castlemartyr WwTP at Mogeely. The IED Licence, P0817-01, currently permits the facility to discharge 700m^3 of treated effluent per day to the River Kiltha. There are current proposals to relocate the existing outfall from this facility, however any effect of this is not predictable. For purposes of the current assessment, it is assumed that this pressure is not removed.

While it is not possible to predict the effect of removing this pressure on the ambient water quality at Castlemartyr's WwTP Primary Discharge Point (SW001), the use of historic ambient data is therefore conservative.

Calculation of the WAC using both background water quality data and the "Notionally clean" approach have been investigated.

4.3 "Notionally Clean" Approach

The WAC has been calculated using both background water quality data and the "Notionally clean" approach. This method has been applied to situations where the upstream background concentrations of pollutants exceed, or are very close to ecological quality standards and there is no objective means to calculate assimilative capacity. It is understood that this approach is only adopted where upstream background concentrations of pollutants exceed, or are very close to, the ecological quality standards for 'Good' status to be achieved.

As the upstream pollutant concentrations do not exceed the threshold for 'Good' status to be met, the "Notionally Clean" approach is not applicable.

5.0 ALLOWABLE DOWNSTREAM CONCENTRATIONS

5.1 Water Framework Directive and Surface Water Regulations

The purpose of this investigation is to determine the required effluent quality from Castlemartyr WwTP in order to allow the Kiltha River to maintain at least “Good” status under the Water Framework Directive (WFD). The directive has been transposed into Irish Law by the European Communities Environmental Objectives (Surface Waters) Regulations 2009 (SI No.272 of 2009), with updated limits contained in European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 (SI No.77 of 2019). The 95%ile boundaries are summarised in the table below.

RIVER WATER BODY		
OXYGENATION CONDITIONS (BIOCHEMICAL OXYGEN DEMAND)		
Biochemical Oxygen Demand (BOD) (mg O_2/L)	Good status ≤ 2.6	High status ≤ 2.2
NUTRIENT CONDITIONS		
Total Ammonia (mg N/L)	Good status ≤ 0.140	High status ≤ 0.090
Molybdate Reactive* Phosphorus (MRP) mgP/L	Good status ≤ 0.075	High status ≤ 0.045

Table 4: Summary of Status Boundaries in the Surface Water Regulations

*Phosphorus occurs in wastewater almost solely as phosphates, which are classified as orthophosphates, polyphosphates (“condensed phosphates”) and organically bound phosphates. Phosphates may be present in solution, in particulate form or within biomass. Phosphates that contribute to colorimetric tests without preliminary digestion are termed "Reactive Phosphorus" hence the term “Molybdate Reactive Phosphorus”. Reactive Phosphorus mainly measures Orthophosphate, but some Condensed Phosphate is also known to contribute when measured using the ammonium molybdate method. The contribution of condensed phosphate is assumed to be small in a treated WWTP effluent and for the purposes of this investigation, MRP and orthophosphate are taken to be numerically equal.

5.2 Salmonid Waters

Freshwater Fish Directive (78/659/EEC amended by 91/692/EC) and transposed into Irish Law by European Communities (Quality of Salmonid Waters) Regulations, 1988 (S.I. No. 293 of 1988) prescribes quality standards for salmonid freshwaters. The Kiltha River is not a salmonid river based on the Salmonid Water Regulation Tables and so the limits contained within the Salmonid Waters Regulations are not considered when setting the ELVs for the Kiltha River.

6.0 CALCULATIONS

6.1 Biochemical Oxygen Demand, Orthophosphate and Total Ammonia

6.1.1 Calculation

The calculation for allowable effluent concentrations was based on the equations presented in Section 2.1 above, the characteristic discharge rate of 765m^3/day and the receiving watercourse flow rate 0.09442m^3/s set out above.

The results of the mass balance calculations for each parameter are set out in Table 5 below.

Parameter	Background concentration C_R (mg/L)	Proposed ELV's for discharge from SW001 (mg/L)	Contribution from primary discharge (mg/L)	Predicted downstream concentration C_T (mg/L)	Relevant Standard (mg/L)
BOD	1.511	6.631	0.439	1.950	2.600
Orthophosphate	0.041	0.215	0.015	0.056	0.075
Total Ammonia	0.051	0.681	0.054	0.105	0.140

Table 5: Summary of Calculated ELV's and Predicted Downstream Concentrations

6.2 Chemical Oxygen Demand

The COD ELV for the Castlemartyr WwTP is 125mg/L based on the Urban Wastewater Treatment Regulations, but the Surface Water Regulations do not set limits on the COD levels in receiving watercourses. Hence WAC for COD is not evaluated.

6.3 Suspended Solids

The Suspended Solids (SS) ELV for the Castlemartyr WWTP is 35mg/L based on the Urban Wastewater Treatment Regulations, but the Water Framework Directive does not set limits on the SS levels in receiving watercourses. Hence WAC for SS is not evaluated.

