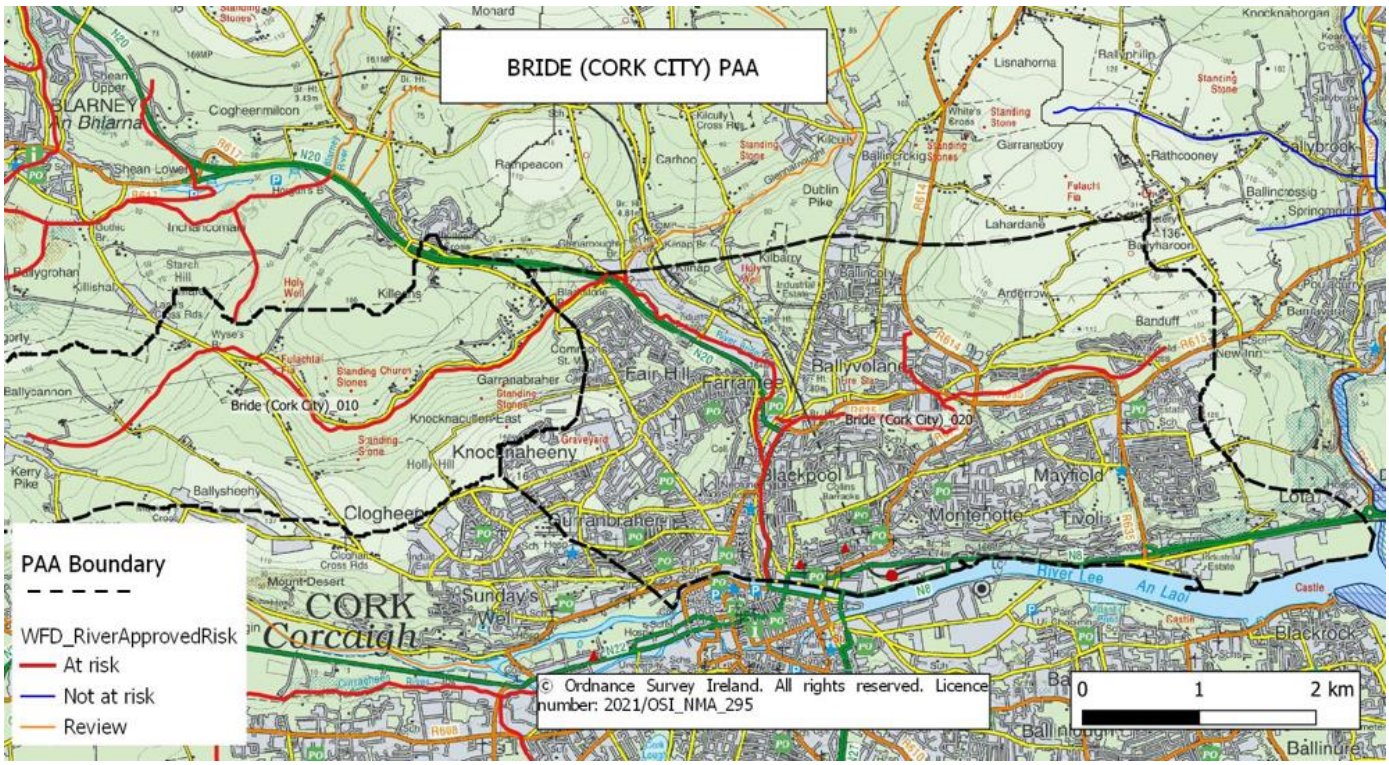
Bride (Cork City) Priority Area for Action

Desk Study AFA0029



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Acknowledgements

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Data attribution

The following data sources were consulted in the preparation of this report:

Catchment boundaries, waterbodies and areas for action: EPA (2018)
Land use: Corine 2018
Subsoils Maps: Teagasc-EPA (2015)
Susceptibility Maps: EPA (2018)
Aquifer Category: GSI (2017)
Groundwater Vulnerability: GSI (2017)
WFD Waterbody Status: EPA (2018)
Pollution Impact Potential Maps: EPA (2021)
OPW Blackpool Retail Park (waterlevel.ie)
River Bride (Blackpool) Certified Drainage Scheme Blackpool FRS - Timeframe (floodinfo.ie)
EPA report 'Assessment of the catchments that need reductions in nitrogen concentrations to achieve water quality objectives' June 2021 Catchment nitrogen reductions assessment - June 2021 (10).pdf

Date of Completion of this Desk Study

Document conclusions are based on data collated on or before **2nd July 2021**

Summary

The Bride (Cork City) priority area for action (PAA) comprises two river waterbodies, Bride (Cork City)_010 and Bride (Cork City)_020. The PAA is located entirely within Cork City Council's functional area. The river system includes inputting waterbody Glennamought Trib (Bride)_010 which is headwaters to Bride (Cork City)_020 but does not form part of the current PAA. These are the only three waterbodies within subcatchment 19_1 (Kiln_SC_010).

Bride (Cork City)_010 rises to the west of the subcatchment in Ballycannon townland, flowing east to its confluence with Bride (Cork City)_020 at Blackstone Bridge. Glennamought Trib (Bride)_010 joins Bride (Cork City)_020 in a culverted reach near North Point Business Park. Bride (Cork City)_020 flows generally south to its confluence with Lee (Cork) Estuary Upper at Christy Ring Bridge. There is one tributary within the waterbody (Glen river) which rises in the east near the old Youghal road and merges with the main channel in the Blackpool area.

The PAA was selected to build on works already undertaken by Cork County and City Councils in this catchment and also because of the potential for a pilot project focusing on urban diffuse pressures.

All three waterbodies are unassigned. Bride (Cork City)_010 and Bride (Cork City)_020 are *At Risk* and Glennamought Trib (Bride)_010 is at *Review* pending further characterisation.

While none of the waterbodies are monitored under WFD, chemistry monitoring was undertaken by Council staff at seven locations between 2012 and 2017. Results were indicative of phosphorus and organic pollution/dissolved oxygen issues in all waterbodies. Ammonium was also an issue in Bride (Cork City)_020. The greatest nutrient and organic losses occurred along a 1km stretch on the lower reaches of Bride (Cork City)_020.

Bride (Cork City)_010

Results of monitoring undertaken between 2012 and 2017 suggest that orthophosphate and low dissolved oxygen are significant issue in this waterbody. Land use in Bride (Cork City)_010 is mainly under agriculture (pasture) but soils are freely draining and surface P PIP maps indicate that the entire sub-basin is low risk for phosphate loss to surface waters. The waterbody is outside the urban agglomeration boundary and includes pockets of medium density residential development (presumably served by single house systems) particularly in the headwaters and close to the waterbody outlet. Bride (Cork City)_010 is located in Cork City Council's Killard Drainage District. The EPA initial characterisation identified urban runoff (diffuse sources runoff including misconnections) and hydromorphology (channelisation) as the significant pressures impacting on this waterbody and the desk study conclusions support this assessment.

Glennamought Trib(Bride)_010

WFD biological monitoring is not undertaken on Glennamought trib (Bride)_010. However, Q assessments were undertaken by consultants at two locations for the River Bride (Blackpool) Certified Drainage Scheme in December 2016 and both locations were at Good Status (Q4). Results of monitoring undertaken between 2012 and 2017 suggest that elevated orthophosphate and low dissolved oxygen are potential significant issues in this waterbody. Elevated sediment may also be an issue here. Land use is mainly under agriculture although the lower reaches flow through an urban environment. As for Bride (Cork City)_010 though, soils are freely draining and surface P PIP maps indicate that the entire sub basin is low risk for phosphate loss to surface waters (high risk for nitrate). If local catchment

assessment (LCA) findings indicate that the waterbody is impacted, pressures are likely to be urban diffuse, concentrated in the lower reaches.

Bride (Cork City)_020

Monitoring data from 20212 to 2017 indicate that elevated orthophosphate, ammonium and organic pollution (with resultant low DO) are significant issues in Bride (Cork City)_020. Elevated sediment may also be an issue here, mainly from road runoff. Land use in Bride (Cork City)_020 is urban throughout (discontinuous and continuous urban fabric and industrial/commercial units). Urban runoff (diffuse sources runoff) was identified as the sole significant pressure from the EPA initial characterisation. Desk study conclusions support this assessment. Potential misconnections and risk from stormwater overflows will be investigated in the LCS process.

Sections of both PAA waterbodies were culverted in the past and significant flood relief works are proposed for the central part of the subcatchment under the River Bride (Blackpool) Certified Drainage Scheme. However, irrespective of existing and possible future hydromorphological pressures here, a reduction in nutrient and organic loading will be beneficial for water quality in both PAA waterbodies and in *At Risk* receiving waterbody Lee (Cork) Estuary Upper.

Local Catchment Assessment

Local catchment assessments in the Bride (Cork City) PAA will focus on identifying and assessing urban pressures in both PAA waterbodies, looking for sources of phosphate, ammonium and organic pollution. In Bride (Cok City)_020, initial focus will be on the lower 1km reach upstream of the confluence with Lee (Cork Estuary) Upper (between stations M12 Blackpool and M15 Leitrim street)as this is where the greatest nutrient and organic load appears to arise.

Catchment 19 has been identified by the EPA as one of the catchments of concern in relation to nitrate losses, with the recommendation to reduce river nitrate nitrogen levels to below 2.6mg/l. Monitoring for nitrate will also be undertaken in the LCA process to determine whether addressing urban pressures alone will achieve the required reduction in nitrogen concentration or whether investigation of critical source areas for nitrate loss is also required in the upstream rural catchment, including Glennamought Trib (Bride)_010.

1 Background

Table 3-1: Background information on the Bride (Cork City) PAA

Priority Area for Action	Catchment Number	Catchment Name	Subcatchment	Region	Local Authority
Bride (Cork City)	19	Lee Cork Harbour	Kiln_SC_010	Southwest	Cork City Council

Priority Area for Action	No. of *At Risk* WBs	No. of *Review* WBs	No. of dRBMP Prioritised WBs	No of WBs for Status Improvement:		
				2021	2027	Beyond 2027
Bride (Cork City)	2	0	0	0	2	0
Reasons for selection	• Cork City Council has already completed a body of work in this catchment • Potential pilot project in urban diffuse issues • Invasive Species issues • OPW Flood relief scheme					

Table 1-4: Summary table of individual waterbodies within (and contributing to) the Bride (Cork City) PAA

Waterbody Code	Waterbody Name	Risk	Obj.	Ecological Status			Pressures		
				2012	2015	2018	Category	Sub-category	Sig? (Y/N)
IE_SW_ 19B140110 (within PAA)	Bride (Cork City)_010	*At Risk*	Good	Unassigned			Urban Run off	Diffuse Sources Run-Off	Y
							Hydro-morphology	Channelisation	Y
IE_SW_ 19G880990 (inputting to PAA)	Glennamought trib (Bride)_010	*Review*	Good	Unassigned			Urban Run off	Diffuse Sources Run-Off	Y
IE_SW_ 19B140300 (within PAA)	Bride (Cork City)_020	*At Risk*	Good	Unassigned			Urban Run off	Diffuse Sources Run-Off	Y

