

St Cleran's Priority Area for Action

Kilcolgan_030

Section 4 Discharge Referral

Document Control Sheet

| | |
|-----------------------|--------------------------------------------|
| LAWPRO Region | Western Region |
| Document Title | Kilcolgan_030 Section 4 Discharge Referral |
| Document No. | Kilcolgan_030_GCC_RFL_F01 |

| Contents | No. of Pages | No. of Appendices |
|----------|--------------|-------------------|
| | 10 | 0 |

| Date | Version | Status | Authors | | Reviewer | |
|------------|---------|--------|-----------------------------------------|-------------------------|----------------------------------------------------------------------------------------------------|--------------------------------------------------|
| 24/06/2024 | F01 | Final | Michael Sheridan Catchment Scientist | <i>Michael Sheridan</i> | Cormac McConigley Western Region Catchment Manager Ailbhe Douglas Catchment Scientist | <i>Cormac McConigley</i> <i>A Douglas</i> |

Table of Contents

| | | |
|---|-------------------------------------------|---|
| 1 | Background | 1 |
| 2 | Local Catchment Assessment Findings | 3 |
| 3 | Conclusions | 8 |

List of Figures

| | | |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| Figure 1: | Kilcolgan_030 operational monitoring stations and inputting waterbodies | 1 |
| Figure 2: | Section 4 discharges and LCA sites in the vicinity of Craughwell village | 2 |
| Figure 3: | Section 4 discharge licence W410/06 at the back of Dún Ard housing estate from which waste water effluent flows | 4 |
| Figure 4: | Effluent pond formed in the field at the back of Dún Ard housing estate by the waste water flowing from the Section 4 discharge licence W410/06; note that the effluent continues to flow towards the Kilcolgan_030 from this point | 5 |
| Figure 5: | Location of the Section 4 Discharge Licence W410/06 and the flow of waste water effluent towards the Kilcolgan_030 | 5 |
| Figure 6: | Most effluent that flows from the pond appears to soak into the ground beside an area of scrub and forestry adjacent to the Kilcolgan_030 | 6 |
| Figure 7: | The lowest point of the field which is directly adjacent to the Kilcolgan_030 and where it appears effluent is washed down to during wet weather; photo taken in April 2023..... | 6 |
| Figure 8: | The lowest point of the field which is directly adjacent to the Kilcolgan River and where effluent was observed trickling down to from the effluent pond in July 2023 | 8 |

List of Tables

| | | |
|----------|-----------------------------------------------------------------------------------------------|----|
| Table 1: | Physico-chemical results from the Kilcolgan_030 LCA sites in the vicinity of Craughwell | 10 |
|----------|-----------------------------------------------------------------------------------------------|----|

1 Background

St Cleran's Priority Area for Action (PAA) is located in Co. Galway and comprises most of the Kilcolgan_SC_010 sub-catchment of the 29 Galway Bay South East Catchment. For the 3rd WFD cycle, the PAA will be expanded to include both the entire Kilcolgan_SC_010 and Kilcolgan_SC_020 sub-catchments. The area covered by the PAA is predominantly rural, with the towns of Loughrea and Craughwell being the main urban centres within the PAA, in addition to the villages of Kilreekil, Bullaun and Carrabane.

The Kilcolgan_030 has several inputting waterbodies, including the Kilcolgan_020, Toberdoney_020 and Raford_030 (**Figure 1**). There are two EPA operational monitoring stations in the Kilcolgan_030, one at the outflow of the waterbody at the Old Road Bridge in Craughwell (EPA station code: RS29K010400), and a second approximately 1700m upstream at Strongfort Lodge (EPA station code: RS29K010300) (see **Figure 1** and **Figure 2**). The Kilcolgan_030 is currently at Poor Ecological Status for the 2016 to 2021 monitoring period and is *At Risk* of failing to achieve its Good status objective under the Water Framework Directive (WFD). The latest EPA biological assessments were carried out in 2021, with Q4 (Good) and Q3 (Poor) recorded at the Strongfort Lodge and Old Road Bridge in Craughwell monitoring stations, respectively. The EPA biologist noted a very significant covering of blanket weed (i.e. *Cladophera* macroalgae) at the monitoring station in Craughwell but this was not observed upstream at Strongfort Lodge. This indicates that the site in Craughwell is eutrophic and that a source of nutrients is being introduced to the river in between these two monitoring stations.