7.0 CONCLUSION

7.1 Summary of Inputs and Proposed ELVs

The characteristic flow from the proposed upgraded WWTP is Dry Weather Flow of 765m^3/day.

The upstream 95%ile flow of the receiving watercourse (Kiltha River) is 0.09442m^3/s.

ELVs were determined on the basis that the downstream concentrations of BOD, Total Ammonia N and Orthophosphate P would not exceed the relevant EQS.

Proposed ELVs are summarised in Table 6 below.

Parameter	UWWTR requirements	Proposed ELVs
cBOD	25mg/L	6.63mg/L
COD	125mg/L	125mg/L
Suspended Solids	35mg/L	35mg/L
Total Ammonia N	-	0.68mg/L
Orthophosphate P	-	0.22mg/L

Table 6: Proposed ELVs

8.0 COMPLIANCE WITH RELEVANT NATIONAL OR EU LEGISLATION

8.1 Water Framework Directive 2000/60/EC

The Water Framework Directive (WFD) has been transposed into Irish Law. In broad terms, the WFD aims to protect or enhance all waters and to achieve "Good" status for all waters by December 2015. The maximum allowable concentrations, known as EQSs (Environmental Quality Standards) in waters classified as being "Good" status are defined in the European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 (SI No.77 of 2019), known as the Surface Water Regulations.

The purpose of carrying out ELV calculations is to determine the effluent discharge conditions required for the receiving watercourse to meet "Good" status as per guidelines specified by the Water Framework Directive (WFD). By adhering to the ELVs calculated, it can be ensured that the quality of the receiving river water body downstream of the discharge point will meet the necessary standard for the Kiltha River to maintain at least "Good" status under the WFD and Surface Water Regulations.

Th upgraded WwTP that is the subject of this WWDL Review Application has been designed to produce a discharge standard complying with 6.63mg/L cBOD, 0.68mg/L Ammonia and 0.22mg/L Orthophosphate. This will ensure that the water quality of the river continues to comply with maximum allowable concentrations as defined in the European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 (SI No.77 of 2019). In conclusion, the proposal provides secondary and tertiary treatment that will produce a final effluent whose loadings will not cause the receiving watercourse to exceed WFD chemical quality concentrations. Therefore, the proposal complies with the requirements of the WFD.

8.2 Urban Wastewater Treatment Directive

The upgraded WWTP has been designed to meet the discharge quality set out in Urban Wastewater Treatment Directive, as implemented into Irish law by the Urban Waste Water Treatment Regulations, 2001 (S.I. No. 254/2001) and subsequent amendments. A PE of 3,400 exceeds the 2,000PE threshold that requires secondary treatment and hence the plant will be required by the UWWTD to achieve 25mg/L cBOD, 35mg/L SS and 125mg/L COD discharge concentrations. S.I. No. 254/2001 - Urban Wastewater Treatment Regulations, 2001, specify that measures should be employed to limit the pollution of receiving waters due to storm water overflows (without entailing significant additional cost). Such measures to reduce the occurrence of unintended discharges entering the receiving watercourse are detailed in Attachment C2.

8.3 European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009

The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 (S.I. 296 of 2009) set legally binding objectives for water quality in rivers, or parts of rivers, inhabited by freshwater pearl mussels and designated as Special Area of Conservation (SAC). The Kiltha River/ Womanagh River have not been identified in the regulations as being inhabited by freshwater pearl mussels; hence the freshwater pearl mussels' regulations do not apply.

8.4 Drinking Water Directive 80/778/EEC

Drinking Water Directive (80/778/EEC) does not apply, as there are no water abstraction locations intended for human consumption that will be affected by the discharges from the WWTP, either in the current operation or after the upgrade works are complete.

8.5 Bathing Water Directive 76/160/EEC

There are no designated inland bathing areas in the Kiltha or Womanagh Rivers, nor any designated beaches on the Womanagh Estuary. Consequently, Council Directive 76/160/EEC, concerning the quality of bathing water, and the follow up Quality of Bathing Waters Regulations 1992 (SI No. 155 of 1992) do not directly apply.

8.6 Groundwater Directives 80/68/EEC & 2006/118/EC

Groundwater Directives (80/68/EEC & 2006/118/EC) are not applicable as there are no discharges to ground in the current operation and will be none with the upgrade works.

8.7 European Communities Environmental Objectives (Groundwater Regulations)

European Communities Environmental Objectives (Groundwater Regulations) are not applicable as current and future operation of the plant will involve no discharges to ground.