Source: Summary information from WFD App

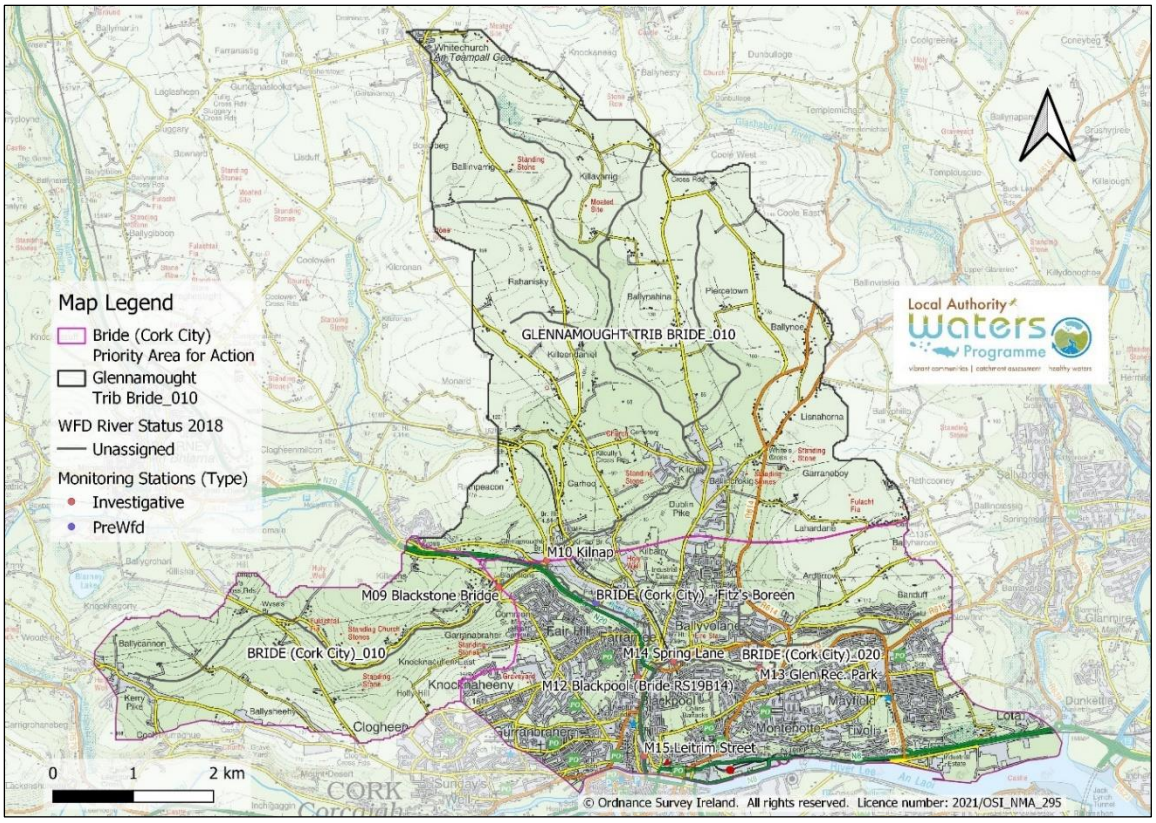


Figure 1.1: Bride PAA waterbody status map, shown with inputting waterbody Glennamought trib (Bride)_010

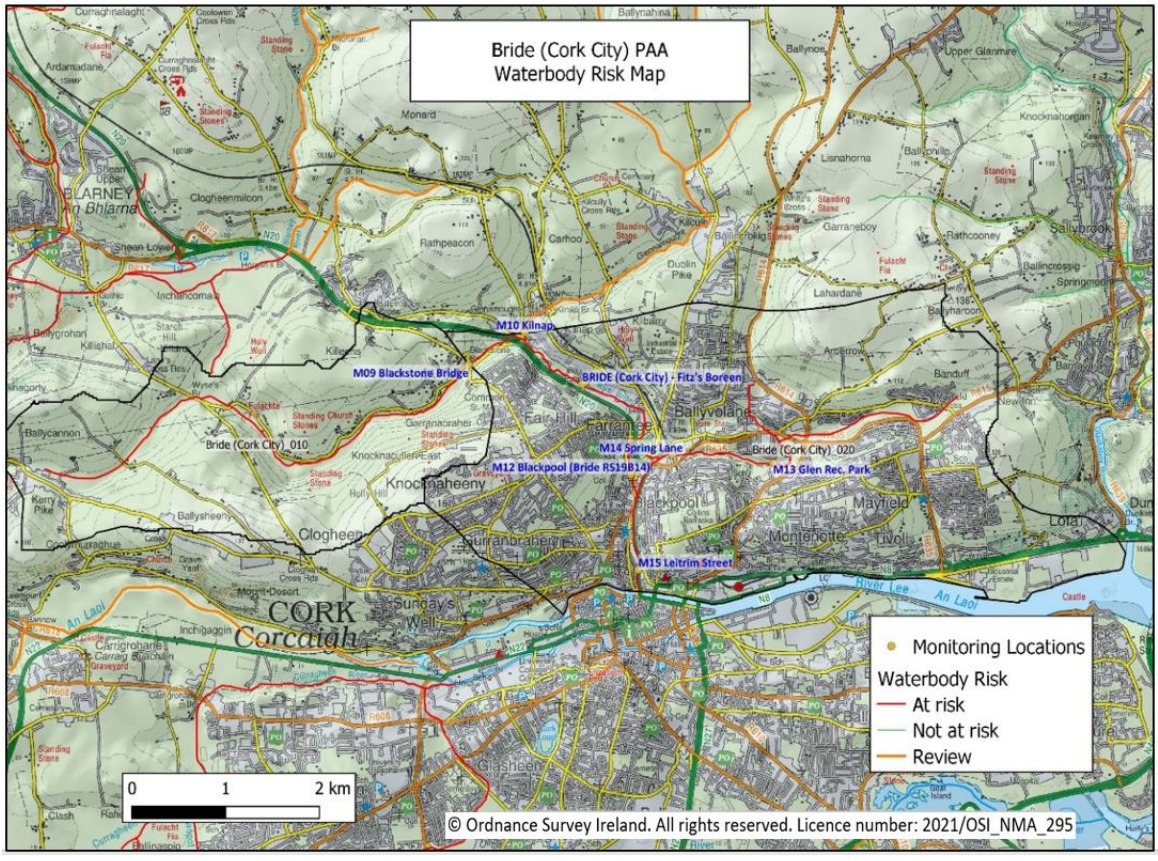


Figure 1.2: Bride PAA waterbody risk map, showing location of investigative/pre WFD monitoring points

2 Receptor information

2.1 Context and Setting

The Bride (Cork City) priority area for action (PAA) comprises two waterbodies, the Bride (Cork City)_010 and Bride (Cork City)_020. The river system includes an inputting waterbody to Bride (Cork City)_020 which does not form part of the current PAA (Glennamought Trib (Bride)_010. These are the only three river waterbodies within subcatchment 19_1 (Kiln_SC_010) in Catchment 19 (Lee Cork Harbour and Youghal Bay). The Lee Cork Harbour and Youghal Bay catchment was identified by the EPA as one of the catchments of concern due to elevated nitrogen concentrations.

All three waterbodies are unassigned. Bride (Cork City)_010 and Bride (Cork City)_020 are *At Risk* and Glennamought Trib (Bride)_010 is in *review*.

There are a number of culverted reaches in the Bride river system. Bride (Cork City)_010 rises to the west of the subcatchment in Ballycannon townland, flowing east to its confluence with Bride (Cork City)_020 at Blackstone Bridge. Glennamought Trib (Bride)_010 joins Bride (Cork City)_020 in a culverted reach at North Point Business Park on the N20. Bride (Cork City)_020 then flows generally north to south with one tributary rising in the east near the old Youghal road, flowing westerly to its confluence with the main channel. This tributary, known locally as the Glen river, is culverted for a stretch under Spring Lane and merges with the main channel in a large culvert 100m downstream of Blackpool Church.

The final stretch of the Bride river (downstream of its confluence with the Glen) is known locally as the Kiln river. It discharges to transitional waterbody Lee (Cork) Estuary Upper at the Christy Ring Bridge. Lee (Cork) Estuary Upper and Lower are both *At Risk* due to urban runoff and urban wastewater. The Bride (Cork City) river system is one of the smaller systems discharging to the estuary.

The entire PAA lies within the Cork City Council boundary. Bride (Cork City)_010 is in Cork City Council's Killard drainage district scheme but does not appear to undergo frequent or routine channel maintenance.

The central part of the subcatchment from the lower reaches of Glennamought Trib (Bride)_010 to the north, the eastern section of Bride (Cork City)_010, near Killeens road, down to the confluence with Lee Cork Estuary, is proposed for flood relief works under the River Bride (Blackpool) Certified Drainage Scheme (Appendix I). Works associated with the Scheme will include construction of new culverts, replacement of existing bridges and culverts, construction of new flood walls/earthen embankments, local channel widening and maintenance of the river channel.

2.2 Receptor Overview

Both PAA waterbodies are unmonitored except for supporting chemistry which was assessed between 2012 and 2017 at seven pre WFD sites, including one site on Bride (Cork City)_010, one on inputting tributary Glennamought Trib (Bride)_010 and five sites on Bride (Cork City)_020. Results are summarised in tables 2.1 and 2.2.

Table 2.1: Receptor information for Bride (Cork City)_010 and Glennamought Trib (Bride)_010

		Figures Tables	Bride (Cork City)_010	Glennamought trib (Bride)_010 headwaters to PAA waterbody Bride (Cork City)_020
WFD Risk		Y	At Risk	Review
Waterbody Monitoring Point			M09 Blackstone Bridge RS19B140110 (pre WFD)	M10 KIlnap RS19G880990 (pre WFD)
Biological Status	**2013-2015**		Unassigned	Unassigned
	2016-2018		Unassigned	Unassigned
	Trends in Q values		NA	NA
Hydrochemistry Data				
Ortho-P (mg/l P)	**Baseline**	Y	0.094	0.090
	indicative quality		Poor	Poor
	Trends - significant?		Upwards - No	Downwards -No
	Dist to threshold		Near	Near
NH4-N (mg/l N)	**Baseline (2017)**	Y	0.031	0.030
	indicative quality		High	High
	Trends - significant?		Downwards - No	Downwards – No
	Dist to threshold		Far	Far
TON (mg/l N)	**Baseline**	Y	2.773	3.110
	indicative quality		Moderate	Moderate
	Trends - significant?		Downwards – No	Downwards -No
	Dist to threshold		Far	Far
Supporting Conditions	**2013- 2018**		NA	NA
Other data		y	BOD periodically elevated and low DOs observed (see section 2.4).	
Hydromorphology				
RHAT score			No data	No data
MQI class (relevant reach)			Moderate	Moderate
Evidence of Arterial drainage			No but forms part of Killard drainage district scheme	No
Ecological Status (2013–2018)			Unassigned	Unassigned
Elements driving status			NA	NA
Protected Areas			Not within the waterbody but Bride (Cork City)_020 discharges to the Lee (Cork) estuary 5km upstream of Cork Harbour SPA (004030) and 10km upstream of Great Island Channel SAC (Site Code:001058)	Not within the waterbody but Bride (Cork City)_020 discharges to the Lee (Cork) estuary 5km upstream of Cork Harbour SPA (004030) and 10km upstream of Great Island Channel SAC (Site Code:001058)
WFD Objective			Good	Good
EPA biologist notes (if any)			NA	NA
Significant issue/impact for receptor			Nutrient and organic pollution	Possible nutrient and organic pollution

Table 2.2: Receptor information for Bride (Cork City)_020

		Figures Tables	Bride (Cork City)_020				
WFD Risk		Y	At Risk				
Waterbody Monitoring Point			Fitz's Boreen RS19B140300	M12 Blackpool (Bride RS19B14) RS19B140800	M13 Glen Rec. Park RS19G090400	M14 Spring Lane RS19G090800	M15 Leitrim Street RS19K750900
Biological Status	**2013-2015** **2016-2018** **Trends in Q values**		Unassigned Unassigned NA	Unassigned Unassigned NA	Unassigned Unassigned NA	Unassigned Unassigned NA	Unassigned Unassigned NA
Hydrochemistry Data							
Ortho-P (mg/l P)	**Baseline 2017** **indicative quality** **Trends - significant?** **Dist to threshold**	Y	0.079 Poor Downwards-No Far	0.074 Poor Downwards-Yes Far	0.117 Bad Downwards-No Far	0.116 Bad Downwards-No Far	0.148 Bad Downwards-Yes Far
NH4-N (mg/l N)	**Baseline (2017)** **indicative quality** **Trends - significant?** **Dist to threshold**	Y	0.042 Good Downwards-No Far	0.031 High Downwards-No Near	0.098 Moderate Downwards-No Far	0.064 Good Downwards-No Near	0.242 Moderate Downwards-No Far
TON (mg/l N)	**Baseline** **indicative quality** **Trends - significant?** **Dist to threshold**	Y	No data	No data	No data	No data	No data
Supporting Conditions	**2013- 2018**		NA	NA	NA	NA	NA
Other data		Y					
Hydromorphology							
RHAT score **MQI class**			No data Bad	No data Poor	No data Moderate	No data Poor	No data No data
Evidence of Arterial drainage			No				
Ecological Status (2013–2018) **Elements driving status**			Unassigned NA				
Protected Areas			Discharges to Lee (Cork) estuary 5km upstream of Cork Harbour SPA and 10km upstream of Great Island Channel SAC				
WFD Objective			Good				
EPA biologist notes (if any)			NA	NA	NA	NA	NA
Significant issue/impact for receptor			Nutrient and organic pollution				

2.3 Biological Monitoring Results

WFD biological monitoring is not undertaken on either waterbody in the Bride (Cork City) PAA or on Glennamought trib (Bride)_010. However, Q assessments were undertaken on behalf of the River Bride (Blackpool) Certified Drainage Scheme project EIA in December 2016 and results suggest that Glennamought Trib (Bride)_010 may be at good biological status. Monitoring results for the two PAA waterbodies were indicative of moderate status.