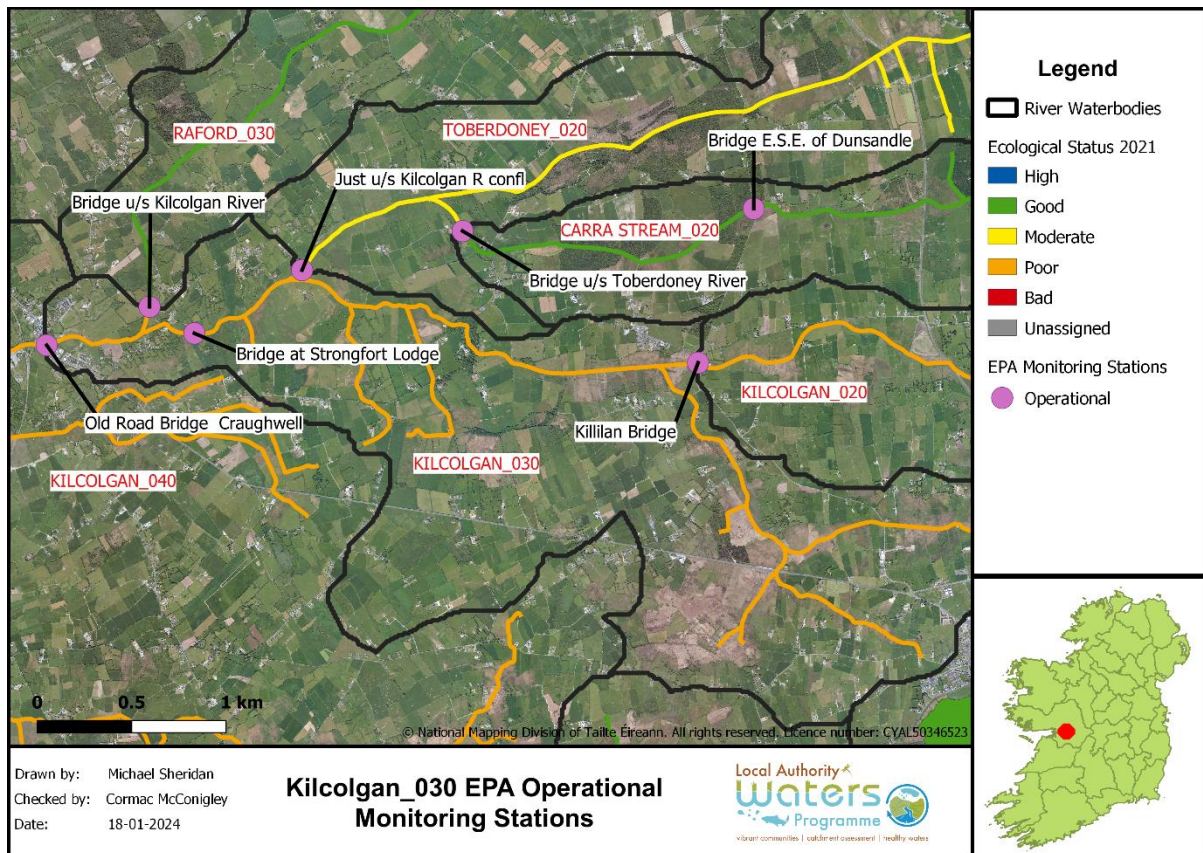


Figure 1: Kilcolgan_030 operational monitoring stations and inputting waterbodies

Initial characterisation identified agriculture, hydromorphology and urban waste water as significant pressures impacting on water quality in the Kilcolgan_030. The EPA biologist suggested that intensive agricultural activities between the monitoring stations at Strongfort Lodge and in Craughwell could be contributing to the eutrophication observed in Craughwell during the 2021 assessment. The Raford_030 also joins the Kilcolgan_030 approximately 1 km upstream of Craughwell (**Figure 2**) and drains a predominantly agricultural catchment. Hydromorphology was characterised as a significant pressure due to this waterbody being part of the Dunkellin Drainage District. The significant deterioration of the monitoring station in Craughwell to Q1 (Bad) in 2018 can also be attributed to the Dunkellin River and Aggard Stream Flood Relief Scheme which was under construction at the time. Other deteriorations in water quality at both monitoring stations in 2015 and at Strongfort Lodge in 2018 can be largely attributed to the Loughrea waste water treatment plant (WWTP). This WWTP discharges effluent to the upper reaches of the Kilcolgan_020, approximately 12.5 km upstream of Craughwell. In 2021, LAWPRO referred the WWTP to the EPA and Uisce Éireann on the basis of ammonia and ortho-phosphate exceedances recorded in both the Kilcolgan_020 and Kilcolgan_030 as a result of the discharges from Loughrea WWTP, as inferred from assimilative capacity calculations.