8.8 Birds Directive 79/409/EEC, Habitats Directive 92/43/EEC and European Communities (Birds and Natural Habitats) Regulations 2011 as amended

Castlemartyr WWTP discharges indirectly via the Kiltha River and Womanagh River into the Ballymacoda (Clonpriest and Pillmore) SAC. The site is protected for priority habitats listed under Annex 1 of the Habitats Directive [92/43/EEC]. It is also selected for protection of species listed under Annex II of the same directive. The site is also designated an SPA (Ballymacoda Bay) under the Birds Directive [79/409/EEC] for the conservation of wild birds. A NIS has been prepared for the proposed development. The NIS identified that the discharge from the proposed upgraded WWTP will not contribute to eutrophication impacts and poses no risk to the conservation objective targets for the wetland habitats supporting the SPA species, or any direct risk to bird species. Assessment of the potential adverse effects relating to the discharge are detailed in Attachment D2.2 Natura Impact Statement – Assessment of Potential Adverse Effects (pg. 21).

8.9 European Communities Environmental Objectives (Surface Waters)

The proposed upgraded WwTP that is the subject of this application has been designed to produce a discharge standard complying with 6.63mg/L cBOD, 0.68mg/L Ammonia and 0.22mg/L Orthophosphate. This will ensure that the water quality of the river continues to comply with maximum allowable concentrations as defined in the European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 (SI No.77 of 2019). The Surface Water Regulations also specify allowable EQS limits for 21 priority hazardous substances. Analysis of available chemical monitoring data from downstream water monitoring station RS19W011040 indicates that (where sufficient data is available) the majority of hazardous substances listed in the Surface Water Regulations are within the specified EQS annual average and maximum allowable concentration (MAC) limits. Three chemical species, namely, (Benzo(b)fluor-anthene, Benzo(k)fluor-anthene & Benzo(g,h,i)-perylene) were shown to exceed the MAC EQS limit. For each component, the MAC was only exceeded once (out of min. 29 samples), with all remaining samples falling within limits. Table D1 (Appendix C) presents AA and MAC limits along with the

compliance of downstream ambient monitoring samples for each priority substance where chemical data was available.

8.10 Wastewater Discharge Licence

It is noted that the Environmental Protection Agency (EPA) issued a Wastewater Discharge Licance (WWDL) for Castlemartyr WW agglomeration in 2014 (Reg No. D0134-01). The WWDL was based on a daily discharge from the primary discharge point to the Kiltha River of 360m3/day for a population equivalent (PE) of 2,000.

8.11 The Impact of the Discharges on any Environmental Media Other than those into which the Emissions are to be made

An Ecological Impact Assessment has been completed for the proposed project. The assessment addresses construction and operational stage effects on emissions to habitats and flora, fauna, visual and noise related disturbances. Assessment of the emissions and potential adverse effects on environmental media mentioned above can be found in Attachment D2.4 Ecological Impact Assessment Report (pg. 26).

8.12 Assessment of Priority Substances

The most recent Priority Substances Assessment (2021 AER) draws conclusions regarding the likelihood of the Castlemartyr WwTP discharge to contain priority hazardous substances. The 2021 AER contains results of a desk top study undertaken to determine the necessity, if any, for analysis of the discharge to comply with the condition in the WWDL based on the Guidance on the Screening for Priority Substances for Wastewater Discharge Licenses, issued by the EPA. The 2021 AER Report containing a Priority Substances Assessment is attached as Attachment D2.5 AER 2021 Castlemartyr D0134-01 (includes Priority Substances Assessment).

- Analysis of inputs to the WwTP has indicated that there are no industrial type discharges, other discharges with a likelihood of priority substances, leachate discharges or other imports. The wastewater entering the WWTP is domestic in nature.
- No parameters have been identified as potentially being higher than the required EQS following dilution at 95 percentile flows therefore no impact on the receiving waters is anticipated. Based on the assessment carried out, it is not considered that any further sampling or analysis is required.

REFERENCES

1. EPA Maps Tool, https://gis.epa.ie/EPAMaps/Water, accessed September 2021
2. River flow estimates – HydroTool Guidance Document, dme.pdf
3. Flow Duration Curves for Ungauged Catchments in Ireland, Bree, Thomas. Dec 2018
4. https://data.gov.ie/dataset/register-of-protected-areas-salmonid-water-regs-table
5. European Communities Environmental Objectives (Surface Waters) Regulations 2009 (SI No.272 of 2009)
6. European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 (SI No.77 of 2019)
7. Urban Wastewater Treatment Regulations, 2001 (S.I. No. 254/2001).

APPENDIX A – UPSTREAM RIVER CHEMICAL QUALITY

The data presented in the tables below are directly extracted from the file exported from the EPA website for water monitoring station RS19W011000. In these tables the data has been simplified, with the statistical data calculated at the foot of each table.