2.4 Hydrochemistry

Bride (Cork City)_010

There is one investigative station on Bride (Cork City)_010, 'M09 Blackstone Bridge' (RS19B140110) which was assessed for supporting chemistry between January 2012 and November 2017. Orthophosphate results are only available from February 2014 as samples collected prior to that date were analysed for *total* phosphorus. Orthophosphate and ammonium results for M09 Blackstone Bridge are graphed below in figures 2.1 and 2.2. Also shown on the graphs (in red) are the mean and 95%ile EQS for good status waters from SI 272 2009 (as amended).

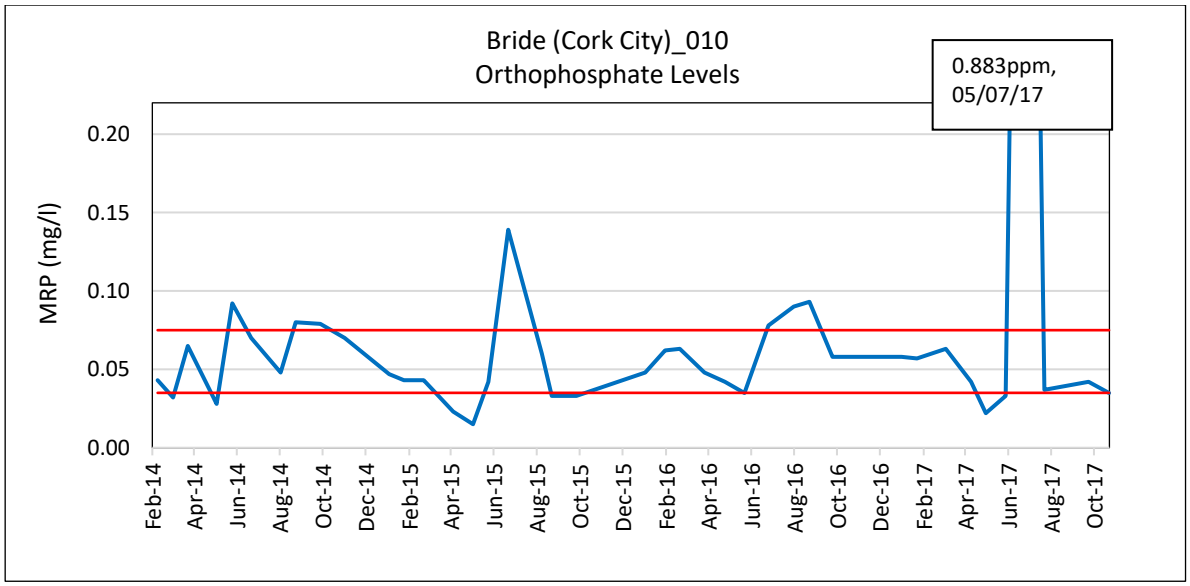


Figure 2.1: Orthophosphate levels, Bride (Cork City)_010

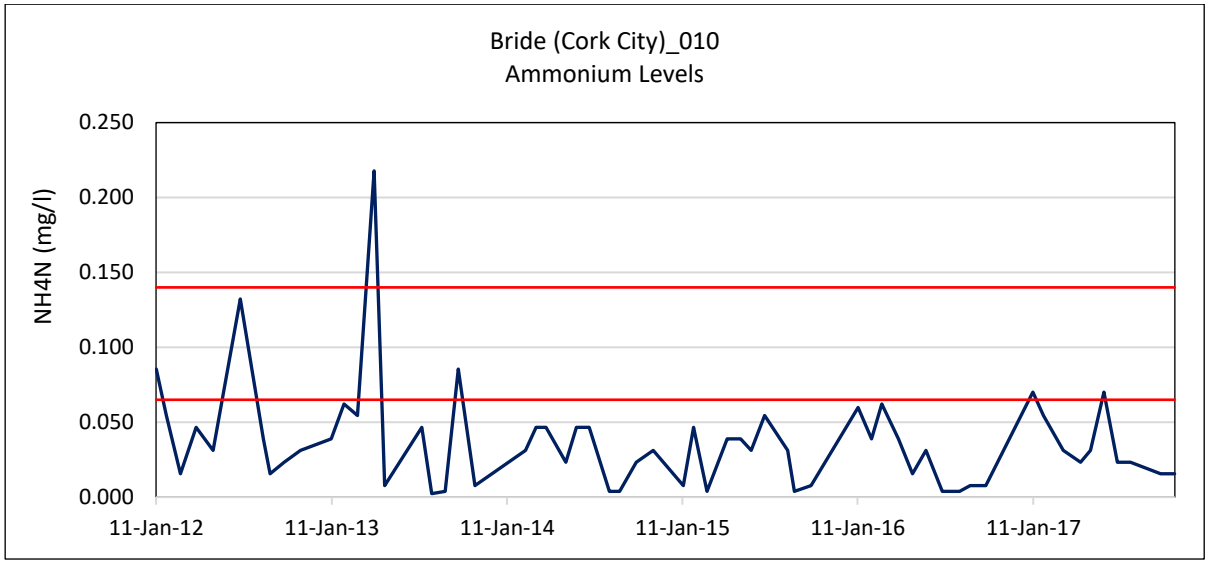


Figure 2.2: Ammonium levels, Bride (Cork City)_010

Results are indicative of persistent elevated orthophosphate levels in this waterbody. The mean good status EQs was exceeded in 75% of samples and the 95%ile limit was exceeded in 20% of samples. One significant peak (0.883ppm) was recorded for the 5th July 2017. This peak didn't coincide with elevated levels of other monitored parameters on that date, although dissolved oxygen levels were low at 57%.

Ammonium levels were generally lower, with all results between 2014 and 2017 meeting the mean good status EQS.

Dissolved oxygen (DO) and BOD levels for station M09 Blackstone Bridge (January 2012 to November 2017) are graphed in figures 2.3 and 2.4. Over 50% of DO results were below the lower EQS of 80%. BOD levels were also periodically elevated although not as persistently elevated as might be expected from the low DO results. 25% of BOD results between January 2012 and November 2017 exceeded the mean good status EQS and 13% of results exceeded the 95%ile limit. There were two significant spikes observed (April 2012 and June 2014). However looking at 2017 data alone, BOD results were satisfactory for all samples while DO levels were below the lower limit on 70% of occasions. Low DO in this catchment may be linked to culverting or possibly to sediment. Organic rich sediment from periodic organic pollution could reduce water column dissolved oxygen levels when lifted into the water column. BOD monitoring will be required in the local catchment assessment for this waterbody.

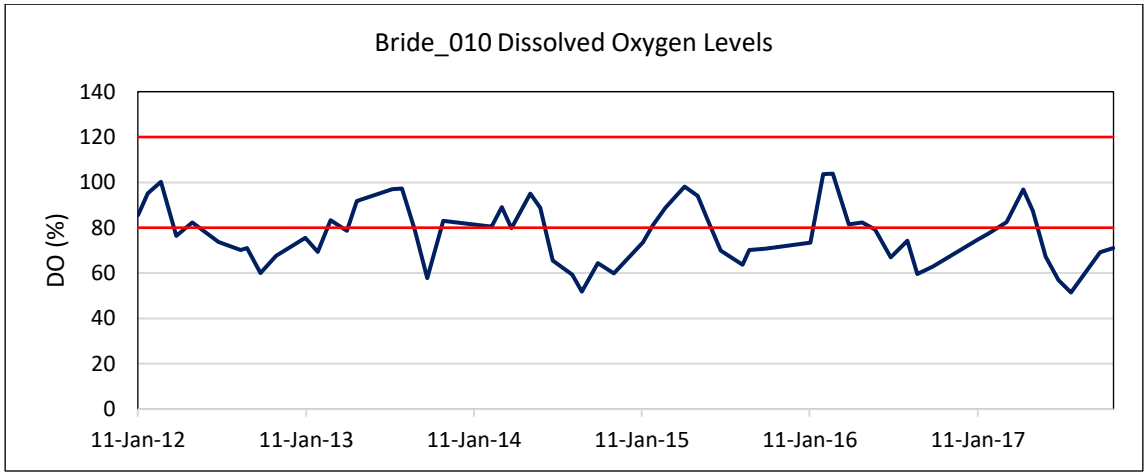


Figure 2.3: D.O. Levels Bride (Cork City)_010

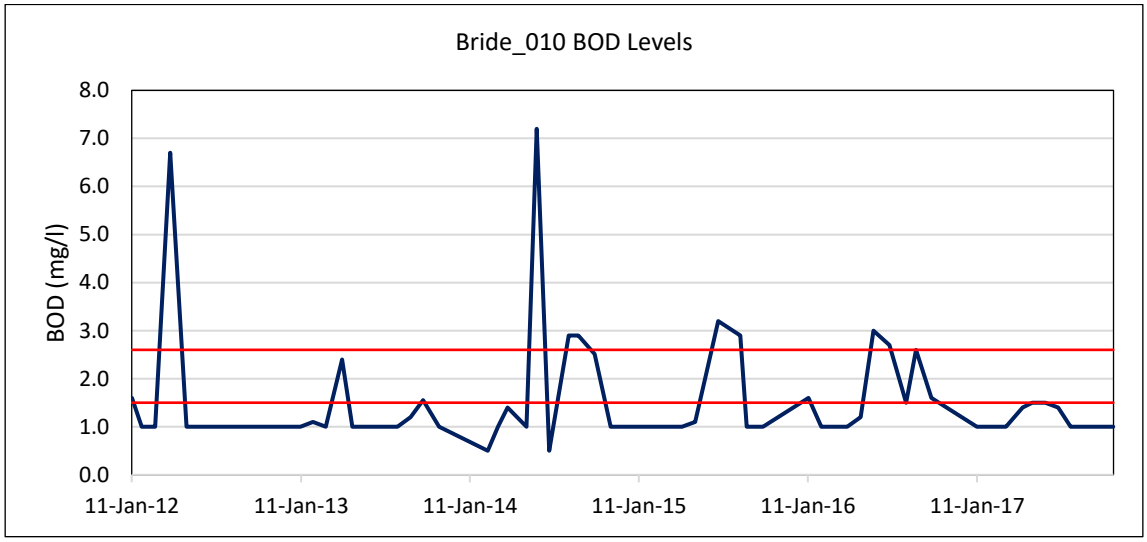


Figure 2.4: BOD Levels, Bride (Cork City)_010

In summary, results available up to 2017 are indicative of orthophosphate issues in Bride (Cork City)_010. Low dissolved oxygen is also an issue here. BOD monitoring is required to confirm that the low DO is due (as would be expected) to organic pollution.

Sediment is also a potential significant issue; Bride (Cork City)_010 is within the Killard drainage district area.