Characterisation for the 3rd WFD cycle also identified domestic waste water and industry as significant pressures impacting on water quality in the Kilcolgan_030. Information provided to the WFD App by Galway County Council indicates these pressures relate to a number of licenced developments, including housing estates in Craughwell village with on-site waste water treatment systems that are malfunctioning. There are four housing estates in Craughwell that were granted Section 4 discharge licences (see **Figure 2**). The impact and significance of these pressures on the Kilcolgan_030 were investigated as part of LAWPRO's Local Catchment Assessments (LCA) in the St Cleran's PAA.

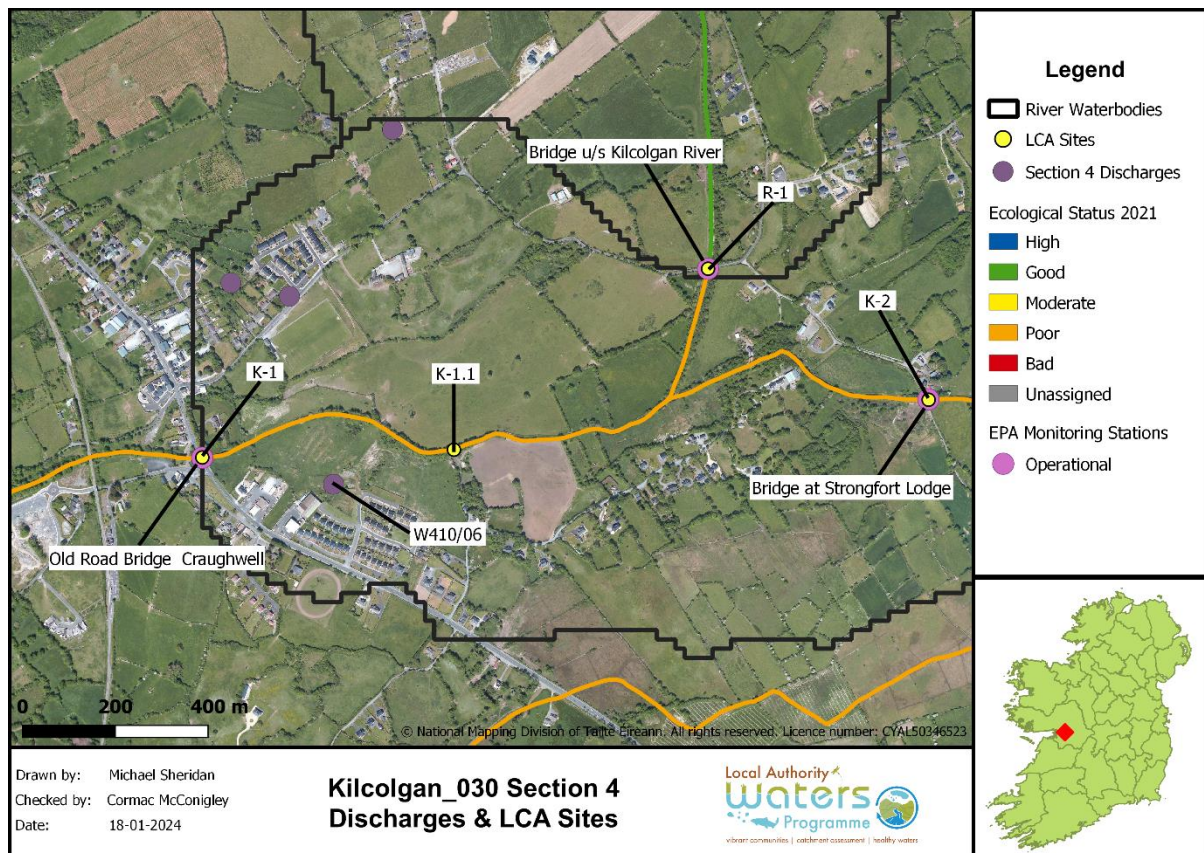


Figure 2: Section 4 discharges and LCA sites in the vicinity of Craughwell village