Sample Date	Parameter	Result (mg/L)	LOD (mg/L)	Reported Result (mg/L)
12/09/2018	Ammonia-Total (as N)	0.28	*	0.28
10/10/2018	Ammonia-Total (as N)	0.0219	*	0.0219
07/11/2018	Ammonia-Total (as N)	0.0218	*	0.0218
06/02/2019	Ammonia-Total (as N)	0.086	*	0.086
06/03/2019	Ammonia-Total (as N)	0.07	*	0.07
03/04/2019	Ammonia-Total (as N)	0.156	*	0.156
01/05/2019	Ammonia-Total (as N)	0.009	*	0.009
19/06/2019	Ammonia-Total (as N)	0.024	*	0.024
03/07/2019	Ammonia-Total (as N)	0.118	*	0.118
14/08/2019	Ammonia-Total (as N)	0.011	*	0.011
11/09/2019	Ammonia-Total (as N)	0.011	*	0.011
09/10/2019	Ammonia-Total (as N)	0.029	*	0.029
06/11/2019	Ammonia-Total (as N)	0.026	*	0.026
05/02/2020	Ammonia-Total (as N)	0.018	*	0.018
04/03/2020	Ammonia-Total (as N)	0.039	*	0.039
13/05/2020	Ammonia-Total (as N)	0.055	*	0.055
03/06/2020	Ammonia-Total (as N)	0.02	*	0.02
01/07/2020	Ammonia-Total (as N)	0.019	*	0.019
15/07/2020	Ammonia-Total (as N)	0.013	*	0.013
12/08/2020	Ammonia-Total (as N)	0.034	*	0.034
02/09/2020	Ammonia-Total (as N)	0.013	*	0.013
07/10/2020	Ammonia-Total (as N)	0.036	*	0.036
04/11/2020	Ammonia-Total (as N)	0.019	*	0.019
13/01/2021	Ammonia-Total (as N)	0.037	0.02	0.037
03/02/2021	Ammonia-Total (as N)	0.11	0.02	0.11
03/02/2021	Ammonia-Total (as N)	0.136	*	0.136
17/02/2021	Ammonia-Total (as N)	0.076	*	0.076
03/03/2021	Ammonia-Total (as N)	0.021	0.02	0.021
03/03/2021	Ammonia-Total (as N)	0.023	*	0.023
08/04/2021	Ammonia-Total (as N)	<0.02	0.02	0.01
14/04/2021	Ammonia-Total (as N)	0.024	*	0.024
12/05/2021	Ammonia-Total (as N)	0.013	*	0.013
19/05/2021	Ammonia-Total (as N)	0.14	0.02	0.14
02/06/2021	Ammonia-Total (as N)	0.008	*	0.008
07/07/2021	Ammonia-Total (as N)	0.059	*	0.059
	Mean			**0.051**

*** Limit of Detection (LOD) not stated**

Sample Date	Parameter	Result (mg/L)	LOD (mg/L)	Reported Result (mg/L)
12/09/2018	COD-Cr	<21	21	10.5
27/09/2018	COD-Cr	25	21	25
10/10/2018	COD-Cr	<21	21	10.5
07/11/2018	COD-Cr	<21	21	10.5
06/02/2019	COD-Cr	<21	21	10.5
06/03/2019	COD-Cr	25	21	25
03/04/2019	COD-Cr	<21	21	10.5
01/05/2019	COD-Cr	<21	21	10.5
19/06/2019	COD-Cr	<21	21	10.5
03/07/2019	COD-Cr	<21	21	10.5
14/08/2019	COD-Cr	<21	21	10.5
11/09/2019	COD-Cr	23	21	23
09/10/2019	COD-Cr	<21	21	10.5
06/11/2019	COD-Cr	<21	21	10.5
05/02/2020	COD-Cr	<21	21	10.5
04/03/2020	COD-Cr	<21	21	10.5
13/05/2020	COD-Cr	<21	21	10.5
03/06/2020	COD-Cr	25	21	25
01/07/2020	COD-Cr	21	21	21
15/07/2020	COD-Cr	28	21	28
12/08/2020	COD-Cr	<21	21	10.5
02/09/2020	COD-Cr	<21	21	10.5
07/10/2020	COD-Cr	25	21	25
04/11/2020	COD-Cr	21	21	21
03/02/2021	COD-Cr	<21	21	10.5
17/02/2021	COD-Cr	<21	21	10.5
03/03/2021	COD-Cr	<21	21	10.5
14/04/2021	COD-Cr	<21	21	10.5
12/05/2021	COD-Cr	<21	21	10.5
02/06/2021	COD-Cr	22	21	22
07/07/2021	COD-Cr	<21	21	10.5
	Mean			**14.4**