Glennamought Trib (Bride)_010

This waterbody is outside the Cycle 2 PAA but is headwaters to Bride (Cork City)_020 and so has potential to impact on the PAA. As for both Bride (Cork City) waterbodies, Glennamought Trib (Bride)_010 is not monitored under WFD but was sampled for chemistry (at station M10 Kilnap) between 2012 and 2017. Orthophosphate, BOD and dissolved oxygen levels are presented below in Figures 2.5 to 2.7. Also shown on the graphs (in red) are the mean and 95%ile EQS for good status waters from SI 272 2009 (as amended).

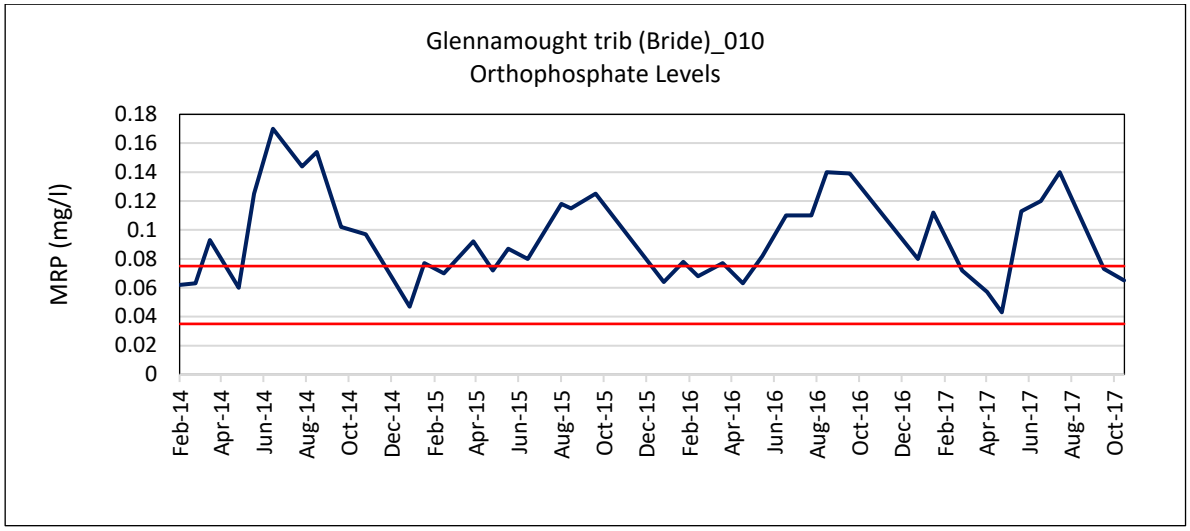


Figure 2.5: Orthophosphate Levels Glennamought Trib (Bride)_010

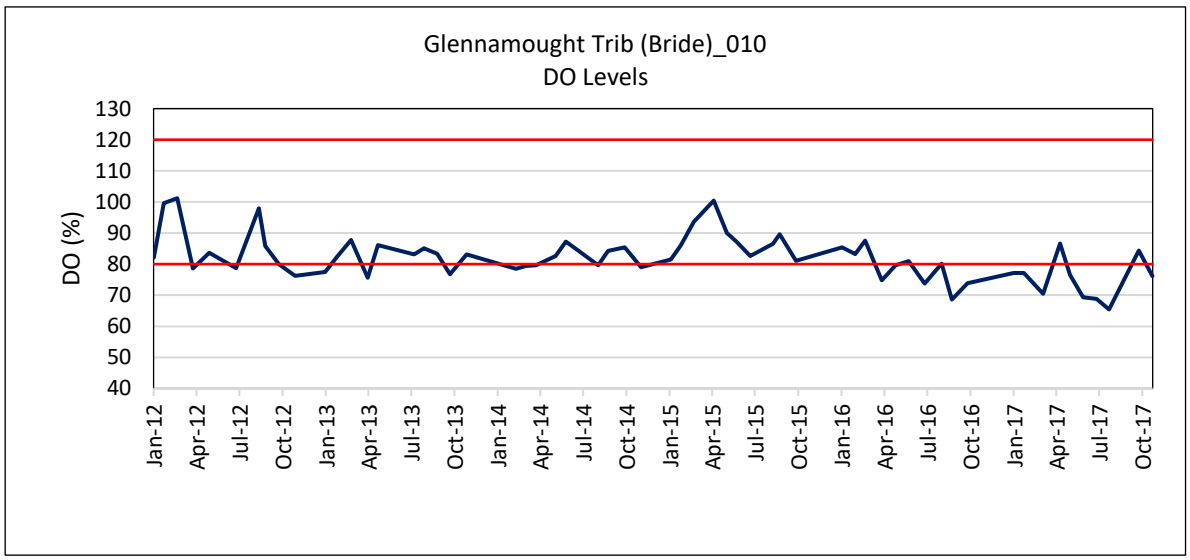


Figure 2.6: DO Levels Glennamought Trib (Bride)_010

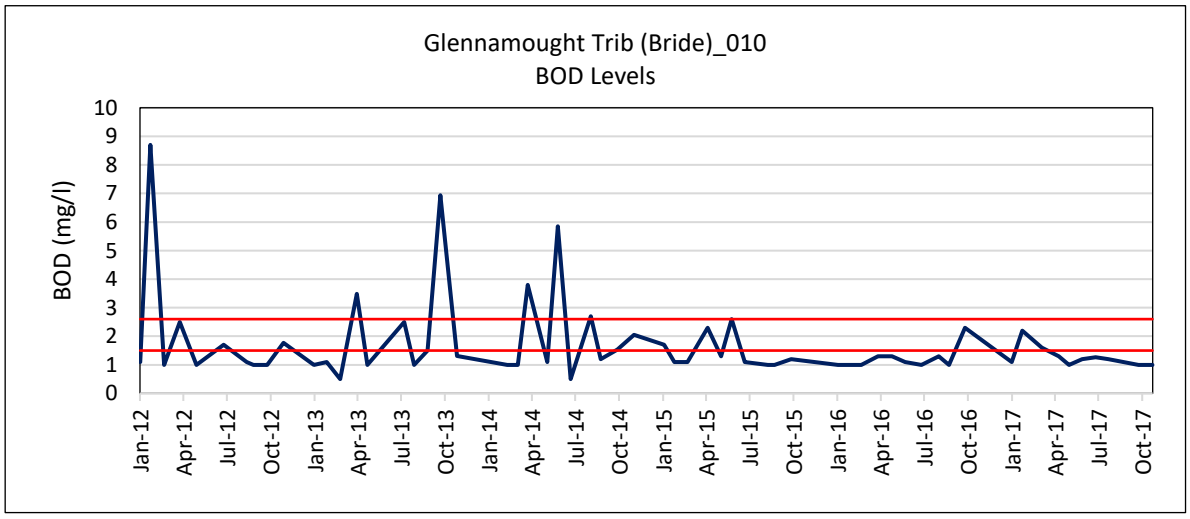


Figure 2.7: BOD Levels Glennamought Trib (Bride)_010

As can be seen from figure 2.5, orthophosphate results consistently exceeded the mean good status EQS and 65% of results exceeded the 95%ile limit between February 2014 and November 2017.

Dissolved oxygen levels were below the lower limit on 42% of occasions between January 2012 and November 2017 and on 80% of occasions in 2017 alone, suggesting organic pollution issues here. However, while BOD spikes occurred in 2012, 2013 and 2014, more recent results were generally satisfactory. As for Bride (Cork City)_010, this requires further investigation. If sediment is a significant issue here, then it is possible that periodic organic pollution has resulted in organic rich sediment on the bed, contributing to depleted DO levels in the water column.

Ammonium results (not graphed) were not indicative of an ammonium issue in this waterbody. The 2017 baseline was 0.03ppm (indicative of high status).

Bride (Cork City)_020

Five stations on Bride (Cork City)_020 were monitored for chemistry between January 2012 and November 2017. Three stations are located on the main channel and two on the Glen river E-W tributary. Results are presented in figures 2.8 to 2.16. BOD results for the lowest station (M15 Leitrim Street) have been graphed separately because of extremely elevated BOD peaks recorded here prior to 2017 (indicative of gross pollution). Also shown on the graphs (in red) are the mean and 95%ile EQS for good status waters from SI 272 2009 (as amended).