2 Local Catchment Assessment Findings

LAWPRO catchment scientists carried out LCA in the Kilcolgan_030 RWB in March 2023 at sites K-1 and K-2, which correspond to the EPA operational monitoring stations at the Old Road Bridge in Craughwell and at Strongfort Lodge, respectively (**Figure 2**). Visual observations were recorded, and physico-chemical parameters measured using handheld probes and water samples for laboratory analysis were also collected at each site. Physico-chemical parameters were normal, although DO saturation at both sites was at the upper end of the range permitted under the WFD. Concentrations of ortho-phosphate, ammonia and BOD were below the Good Status EQS for these parameters in a river waterbody¹, and nitrate concentrations were also low (see **Table 1**).

At site K-1, no macrophytes were observed growing instream, but the macroalgae *Cladophora* and *Vaucheria* covered approximately 20% and 10% of the river substrate, respectively. Upstream at site K-2, low coverage of the moss *Platyhypnidium riparioides* and to a lesser extent the aquatic plant *Ranunculus* was observed; both are generally thought to be indicative of low nutrients and good water quality. *Vaucheria* and *Cladophora* were also observed at this site and covered approximately 10% and 2% of the river substrate, respectively. Light availability is good at both sites with little shading, but the higher coverage of macroalgae at site K-1 compared to site K-2 suggests that Site K-1 is more susceptible to eutrophication and corroborates the EPA biologist's 2021 observations of nutrient enrichment at this site. The LCA then focused on identifying potential sources of nutrients between sites K-1 and K-2.

In April 2023, kick-sampling and analysis of the macroinvertebrate community at LCA site K-1 was carried out to determine a Small Stream Impact Score (SSIS). The SSIS of 3.2 indicated that water quality was probably impacted at this site. Comparison of the 2021 EPA sample and the 2023 LAWPRO sample suggests that the composition of the macroinvertebrate community at this site has not changed in recent years, with the same pollution tolerant taxa remaining dominant and pollution sensitive taxa absent. Some interstitial siltation was noted at this site when the substrate was disturbed, however, given the low levels it is not considered to be a significant issue.

The substrate at K-1 is comprised predominantly of loose cobbles and gravels that are easily disturbed and not typical of a natural river that would have a more stable substrate. The EPA biologist noted in 2021 that the substrate at the monitoring station in Craughwell hadn't yet settled following completion of the flood relief works, and this appears to still be the case in 2023. This may be having a continuing impact on the macroinvertebrate community present at this site, however, some pollution sensitive taxa would still be expected to be present. Coverage of macroalgae was reduced compared to the previous visit to this site six weeks prior, with heavy rainfall during the intervening period likely resulting in some macroalgae being washed away. The moss *P. riparioides* was also now observed with low coverage in the margins.

A catchment walk from the monitoring station in Craughwell to approximately 300m upstream, identified a serious waste water issue on the south side of the Kilcolgan_030, at the back of the Dún Ard housing estate. Waste water effluent was observed flowing from a concrete tank that is buried in the ground and that has mostly been grown over by scrub and briars (see Figure 3Error! Reference source not found.). This waste water treatment system was granted a Section 4 discharge licence (W410/06) at the time of development, but it is not operating sufficiently and does not appear to have the capacity to receive and treat the volume of waste water currently being collected from the Dún Ard housing estate. The greyish and odorous effluent flows downslope from the concrete tank

¹ S.I. No. 77/2019 - European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019

towards the Kilcolgan_030, with sewage fungus observed on the ground where it flowed. The effluent forms a pond in the field at the back of the Dún Ard housing estate, approximately 70m from the river (see Figure 4 and **Figure 5** for location). The effluent continues to flow from the pond towards the river and appears to soak into the ground beside an area of scrub and forestry adjacent to the river (**Figure 6**). The lowest point in the field which is directly adjacent to the river also appears to be an area where effluent could be washed to during wet weather and where it would either soak into the ground or be washed directly into the river during flood events (**Figure 7**). This site would be re-visited during a heavy rainfall event to determine if there are pathways for effluent to directly enter the river.