Sample Date	Parameter	Result (mg/L)	LOD (mg/L)	Reported Result (mg/L)
12/09/2018	Suspended Solids	4	2.5	4
27/09/2018	Suspended Solids	61	2.5	61
10/10/2018	Suspended Solids	4	2.5	4
07/11/2018	Suspended Solids	5	2.5	5
06/02/2019	Suspended Solids	<2.5	2.5	1.25
06/03/2019	Suspended Solids	30	2.5	30
03/04/2019	Suspended Solids	9	2.5	9
01/05/2019	Suspended Solids	12	2.5	12
19/06/2019	Suspended Solids	<2.5	2.5	1.25
03/07/2019	Suspended Solids	4	2.5	4
14/08/2019	Suspended Solids	<2.5	2.5	1.25
11/09/2019	Suspended Solids	<2.5	2.5	1.25
09/10/2019	Suspended Solids	4	2.5	4
06/11/2019	Suspended Solids	5	2.5	5
05/02/2020	Suspended Solids	6	2.5	6
04/03/2020	Suspended Solids	9	2.5	9
13/05/2020	Suspended Solids	7	2.5	7
03/06/2020	Suspended Solids	5	2.5	5
01/07/2020	Suspended Solids	25	2.5	25
15/07/2020	Suspended Solids	<2.5	2.5	1.25
12/08/2020	Suspended Solids	<2.5	2.5	1.25
02/09/2020	Suspended Solids	6	2.5	6
07/10/2020	Suspended Solids	9	2.5	9
04/11/2020	Suspended Solids	5	2.5	5
03/02/2021	Suspended Solids	12	2.5	12
17/02/2021	Suspended Solids	7	2.5	7
03/03/2021	Suspended Solids	4	2.5	4
14/04/2021	Suspended Solids	5	2.5	5
12/05/2021	Suspended Solids	6	2.5	6
02/06/2021	Suspended Solids	7	2.5	7
07/07/2021	Suspended Solids	<2.5	2.5	1.25
	Mean			**8.4**

Sample Date	Parameter	Result (mg/L)	LOD (mg/L)	Reported Result (mg/L)
12/09/2018	BOD - 5 days (Total)	1.1	1	1.1
10/10/2018	BOD - 5 days (Total)	1.2	1	1.2
07/11/2018	BOD - 5 days (Total)	1.6	1	1.6
06/02/2019	BOD - 5 days (Total)	1.4	1	1.4
06/03/2019	BOD - 5 days (Total)	1.9	1	1.9
03/04/2019	BOD - 5 days (Total)	<1	1	0.5
01/05/2019	BOD - 5 days (Total)	1.1	1	1.1
19/06/2019	BOD - 5 days (Total)	1.1	1	1.1
03/07/2019	BOD - 5 days (Total)	2.1	1	2.1
14/08/2019	BOD - 5 days (Total)	2.6	1	2.6
11/09/2019	BOD - 5 days (Total)	1.2	1	1.2
09/10/2019	BOD - 5 days (Total)	1.6	1	1.6
06/11/2019	BOD - 5 days (Total)	1.6	1	1.6
05/02/2020	BOD - 5 days (Total)	2.5	1	2.5
04/03/2020	BOD - 5 days (Total)	1.4	1	1.4
13/05/2020	BOD - 5 days (Total)	3.2	1	3.2
03/06/2020	BOD - 5 days (Total)	1.1	1	1.1
01/07/2020	BOD - 5 days (Total)	2	1	2
15/07/2020	BOD - 5 days (Total)	1.5	1	1.5
12/08/2020	BOD - 5 days (Total)	1.6	1	1.6
02/09/2020	BOD - 5 days (Total)	4	1	4
07/10/2020	BOD - 5 days (Total)	1.3	1	1.3
04/11/2020	BOD - 5 days (Total)	2	1	2
13/01/2021	BOD - 5 days (Total)	<1	1	0.5
03/02/2021	BOD - 5 days (Total)	2.3	1	2.3
03/02/2021	BOD - 5 days (Total)	1.1	1	1.1
17/02/2021	BOD - 5 days (Total)	1.4	1	1.4
03/03/2021	BOD - 5 days (Total)	<1	1	0.5
03/03/2021	BOD - 5 days (Total)	1.1	1	1.1
08/04/2021	BOD - 5 days (Total)	<1	1	0.5
14/04/2021	BOD - 5 days (Total)	1.9	1	1.9
12/05/2021	BOD - 5 days (Total)	<1	1	0.5
19/05/2021	BOD - 5 days (Total)	1.7	1	1.7
02/06/2021	BOD - 5 days (Total)	1.3	1	1.3
07/07/2021	BOD - 5 days (Total)	<1	1	0.5
	Mean			**1.5**