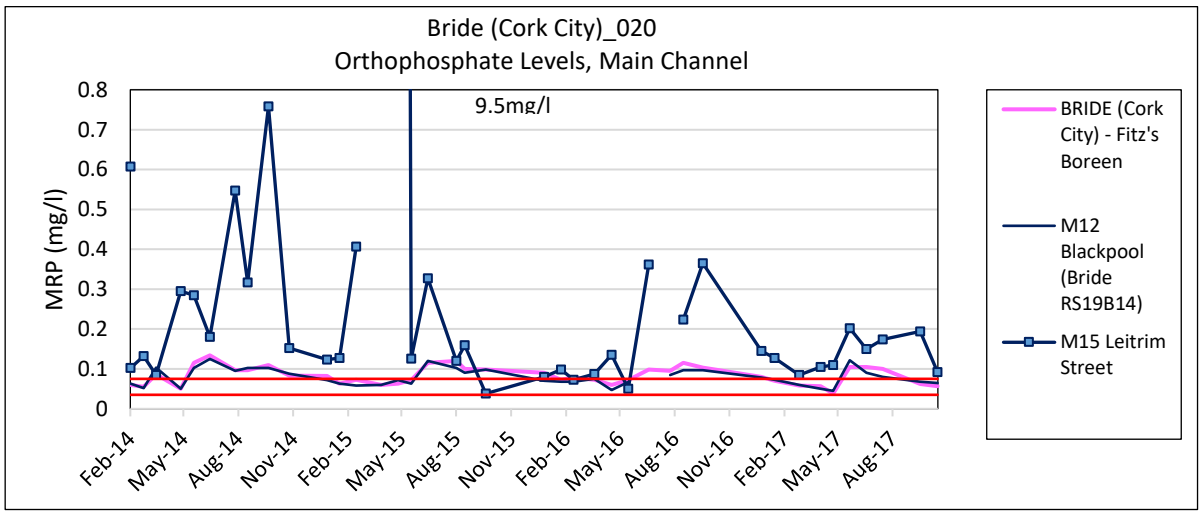


Figure 2.8: Orthophosphate Levels Bride Cork City)_020, Main Channel

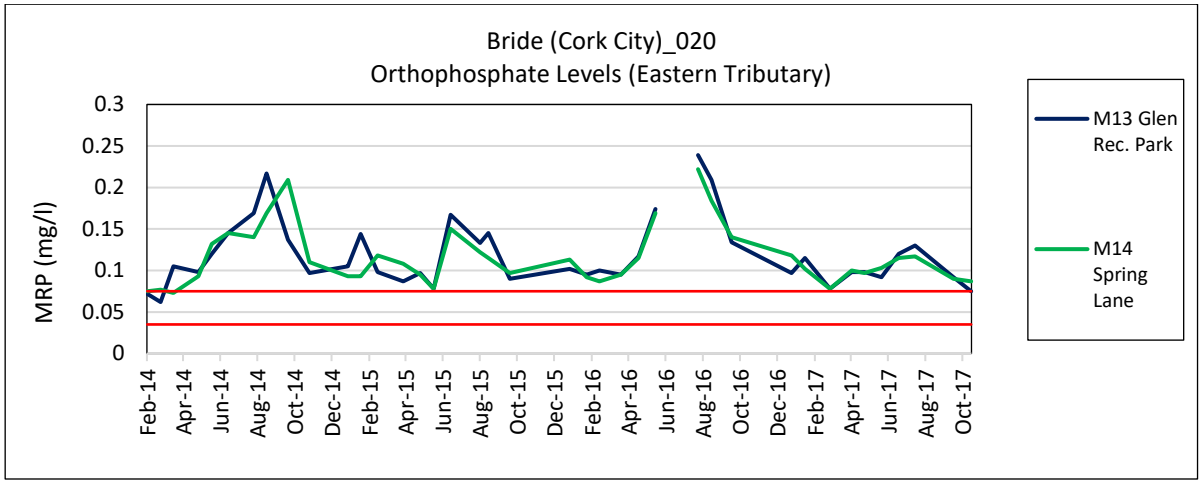


Figure 2.9: Orthophosphate Levels Bride Cork City)_020, E-W Tributary

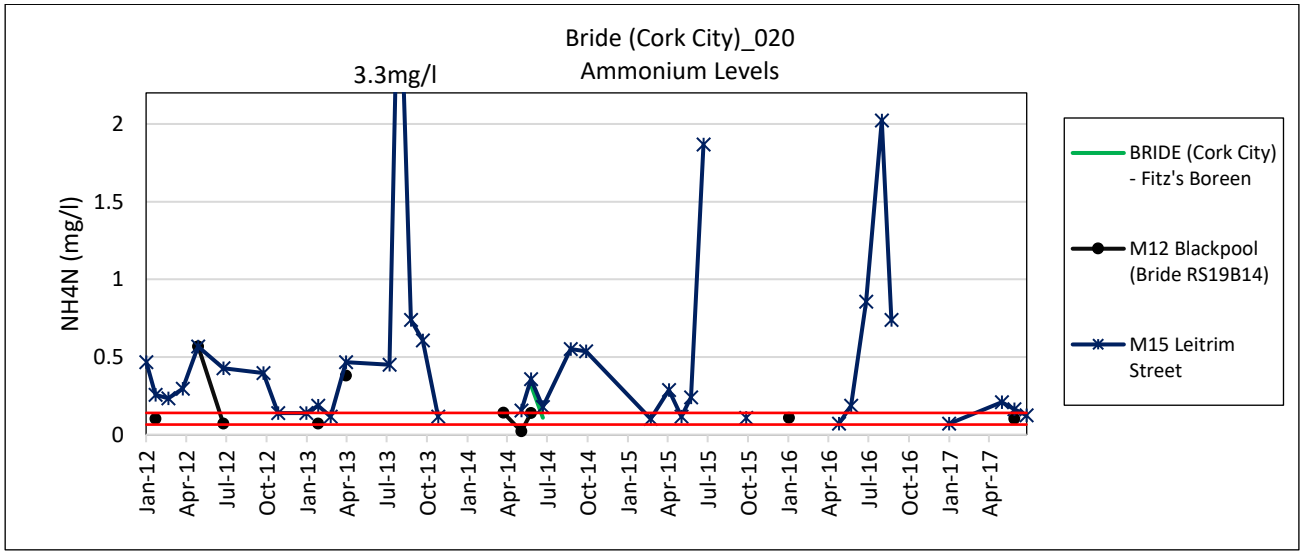


Figure 2.10: Ammonium Levels Bride Cork City)_020, Main Channel

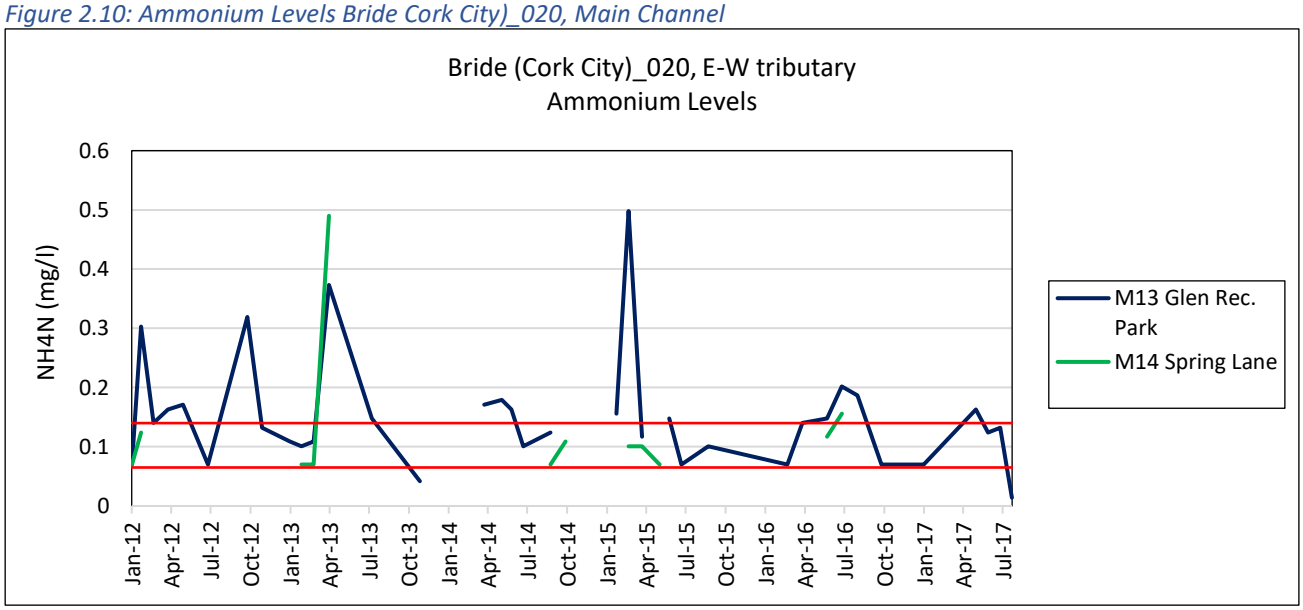


Figure 2.11: Ammonium Levels Bride Cork City)_020, E-W Tributary

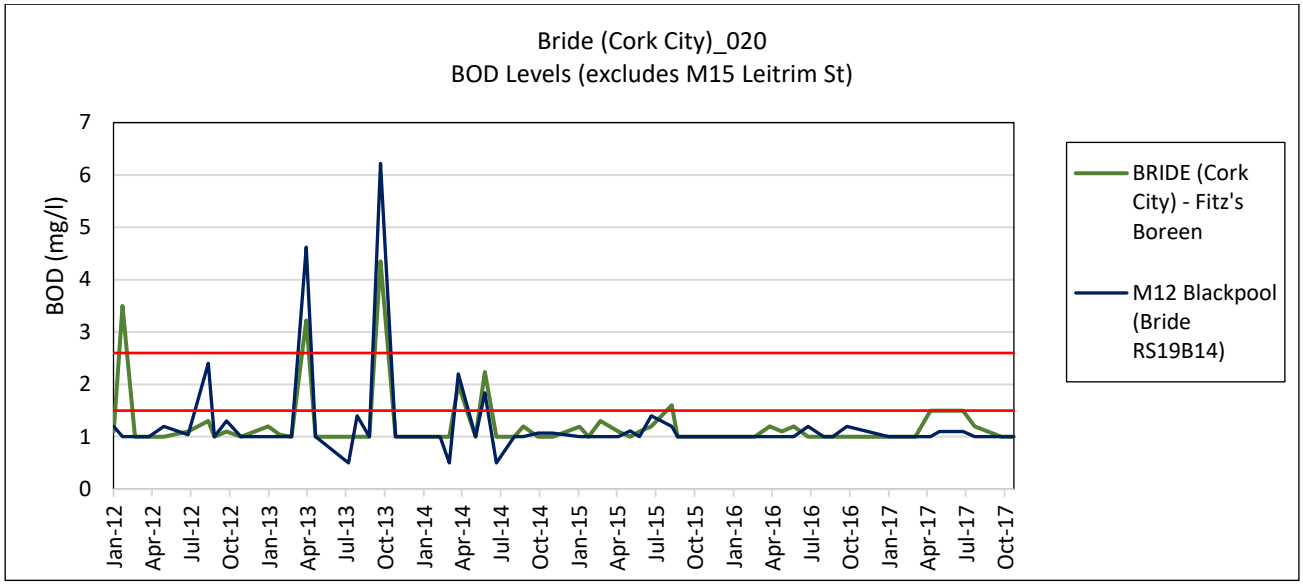


Figure 2.12: BOD Levels Bride Cork City)_020 (excl M15 Leitrim Street)