Figure 3: Section 4 discharge licence W410/06 at the back of Dún Ard housing estate from which waste water effluent flows

A catchment walk upstream from site K-1 on the north side of the river did not identify any direct pathways for waste water from other Section 4 discharge licences in the Craughwell area to enter the Kilcolgan_030 (see **Figure 2** for locations). Continuing the catchment walk upstream, a kick-sample for SSIS was carried out at LCA site K-1.1, approximately 600m upstream of site K-1 (see **Figure 2** and **Figure 5** for location). This site was chosen as it is upstream of the Section 4 waste water issues at Dún Ard housing estate and allowed for comparison of the macroinvertebrate communities at sites K-1 and K-1.1. The SSIS of 4, a slight improvement on the 3.2 recorded downstream at site K-1, indicated that water quality was also probably impacted at this site. The macroinvertebrate community was similar to site K-1, with pollution sensitive taxa absent except for single *Heptagenia* and *Limnephilidae* individuals and an increased abundance of pollution tolerant caseless caddisflies. There was decreased abundance of pollution tolerant G.O.I.D taxa at site K-1.1, with *Tubificidae*, one of the most pollution tolerant taxa notably absent having been one of the most abundant taxa present downstream at site K-1. There was very low coverage of macroalgae at this site, with some observed in the margins, but the fast flow and increased shading here would likely prevent algae from proliferating.



Figure 4: Effluent pond formed in the field at the back of Dún Ard housing estate by the waste water flowing from the Section 4 discharge licence W410/06; note that the effluent continues to flow towards the Kilcolgan_030 from this point