Sample Date	Parameter	Result (mg/L)	LOD (mg/L)	Reported Result (mg/L)
12/09/2018	ortho-Phosphate (as P) - unspecified	0.087	*	0.087
10/10/2018	ortho-Phosphate (as P) - unspecified	0.0439	*	0.0439
07/11/2018	ortho-Phosphate (as P) - unspecified	0.0604	*	0.0604
06/02/2019	ortho-Phosphate (as P) - unspecified	0.025	*	0.025
06/03/2019	ortho-Phosphate (as P) - unspecified	0.044	*	0.044
03/04/2019	ortho-Phosphate (as P) - unspecified	0.027	*	0.027
01/05/2019	ortho-Phosphate (as P) - unspecified	0.025	*	0.025
19/06/2019	ortho-Phosphate (as P) - unspecified	0.038	*	0.038
03/07/2019	ortho-Phosphate (as P) - unspecified	0.064	*	0.064
14/08/2019	ortho-Phosphate (as P) - unspecified	0.049	*	0.049
11/09/2019	ortho-Phosphate (as P) - unspecified	0.037	*	0.037
09/10/2019	ortho-Phosphate (as P) - unspecified	0.049	*	0.049
06/11/2019	ortho-Phosphate (as P) - unspecified	0.029	*	0.029
05/02/2020	ortho-Phosphate (as P) - unspecified	0.046	*	0.046
04/03/2020	ortho-Phosphate (as P) - unspecified	0.021	*	0.021
13/05/2020	ortho-Phosphate (as P) - unspecified	0.021	*	0.021
03/06/2020	ortho-Phosphate (as P) - unspecified	0.078	*	0.078
01/07/2020	ortho-Phosphate (as P) - unspecified	0.044	*	0.044
15/07/2020	ortho-Phosphate (as P) - unspecified	0.047	*	0.047
12/08/2020	ortho-Phosphate (as P) - unspecified	0.055	*	0.055
02/09/2020	ortho-Phosphate (as P) - unspecified	0.064	*	0.064
07/10/2020	ortho-Phosphate (as P) - unspecified	0.052	*	0.052
04/11/2020	ortho-Phosphate (as P) - unspecified	0.028	*	0.028
13/01/2021	ortho-Phosphate (as P) - unspecified	0.041	0.01	0.041
03/02/2021	ortho-Phosphate (as P) - unspecified	0.039	*	0.039
03/02/2021	ortho-Phosphate (as P) - unspecified	0.042	0.01	0.042
17/02/2021	ortho-Phosphate (as P) - unspecified	0.037	*	0.037
03/03/2021	ortho-Phosphate (as P) - unspecified	0.034	*	0.034
03/03/2021	ortho-Phosphate (as P) - unspecified	0.028	0.01	0.028
08/04/2021	ortho-Phosphate (as P) - unspecified	0.026	0.01	0.026
14/04/2021	ortho-Phosphate (as P) - unspecified	0.018	*	0.018
12/05/2021	ortho-Phosphate (as P) - unspecified	0.027	*	0.027
19/05/2021	ortho-Phosphate (as P) - unspecified	0.041	0.01	0.041
02/06/2021	ortho-Phosphate (as P) - unspecified	0.025	*	0.025
07/07/2021	ortho-Phosphate (as P) - unspecified	0.056	*	0.056
	Mean			**0.041**

*** Limit of Detection (LOD) not stated**

APPENDIX B - RIVER FLOW RATE VERIFICATION BASED ON 'HYDROTOOL'

The EPA's mapping site provides estimates of river flow at selected points on the river network via the HydroTool application. This tool provides flow estimates of ungauged rivers and is used here to verify the estimate derived from the donor site.

The nearest upstream location for which flows are estimated RWSEG-CD 19_975 is located approximately 7km upstream of the discharge location near Dungourney (A). The downstream estimate location RWSEG-CD 19_1909 is located just before the confluence of Kiltha River and Womanagh River (B).

The discharge location is marked as a red cross on the figure below:

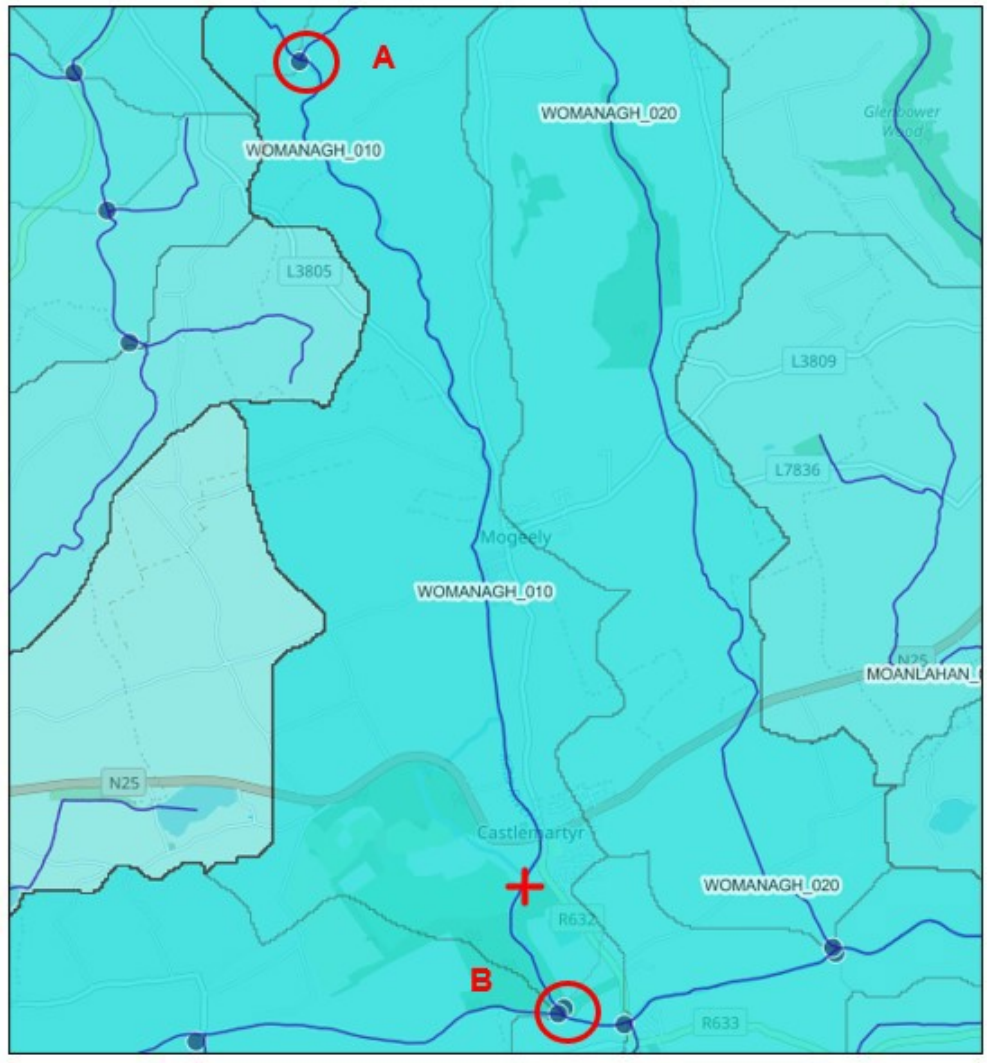

Figure B1: Location of flow estimate points taken from https://gis.epa.ie/EPAMaps/Water

Flows at the discharge point could be calculated by interpolation between the two points. However, given that the discharge point is close to the downstream point, a better estimate of river flows would be made by reducing the flows in proportion to their relevant catchment area.

The EPA website identifies the catchment boundary for the Kiltha River prior to the confluence with the Womanagh River. In the current investigation, the watershed was reproduced below and then topographical mapping of the area between the discharge point and the EPA's flow measurement point was used to estimate the catchment of the watercourse at the discharge point.

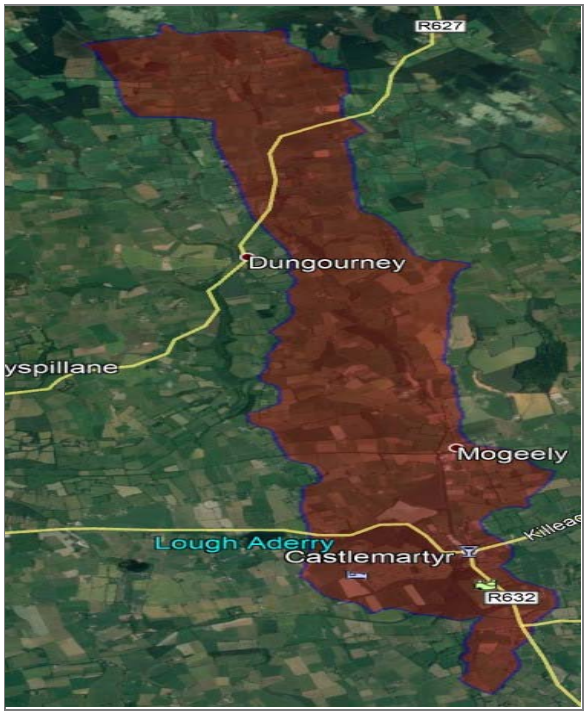

Figure B2: Entire catchment of the Kiltha River

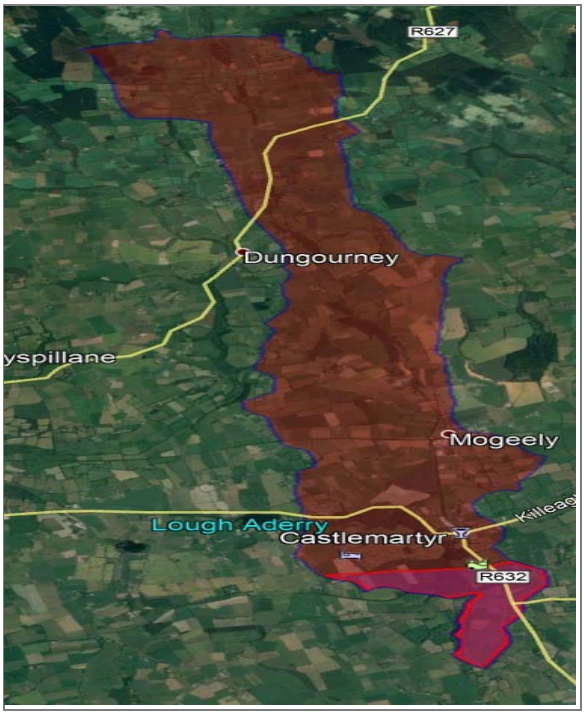

Figure B3: Kiltha River catchment with contributing area downstream of discharge point