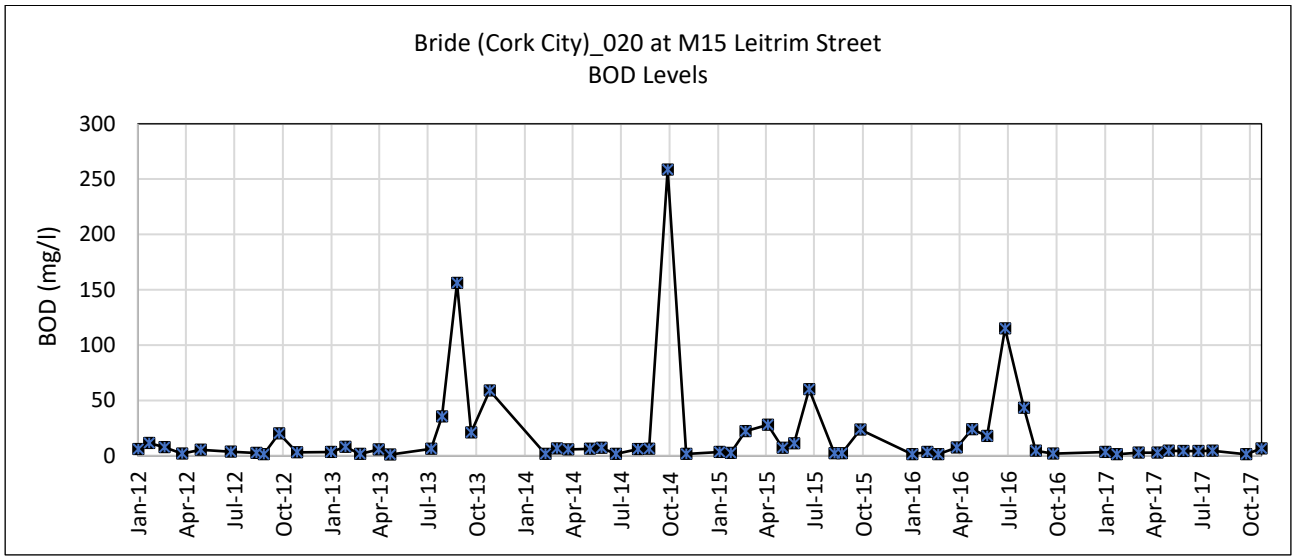


Figure 2.13: BOD Levels Bride Cork City)_020, M15 Leitrim Street

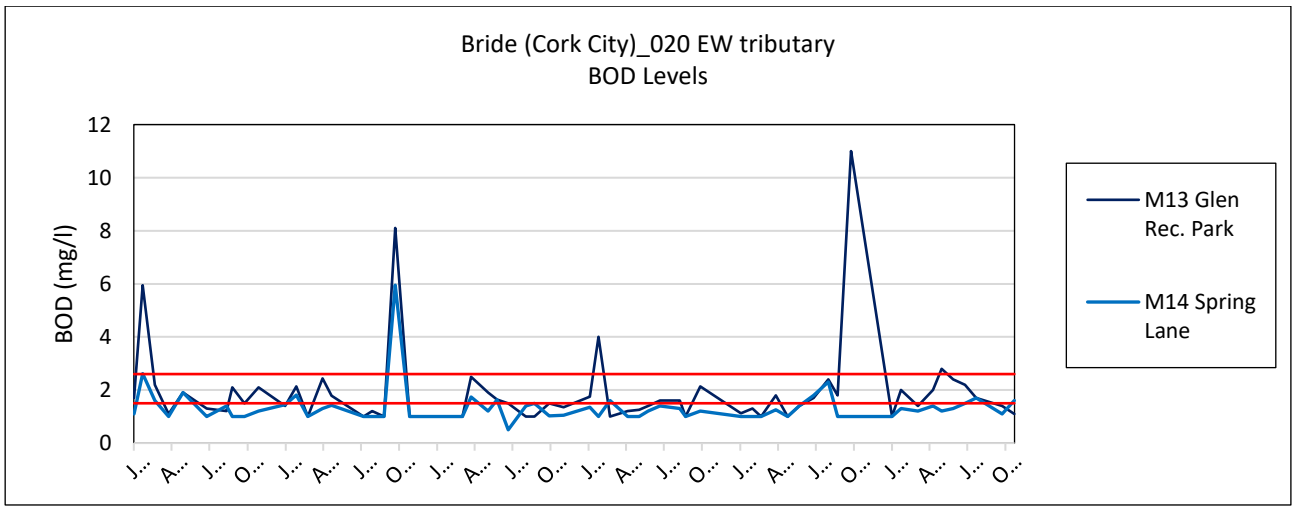


Figure 2.14: BOD Levels Bride Cork City)_020, E-W Tributary

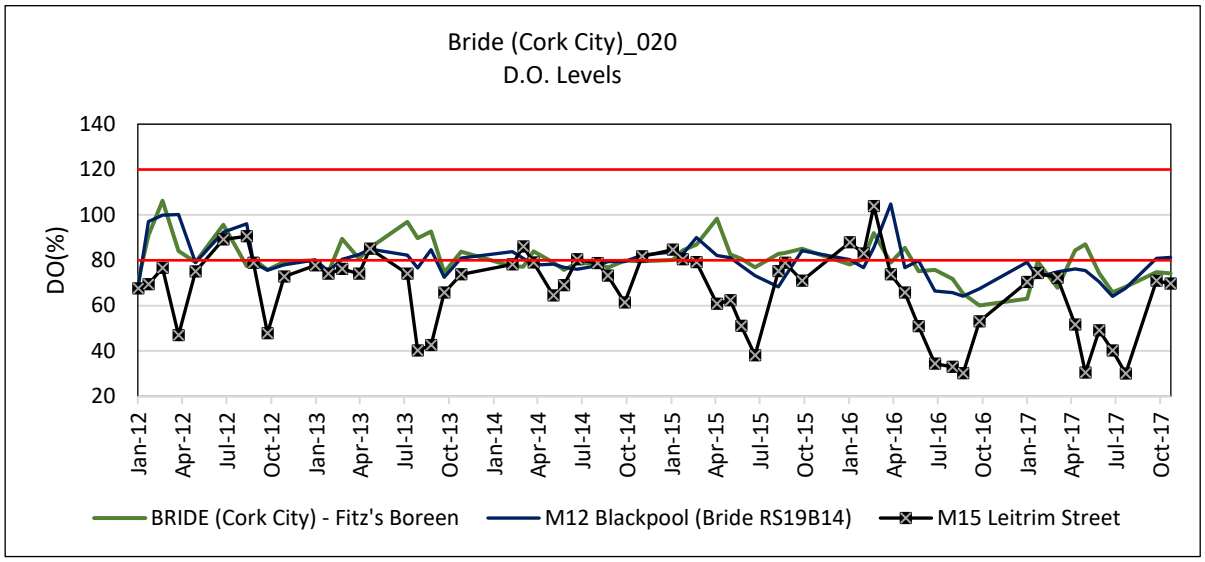


Figure 2.15: D.O. Levels Bride Cork City)_020, Main Channel

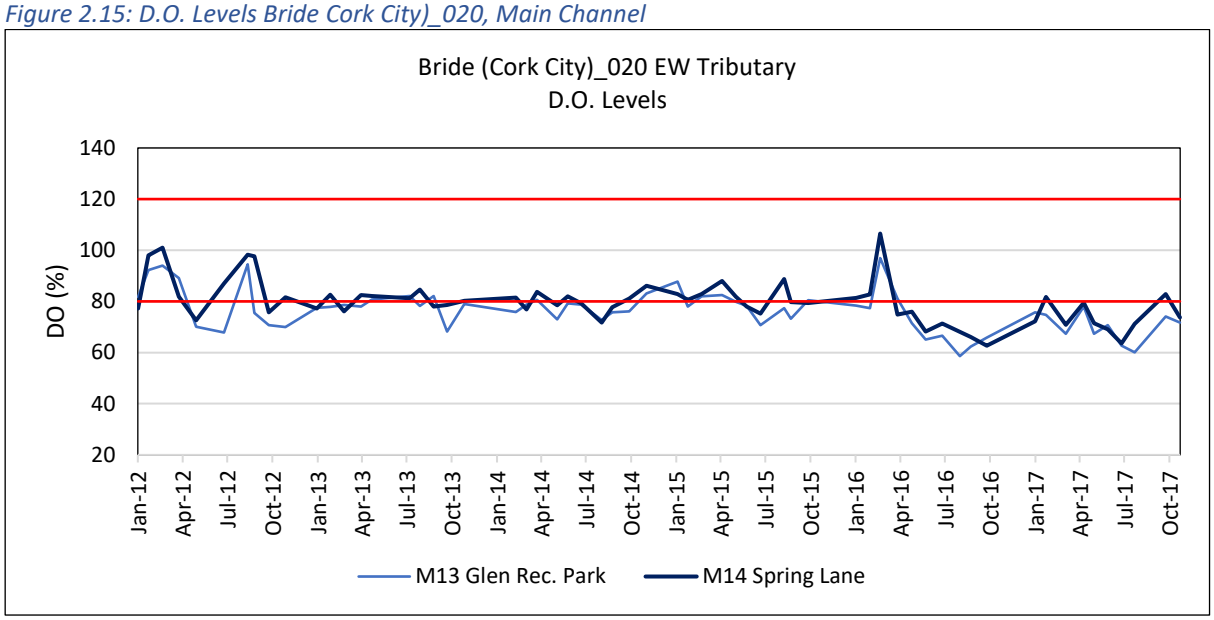


Figure 2.16: D.O. Levels Bride Cork City)_020, E-W Tributary

As can be seen from the graphs, orthophosphate levels were elevated for all sites on Bride (Cork City)_020 and particularly elevated for station 'M15 Leitrim Street'. All results for this station exceeded the mean good status EQS. 93% of results exceeded the 95%ile EQS and 44% of results were more than double this 95%ile limit. One peak of 9.5ppm was reported for May 2015 (fig 2.13).

Elevated BOD was an issue mainly at station M15 Leitrim street. The significant peaks (over 100ppm) observed here prior to 2017 are indicative of gross pollution.

Ammonium results generally exceeded the mean EQS at all stations and were particularly elevated at station M15 Leitrim Street.

Dissolved oxygen levels were low throughout the waterbody. Results for all stations were below the lower limit on more than 50% of occasions monitored. At stations M13 Glen Rec Park and M15 Leitrim Street, results failed to meet the lower limit on 73% and 82% of occasions respectively.

These data are indicative of nutrient and organic issues throughout Bride (Cork City)_020 with highest results consistently observed at the lowest station, M15 Leitrim Street.

Sediment (associated with road runoff) is also a potential significant issue on this waterbody.

To identify areas with greatest BOD and orthophosphate contribution, the daily load at each monitoring station was estimated by multiplying concentration by extrapolated flow for each sample event. Flows were obtained for each sample event from data for OPW station 19058 (Blackpool Retail Park), adjusting for each sample location based on contributing catchment area (see appendix X).

BOD load was examined for 2017 only because the incidents of gross pollution evident in 2013, 2014 and 2016 (BOD>100mg/l) increased the mean BOD to 18mg/l. These significant BOD spikes were not observed in 2017, suggesting (possibly) that whatever pressures caused these earlier spikes may have since been addressed.

Results are illustrated in figures 2.17 and 2.18.