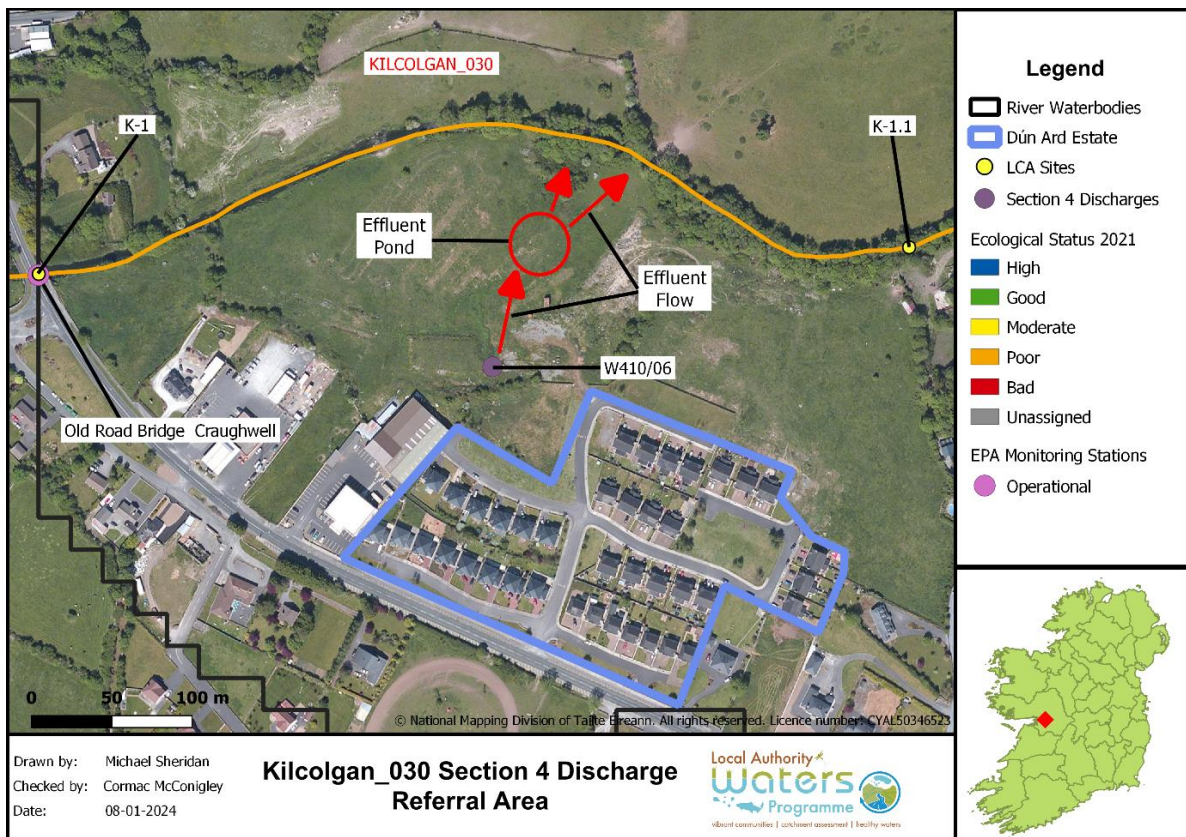


Figure 5: Location of the Section 4 Discharge Licence W410/06 and the flow of waste water effluent towards the Kilcolgan_030



Figure 6: Most effluent that flows from the pond appears to soak into the ground beside an area of scrub and forestry adjacent to the Kilcolgan_030



Figure 7: The lowest point of the field which is directly adjacent to the Kilcolgan_030 and where it appears effluent is washed down to during wet weather; photo taken in April 2023

The moss *P. riparioides* was present with coverage of approximately 10%, and another moss indicative of good water quality, *Fontinalis antipyretica*, was also present but with very low coverage. Further upstream, at LCA site K-2, the location of the operational monitoring station at Strongfort Lodge, flow conditions on the day didn't allow for kick-sampling to be safely undertaken. Low coverage of

macroalgae was observed in the margins and *P. riparioides* moss was also present, similar to sites K-1 and K-1.1 on the day. LCA site R-1 (see **Figure 2**), which is the EPA operational monitoring station for the Raford_030 that joins the Kilcolgan_030 between sites K-1.1 and K-2, could not be sampled on this day as the river was dry. Karst features in the limestone bedrock upstream of this monitoring station means that the lower reaches of the Raford_030 are dry at certain times of the year as the water disappears underground via swallow holes to recharge groundwater aquifers.

At LCA sites K-1, K-1.1 and K-2 in April 2023, nutrient and BOD concentrations were low and other physico-chemical parameters were normal. DO saturation was within the range permitted under the WFD, although at site K-2 it was at the upper end of this range. Samples were also taken and analysed from sites K-1 and K-1.1 to determine if the wastewater issues at the back of the Dún Ard housing estate were contributing to coliform and *E. coli* concentrations in the Kilcolgan_030. The results, however, were inconclusive, with a higher total coliform concentration at site K-1.1 and a higher *E. coli* concentration downstream at site K-1, but with neither at concentrations that would be considered problematic or suggest that significant volumes of anthropogenic waste water is directly entering the river between sites at the time of sampling.

Follow-up LCA after heavy rainfall was carried out in July 2023 with a repeat of the catchment walk that was carried out in April 2023 between LCA sites K-1 and K-1.1, with physico-chemical sampling at these sites in addition to sites K-2 and R-1. The Kilcolgan_030 was in flood, and it was not possible to enter the river or observe macroalgal coverage at any site on the day, but presumably most macroalgae would have been washed away. The waste water effluent from the concrete tank in the field at the back of the Dún Ard housing estate continued to flow at a similar rate to what was observed previously. From the pond that had formed in the field, effluent continued to flow into the area of scrub and forestry adjacent to the river. The lowest point in this field, which is directly adjacent to the river was now flooded, and effluent was observed trickling down to this point from the effluent pond (**Figure 8**). No surface pathways for the transport of effluent directly into the river were observed in this area; an embankment along the river was high enough to prevent run-off on the day, however, a more prolonged period of heavy rainfall would likely result in the embankment being breached.

At LCA sites K-1, K-1.1, K-2 and R-1, concentrations of ortho-phosphate, ammonia and BOD did not exceed the EQS at any site, and nitrate concentrations were also low. At site K-2, DO saturation was at the lower end of the range permitted under the WFD, but at the other sites it was below this threshold and therefore in breach of the EQS, with the lowest saturation of 61.4% recorded at site R-1 (**Table 1**). Results from samples taken for coliform and *E. coli* analysis at sites K-1, K-1.1 and K-2 indicated that concentrations were generally low and not of any concern.