The overall catchment area was calculated by this plot to be 28.8 km^2 which is in reasonable agreement with the published figure of 29.336km^2 for river segment 19_1909. The area of the catchment downstream of the Primary Discharge Location (red cross in the map above) was 1.8 km^2. Therefore, the catchment area upstream of the discharge point is 27.0km^2 which is 94% of the total catchment area. In 2006 Dixon Brosnan Environmental Consultants were commissioned by Cork County Council to carry out an environmental assessment of the entire River Womanagh catchment as part of an exercise to determine assimilative capacity of a number of points in the catchment. They estimated that the entire catchment of the Kiltha River to be 31km^2 and the sub catchment area upstream of Castlemartyr WWTP to be 30 km^2, hence at Castlemartyr WwTP the sub catchment is around 96% of the total Kiltha River catchment. This is in satisfactory agreement.

The estimated annual mean flow, median flow and 95%ile flow at the discharge location point are presented below for the discharge location as well as the points marked 'A' and 'B' for information.

	At Upstream Point 'A' (19_975)	At Discharge Point (estimated)	At Downstream Point 'B' (19_1909)
Annual Mean Flow	0.412 m^3/s	0.676 m^3/s	0.693 m^3/s
Median Flow	0.265 m^3/s	0.441 m^3/s	0.452 m^3/s
95%ile Flow	0.047 m^3/s	0.105m^3/s	0.109 m^3/s

Table B1: Estimated river flows at discharge point

The 95%ile flow determined by this method is 0.105m^3/s. Therefore, this supports the use of the value of 0.09442m^3/s described in section 3.0.

APPENDIX C – PRIORITY HAZARDOUS SUBSTANCE ASSESSMENT 2014

Name of Substance	AA-EQS Inland Surface Water (µg/L)	MAC-EQS Inland Surface Water (µg/L)	AA-Chemical Monitoring Data	No. of Samples	No. of MAC Exceedances	MAC-Chemical Monitoring Data	Within Specified Limits
Anthracene	0.1	0.1	0.005	36	0	0.0165	YES
Brominated diphenylether	N/A	0.14	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
Cadmium (assuming class 5 - CaCO3 > 200mg/L	0.25	1.5	0.038	12	0	0.05	YES
C10-C13 Chloroalkanes	0.4	1.4	<5	N/A	N/A	<5	YES *
Di(2-ethylhexyl)-phthalate	1.3	N/A	0.153	17	0	N/A	YES
Endosulfan	0.005	0.01	0.005	12	0	< 0.01	YES
Hexachlorobenzene	N/A	0.05	N/A	12	0	< 0.01	YES
Hexachlorobutadiene	N/A	0.6	N/A	43	0	< 0.5	YES
Hexachlorocyclohexane	0.02	0.04	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
Mercury	N/A	0.07	N/A	36	0	0.05	YES
Nonylphenol	0.3	2	0.01	12	0	< 0.02	YES
Pentachloro-benzene	0.007	N/A	0.005	12	N/A	N/A	YES
Polyaromatic hydrocarbons	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	0.00017	0.27	0.003	N/A	N/A	0.04	YES *
Benzo(b)fluor-anthene	N/A	0.017	N/A	32	1	0.044	NO
Benzo(k)fluor-anthene	N/A	0.017	N/A	29	1	0.044	NO
Benzo(g, h, i)-perylene	N/A	0.0082	N/A	33	1	0.046	NO
Indeno(1,2,3-cd)-pyrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tributyltin compounds	0.0002	0.0015	0.0005	N/A	N/A	<0.001	YES *
Trifluralin	0.03	N/A	0.005	12	N/A	N/A	YES
Dicofol	0.0013	N/A	NO DATA	NO DATA	N/A	N/A	NO DATA
Perfluoro-octane sulfonic acid	0.00065	36	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
Quinoxyfen	0.15	2.7	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
Dioxins	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hexabromocyclododecane	0.0016	0.5	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
Heptachlor & Heptachlor epoxide	0.0000002	0.0003	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA

Table C1 – Priority Hazardous Substances chemical monitoring data and respective Surface Water Regulation limits

* Assessment cannot be completed as presence of chemical species cannot be detected down to required level. I.e., Majority of samples have values which are below the LOD. EQS limits are considered to be met where the concentration of chemical species present in the sample is sufficiently insignificant to the point that it cannot be detected.