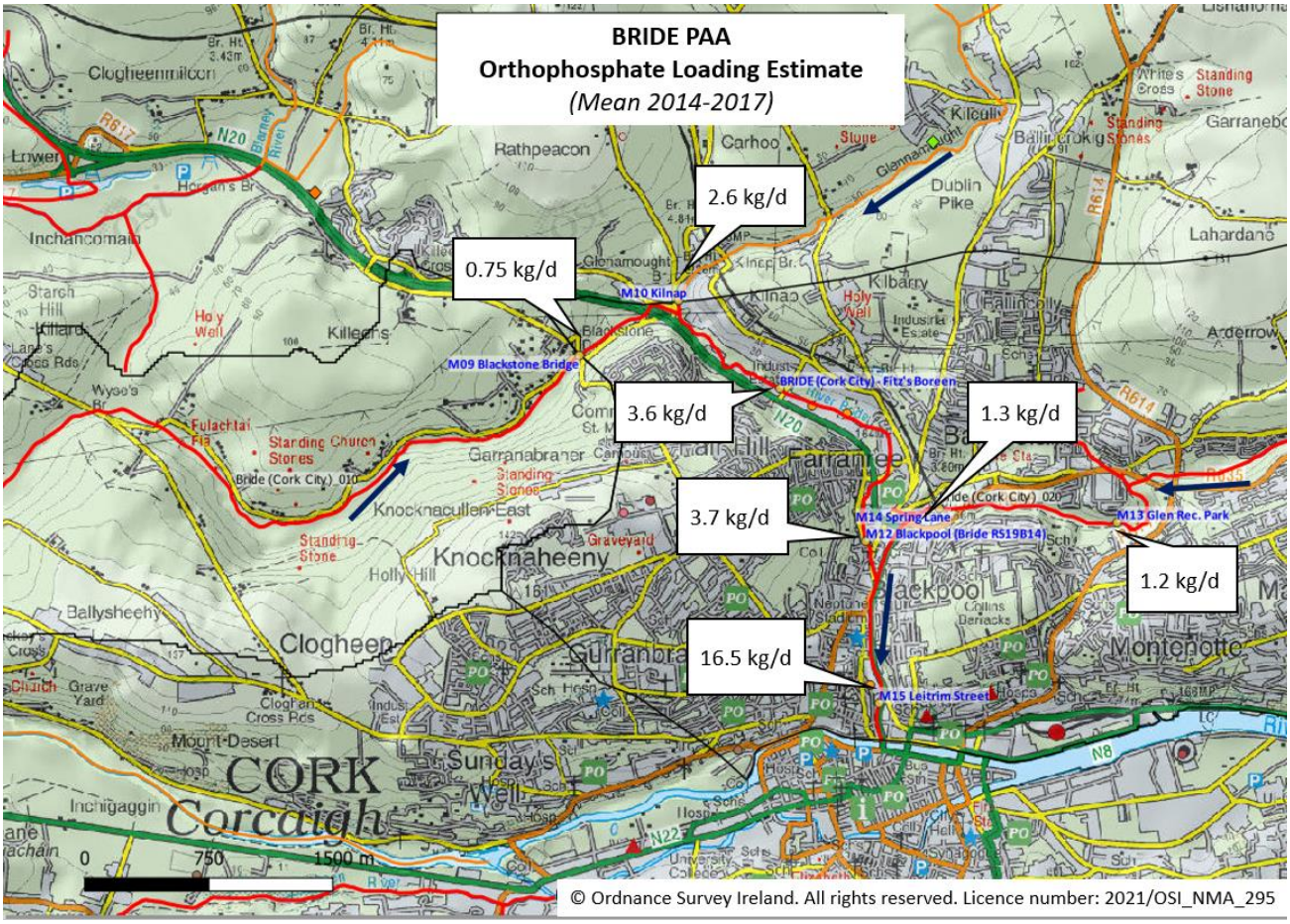


Figure 2.17: Estimated nutrient loadings, Bride PAA

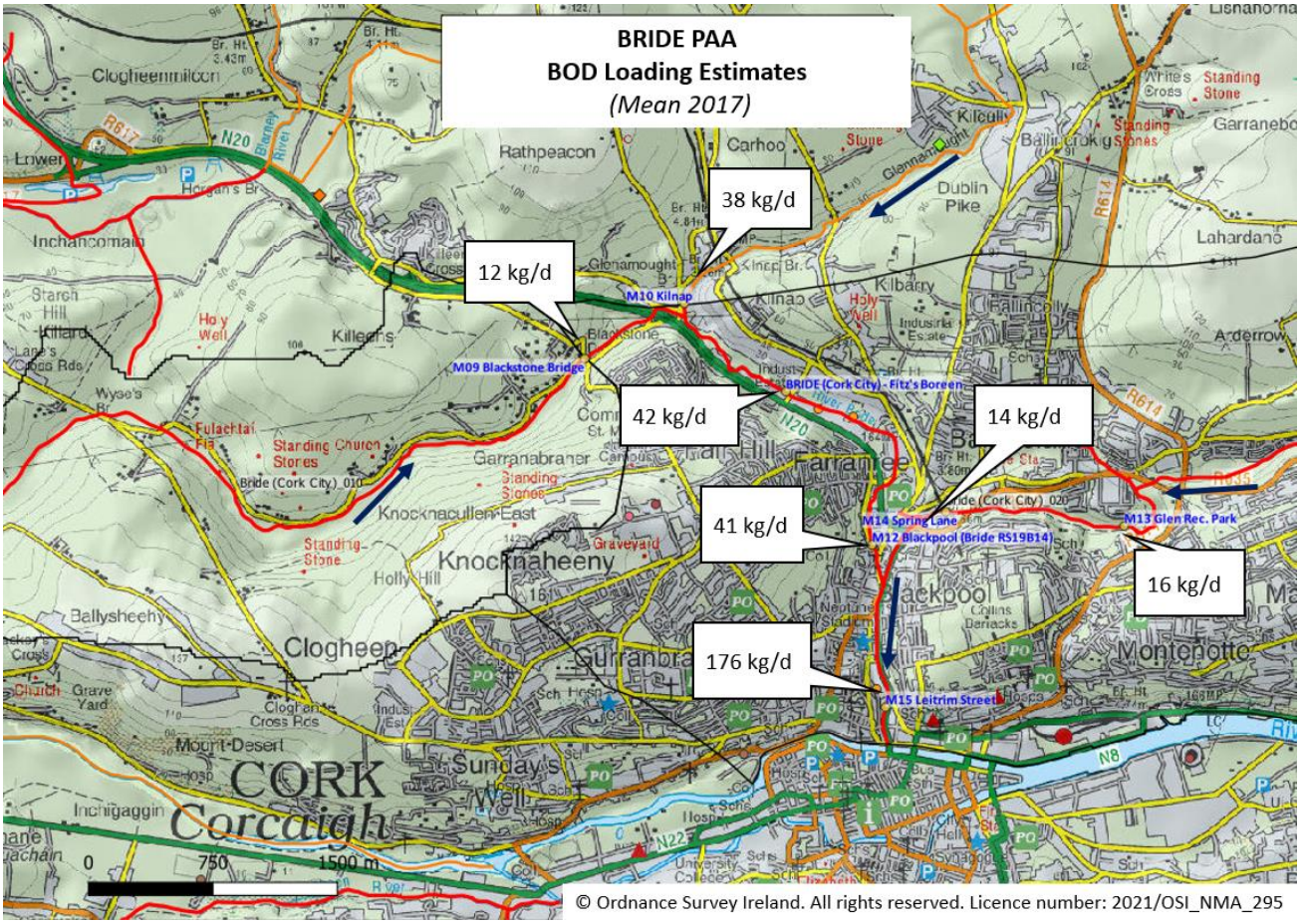


Figure 2.18: Estimated organic loadings, Bride PAA

Elevated phosphate and organic pollution are issues throughout the PAA but the loading data suggest that the greatest orthophosphate and BOD load contribution to Bride (Cork City)_020 is arising along a 1km stretch between two monitoring stations 'M12 Blackpool' and 'M15 Leitrim Street'. While the Glen river tributary flows into the main channel between these two stations, it appears to deliver only 10% approximately of the total nutrient and BOD contribution at M15 Leitrim Street.

EPA maps indicate that there are seven stormwater overflows (SWO's) discharging to the main Bride channel along this lower 1km stretch. The extreme BOD peaks observed prior to 2017 at M15 Leitrim Street would suggest that storm overflows may be a significant pressure here. Two of the SWOs appear to be located within the boundary of (or in close proximity to) an EPA licensed facility (P0445-01). This facility discharges to sewer but it is not known at this point whether these SWOs are upstream or downstream of the discharge location.

BOD results from 2012 to 2017 were graphed with three-day cumulative rainfall to try to determine whether the concentration spikes were associated with high rainfall events (figure 2.19). However aside from the BOD peak of 258mg/l in October 2014, this does not appear to be the case.

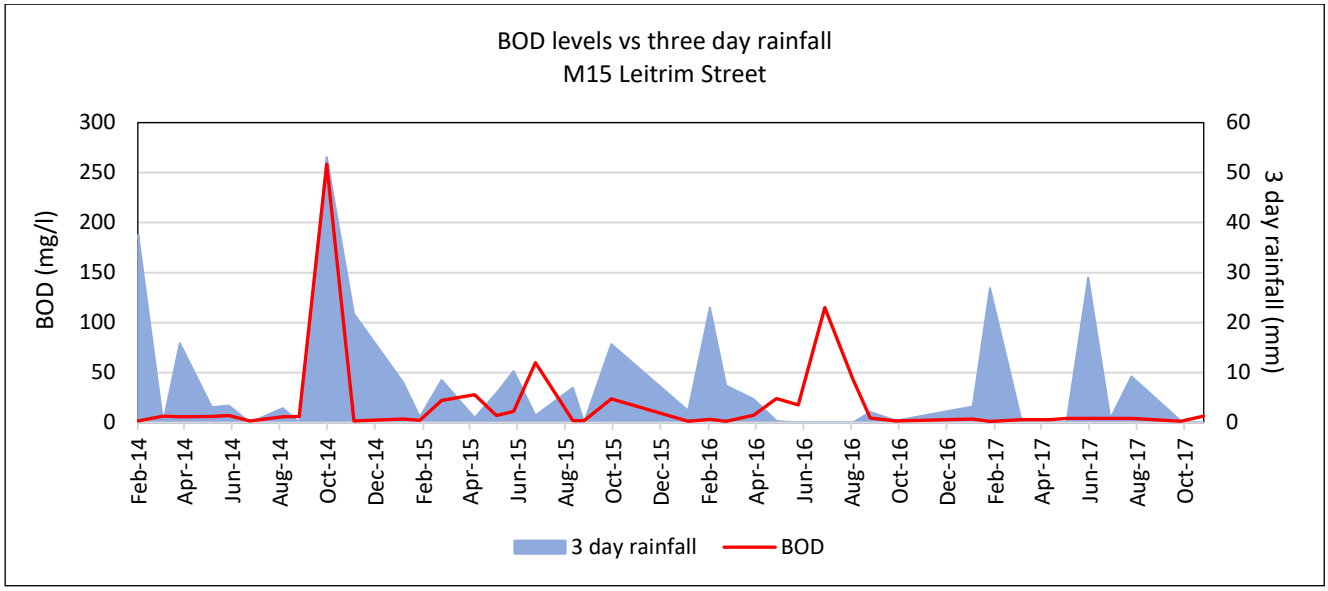


Figure 2.19: BOD and three day rainfall, M15 Leitrim Street

2.5 Conclusion on Significant Issues

Bride (Cork City)_010

Results of monitoring undertaken between 2012 and 2017 suggest that orthophosphate and low dissolved oxygen are significant issues in this waterbody. While there have been periodic spikes in BOD, results for 2017 indicate that further investigation is needed here. 2017 DO levels were consistently below the lower EQS but BOD results for the same sampling events were all satisfactory. Sediment may also be a potential significant issues here.

Glennamought Trib (Bride)_010 (outside Cycle 2 PAA, headwaters to Bride (Cork City)_020)

Elevated orthophosphate and low dissolved oxygen are potential significant issues in Glennamought Trib (Bride)_010. The low dissolved oxygen levels are presumably linked to organic pollution with periodic BOD spikes observed here in the past although more recent BOD results were below the mean good status EQS. Sediment may also be an issue here.

Bride (Cork City)_020

Elevated orthophosphate and ammonium and organic pollution (with resultant low DO) are significant issues in Bride (Cork City)_020. Elevated sediment may also be an issue here, mainly from road runoff.

While available results indicate that phosphate, ammonia and organic pollution are an issue throughout the waterbody, the greatest loading to the river channel is arising on the final 1km reach of the main channel, between stations M12 Blackpool and M15 Leitrim Street. There are likely to be significant urban misconnections along this lower reach. This will be investigated in the LCA process.

Catchments of Concern with Nitrate Issues

An EPA Catchments Unit report (June 2021) identified the Lee catchment as one of the catchments of concern nationally because of elevated dissolved inorganic nitrogen levels in coastal waters. The report recommends a

maximum limit of 2.6mg/l nitrogen for rivers in this catchment and estimates that a reduction of **183** tonnes of nitrogen would have been required in 2019 in order for this limit to be met. Total nitrogen loadings through the Bride river system are assessed in Appendix X to this desk study report, based on data between 2015 and 2017. While this system is small, results indicate that it may contribute approximately 81 tonnes of total nitrogen per annum, of which at least 33 tonnes is likely to be directly associated with urban pressures. A reduction of 50 tonnes per annum would be required at the outlet of Bride (Cork City)_010 for the average nitrogen concentration here to reduce to 2.6mg/l.

3 Significant Pressures

3.1 Initial characterisation

Table 3-1 EPA initial characterisation information

Water body Name	Id	Category	Subcategory	Name	Significant?	Pressure & Impact details
Bride (Cork City)_010	WBP0004913	Urban Run Off	Diffuse Sources Run Off	NA	Yes	• Nutrient pollution. • Organic pollution • Urban Run-off, including misconnections, has been identified as a significant pressure. Further investigation is required to determine the nature and extent of the impacts.
	WBP0004915	Hydromorphology	Channelisation	NA	Yes	• Altered habitat due to hydrological and morphological changes • Killard drainage district scheme exists within this water body.
Glennamought trib (Bride)_010 (outside PAA but inputting to Bride (Cork City)_020	WBP0004911	Urban Run Off	Diffuse Sources Run Off	NA	Yes	• Nutrient pollution • Chemical pollution • SLAM (v2.4) indicates that diffuse urban contributes 28% of the phosphate. The lower reaches of this water body are located within the northern suburbs of Cork city.
Bride (Cork City)_020	WBP0004912	Urban Run Off	Diffuse Sources Run Off	NA	Yes	• Nutrient pollution • Organic pollution • Urban Run-off, including misconnections, has been identified as a significant pressure. Further investigation is required to determine the nature and extent of the impacts.

3.2 Additional Pressure Information

Bride (Cork City)_010

EPA initial characterisation identified urban runoff (diffuse sources runoff) and hydromorphology (channelisation) as the two likely significant pressures impacting on Bride (Cork City)_010.

Section 2 of this report concludes that orthophosphate, ammonium and organic pollution are significant issues impacting on water quality in Bride (Cork City)_010. Nitrate is also considered, specifically in relation to the downstream catchment as the Lee is one of the EPA catchments of concern in terms of elevated nitrate discharging to coastal waters.

Corine 2018 maps (Appendix II) indicate that main land use for this sub-basin is agriculture (pasture) but soils are well-draining (Appendix III) and therefore low risk of phosphate loss to surface waters (see surface P PIP map Appendix VI). Therefore agriculture is unlikely to be a significant pressure considering phosphate as the significant issue. However in terms of nitrate contribution to the downstream catchment agriculture is a potential pressure. Nitrate PIP maps (Appendix IX) indicate that more than 70% of the sub basin is ranked 1-3 for nitrate loss. The nitrogen load reduction required to bring mean river nitrogen levels below the EPA recommended limit of 2.6mg/l is 3.5 tonnes per annum (see Appendix X). Assuming that all of this is from agricultural sources, this equates to a per hectare reduction of 0.01 tonnes per annum.

There are development clusters within the sub-basin, all mapped as being outside the agglomeration boundary and Cork City Council has advised that these residences are on private domestic wastewater treatment systems (DWWTSs). Development density is quite high in the headwaters adjacent to the L2779 and is also high close to the waterbody outlet, to the north of the channel in particular. There are approximately 70 residences and a business park here, adjacent to the lower Killeens Road. These need to be assessed in the LCA process as potential point sources of nutrient and organic pollution.