Figure 8: The lowest point of the field which is directly adjacent to the Kilcolgan River and where effluent was observed trickling down to from the effluent pond in July 2023

3 Conclusions

Following catchment walks between the two Kilcolgan_030 monitoring stations, agricultural pressures were ruled out as a cause of deteriorated water quality in the river. Hydromorphological impacts, particularly those from the flood relief works in this area, continue to impact the macroinvertebrate community at K-1 as the substrate has not returned to a natural state yet. The absence of pollution sensitive taxa in both the 2021 EPA Q-assessment and 2023 LAWPRO assessment, however, suggests that eutrophication is having a greater impact on water quality at this site.

Waste water issues observed at the back of the Dún Ard housing estate (Section 4 discharge licence W410/06) are likely contributing to the eutrophic condition of K-1 where there is less diversity in the macroinvertebrate community and macroalgae cover is higher compared to sites upstream (i.e. K-1.1 and K-2).

Although no direct pathways for waste water effluent to enter the Kilcolgan_030 were observed during LCA, diffuse pathways may be resulting in the input of the organic discharge to the river where ponding occurs in saturated areas adjacent to the river. Nutrients, particularly phosphorous, may therefore be leaching through the soils without much attenuation and transiting the 5 – 40m into the river via groundwater depending on where the effluent leaches into the ground. The impacts of this would be heightened during dry periods when a greater proportion of flow in the river is provided by groundwater and when nutrient loads aren't being diluted to the same degree, resulting in eutrophication. It was observed during LCA that the lowest point of this field, which is directly adjacent to the river, is susceptible to flooding (**Figure 8**). The EPA pollution impact potential (PIP) maps indicate this area is at high risk of phosphorous loss to the river via overland flow as it is PIP rank 2. The soils

St Cleran's Priority Area for Action

adjacent to the river in this area are also river alluvium and poorly drained, therefore, direct overland flow pathways can't be ruled out, particularly during flood events.

If the overall ecological status of the Kilcolgan_030 is to improve sufficiently to meet its WFD objective, the ongoing waste water issue related to the Section 4 discharge licence W410/06 must be resolved given its close proximity to the operational monitoring station in Craughwell. This, in addition to improvements in the hydromorphological condition of the river following the flood relief works and improvements at Loughrea WWTP, should result in improvements in water quality.

St Cleran's Priority Area for Action

Table 1: Physico-chemical results from the Kilcolgan_030 LCA sites in the vicinity of Craughwell (annual average EQS exceedances for a RWB are highlighted in yellow, 95%ile EQS exceedances for a RWB are highlighted in orange)

| Date | LCA Site | BOD (mg/l) | Ortho-P (mg/l) | Ammonia (mg/l) | Nitrate (mg/l) | Coliforms (MPN/100mls) | E. coli (MPN/100mls) | DO (%) | Temperature (°C) | Conductivity (µs/cm) | pH |
|------------|----------|------------|----------------|----------------|----------------|------------------------|----------------------|--------|------------------|----------------------|------|
| 08/03/2023 | K-1 | < 1 | < 0.006 | < 0.02 | 0.858 | - | - | 114 | 6.3 | 578 | 8.14 |
| 08/03/2023 | K-2 | < 1 | <0.006 | < 0.02 | 0.856 | - | - | 117 | 6.4 | 566 | 8.18 |
| 18/04/2023 | K-1 | < 1 | < 0.006 | 0.021 | 0.72 | 4840 | 580 | 101.4 | 11 | 618 | 8.08 |
| 18/04/2023 | K-1.1 | < 1 | < 0.006 | 0.023 | 1.054 | 6920 | 388 | 109.3 | 10.9 | 583 | 8.34 |
| 18/04/2023 | K-2 | < 1 | < 0.006 | 0.023 | 1.018 | - | - | 117.9 | 12.6 | 575 | 8.41 |
| 18/07/2023 | K-1 | 1.2 | 0.021 | 0.026 | 0.415 | 4352 | 249 | 71.4 | 15.8 | 442 | 7.7 |
| 18/07/2023 | K-1.1 | 1.1 | 0.021 | < 0.02 | 0.427 | 5172 | 161 | 73.4 | 16.3 | 443 | 7.77 |
| 18/07/2023 | R-1 | 1.5 | 0.02 | 0.02 | 0.196 | - | - | 61.4 | 16.8 | 364 | 7.6 |
| 18/07/2023 | K-2 | < 1 | 0.018 | < 0.02 | 0.542 | 8164 | 481 | 82.2 | 16.5 | 504 | 7.82 |