This information supports the EPA initial characterisation of urban diffuse pressure as a significant pressure on Bride (Cork City)_010.

Hydromorphological quality (MQI V1.08.01) is moderate for all three reaches of Bride (Cork City)_010. High impact MQI indicators driving moderate condition on the final 2.1km reach are related to channel morphology (the entire channel is part of the Killard drainage district scheme). Lateral connectivity score is medium on this reach due to confining walls and proximity to roads. No information could be obtained on the frequency and extent of channel maintenance works under the Local Authority's drainage scheme.

Glennamought Trib (Bride)_010 (upstream of Cycle 2 PAA)

The EPA initial characterisation identified urban runoff (diffuse sources runoff) as the sole significant pressure on Glennamought Trib (Bride)_010. Section 2 of this report concludes that orthophosphate and low dissolved oxygen levels are potential significant issues here, assuming that the waterbody is impacted. Low dissolved oxygen is associated with organic pollution although this is not confirmed by most recent available BOD results for this waterbody. Organic reich sediment can also indirectly contribute to low water column DO levels.

The catchment upstream of the confluence with Bride (Cork City)_020 is predominantly rural apart from the town of Whitechurch in the headwaters. The sub-basin overlies an unproductive (Ll) aquifer (Appendix V). Groundwater vulnerability is generally high with areas of Extreme X along the lower 2.8km (Appendix IV). Lands are under pasture but soils are well draining. PIP and P susceptibility maps indicate that most of the sub-basin is low risk for phosphate loss to surface waters (PIP rank 5 and 6 and P susceptibility rank 4, Appendix VII and VIII). This information suggests that agriculture is unlikely to be a significant pressure in this waterbody in terms of phosphate as significant issue. Lands are high risk for nitrate loss to surface waters however (PIP rank 1 to 3

across more than 50% of the sub basin, see appendix IX), which is potentially significant considering the sensitivity of the downstream catchment. As for Bride (Cork City)_010, loadings per hectare and required reduction to meet the EPA recommended limit of 2.6mg/l N are outlined in Appendix X. Results indicate that a reduction of 9.4 tonnes per annum would be required to bring river nitrate concentrations below 2.6mg/l. Assuming that all of the nitrogen originates from agricultural sources, this equates to a reduction of 0.008 tonnes per hectare per year.

Only the lands to the south of the final 1km reach of river channel are mapped as being within the agglomeration boundary. Locations of onsite systems are in ribbon development along roads with higher density in the northern headwaters around Whitechurch and along the lower reaches in the vicinity of Kilcully. Apart from a small number of residences around Kilcully, Sanicose P maps indicate very low potential impact from these systems.

The Rosemount (Kilcully) sewage treatment plant discharges to ground approximately 2km upstream of M10 Kilnap. This is a secondary treatment system serving approximately 26 houses (100PE) in a small agglomeration in Rosemount. It operates under Certificate of Authorisation A0351. As the system discharges to ground, it is unlikely to be a significant pressure on Glennamought Trib (Bride)_010. There are no other licensed point source discharges mapped for this river waterbody.

This information supports the initial characterisation conclusion that urban runoff is a potential significant pressure here. Pollution sources may be both diffuse and point (including misconnections along the final 1km reach) delivering both nutrient and organic pollution to the river.

Bride (Cork City)_020

The EPA initial characterisation identified urban runoff (diffuse sources runoff) as the sole significant pressure on Bride (Cork City)_020. Land use in the entire sub-basin is discontinuous urban fabric (Appendix II). Orthophosphate loading estimates from five investigative/pre WFD stations indicates that while orthophosphate is consistently elevated throughout the waterbody and in both inputting waterbodies, the highest load is delivered along a 1km reach between two monitoring stations 'M12 Blackpool' and 'M15 Leitrim Street'. EPA maps show seven stormwater overflows (SWO's) discharging to the main Bride channel along this lower 1km reach. Two of these are located within or adjacent to an EPA licensed facility although it is not known whether they are upstream or downstream of the location of the sewerage connection for this facility. These storm overflows and other potential point sources need to be investigated in the LCA process.

Bride (Cork City)_020 is culverted at North Point Business Park where the Glennamought Trib (Bride)_010 joins the main river channel. The Glen river (E-W tributary of Bride (Cork City)_020 is culverted for a stretch under Spring Lane and again where it merges with the main channel 100m downstream of Blackpool Church.

Significant flood relief works are proposed here which may impact on water quality in the future. However, the local catchment assessment on Bride (Cork City)_020 will focus on identifying sources of nutrient and organic pollution. Irrespective of current and future hydromorphological pressures, a reduction in nutrient and organic loading will be beneficial for water quality in Bride (Cork City)_020 and also in *At Risk* receiving waterbody Lee (Cork) Estuary Upper.

3.3 Conclusions on Significant Pressures

The findings of this desk study indicate that, as for the EPA's initial characterisation, urban runoff is the likely significant pressure in Bride (Cork City)_010, in inputting waterbody Glennamought Trib (Bride)_010 and in Bride (Cork City)_020.

Potential hydromorphological pressures on Bride (Cork City)_010 due to drainage maintenance under the Killard Drainage Scheme will be investigated in the LCA process.

The culverting of sections of Bride (Cork City)_020 may also be a significant pressure impacting on downstream biology. This will be investigated in the local catchment assessment.

In relation to the nitrogen loading from this subcatchment and the EPA recommendation to reduce river nitrogen concentrations to 2.6mg/l or below, both urban runoff and agriculture are likely significant pressures here. Urban runoff is potentially contributing an estimated 33 tonnes of nitrogen per annum in Bride (Cork City)_020 and may also be contributing to the estimated 14 tonnes per annum lost from Bride (Cork City)_010 (appendix X). Agriculture is also a potential contributor to N loss in Bride (Cork City)_010 and in inputting waterbody Glennaought Trib (Bride)_010 as land use in both sub basins is mainly under agriculture (pasture) with more than 70% of both sub basins in a nitrate critical source area.

4 Pathways Information and Analysis

Both PAA waterbodies and inputting waterbody Glennamought Trib (Bride)_010 overly an unproductive (Ll) aquifer. Bedrock is Devonian old red sandstones. Soils are generally well drained (AminDW). Groundwater vulnerability in the rural part of the subcatchment is high with areas of extreme and Extreme X (see Appendix IV).

The significant pressures in both PAA waterbodies driving the phosphate and low dissolved oxygen issues are urban in nature. Pressures are likely to be diffuse urban runoff, misconnections and other point sources. Pathways will be via drains and pipes and a conceptual model is therefore not required for this local catchment assessment.

5 Interim Story of the PAA

The Bride (Cork City) priority area for action (PAA) comprises two river waterbodies, the Bride (Cork City)_010 and Bride (Cork City)_020. The river system includes an inputting waterbody to Bride (Cork City)_020 which does not form part of the current PAA (Glennamought Trib (Bride)_010. These are the only three river waterbodies within subcatchment 19_1 (Kiln_SC_010) in catchment area 19, Lee, Cork Harbour and Youghal Bay. Catchment area 19 has been identified by the EPA as a catchment of concern in terms of nitrate levels in the downstream coastal waterbodies. The entire PAA lies within the Cork City Council boundary. The central part of the PAA is proposed for flood relief works under the River Bride (Blackpool) Certified Drainage Scheme.

Bride (Cork City)_010

- WFD Cycle 3 –*At Risk.* WFD status is unassigned.
- WFD Cycle 2 – A*t Risk.* WFD Status is unassigned.
- The waterbody is not currently monitored under WFD but local authority staff undertook chemistry sampling at the outlet between 2012 and 2017. Results indicate that orthophosphate is a significant issue impacting on water quality here. Low dissolved oxygen is also an issue periodically, although recent BOD results are

not directly indicative of organic pollution. Sediment may also be a significant issue and organic rich sediment may be contributing to low DO levels in the water column.

- The significant pressure is urban runoff (diffuse and possible point sources). Hydromorphology (channelisation) is also a potential pressure; this waterbody is located within the Killard Drainage District.
- Local catchment assessments will focus on assessing biology (SSIS) along the river channel, identifying impacted reaches. Stream walks including monitoring for field parameters, nutrients and BOD should enable pressures to be located and sources of nutrient and organic pollution to be identified. If sediment is identified as a significant issue, sediment extent, depth and type will be assessed along the channel following LAWPRO's sediment assessment methodology and sources will be identified.

Glennamought Trib (Bride)_010 (inputting to Cycle 2 PAA)

- WFD Cycle 3 –*Review.* WFD status is unassigned.
- WFD Cycle 2 –*Review.* WFD Status is unassigned.
- The waterbody is not currently monitored under WFD but local authority staff undertook chemistry sampling at the outlet between 2012 and 2017. Results indicate that orthophosphate is a significant issue impacting on water quality here. Low dissolved oxygen is also a periodic issue although recent BOD results are not directly indicative of organic pollution. Sediment may also be a significant issue and organic rich sediment may be contributing to low DO levels in the water column.
- The significant pressure is urban runoff (diffuse sources runoff) but point source pressures may exist (e.g. misconnections).
- Monitoring undertaken as part of the environmental impact assessment for the River Bride (Blackpool) Certified Drainage Scheme indicates that this waterbody was at good biological status (Q4) in 2018.
- No work is planned for this waterbody in this RBMP cycle as it doesn't form part of the current Bride (Cork City) PAA. However if the PAA is expanded in Cycle 3 to include Glennamought Trib (Bride)_010, the LAWPRO team will undertake biological assessments at the waterbody outlet (M10 Kilnap) to determine whether further investigation is required. If results are indicative of impact, stream walks and monitoring for field parameters, nutrients and BOD will be undertaken to identify impacted reaches and locations of pressures. If sediment also appears to be a significant issue at M10 Kilnap, sediment extent, depth and type will be assessed along the upstream channel following LAWPRO's sediment assessment methodology and sources will be identified.

Bride (Cork City)_020

- WFD Cycle 3 –*At Risk.* WFD status is unassigned.
- WFD Cycle 2 – *At Risk.* WFD Status is unassigned.
- The waterbody is not currently monitored under WFD but local authority staff undertook chemistry sampling here at five locations between 2012 and 2017. Results indicate that orthophosphate and organic pollution are the significant issues impacting on water quality. Sediment may also be an issue. Highest nutrient and BOD loadings appear to arise along the lower 1km of the main channel, between stations M12 Blackpool (Bride RS19B14) and M15 Leitrim Street.
- The significant pressure is urban runoff (likely to be associated with both diffuse and point sources) with greatest risk of misconnections occurring along this lower 1km stretch.
- In terms of the nitrogen loading from this waterbody, urban runoff in Bride (Cork City)_020 is potentially contributing an estimated 33 tonnes of nitrogen per annum to the downstream catchment.

- Local catchment assessments will include assessment of biology (SSIS) along suitable reaches on the main channel and the Glen river tributary. Monitoring for field parameters particularly dissolved oxygen will be used to try to identify urban point sources. Chemistry sampling for nutrients and BOD upstream along the channel and Glen river tributary will enable pressures to be located and sources of nutrient and organic pollution to be identified. If sediment appears to be a significant issue, sediment extent, depth and type will be assessed along the channel. The initial focus of work will be along the lower 1km of the main channel from M15 Leitrim Street up to M12 Blackpool (Bride RS19B14).

6 Workplan

6.1 EPA further characterisation actions

Table 6-1: EPA further characterisation actions

WB Name	Id	Action	Responsible Organisation	Further Characterisation Action details
Bride (Cork City)_010	FC003003	IA6 Multiple Sources in Large Urban Area	LAWPRO	Complete walk along the RWB, identify discharge points, collect field parameters upstream and downstream of discharge points. Prioritise SWOs.
Glennamought Trib (Bride)_010 upstream of cycle 2 PAA	FC002998	IA3. Determination of water quality in unassigned waterbody	Currently Cork City/County Councils but LAWPRO PAA has been proposed for expansion in Cycle 3 to include this waterbody	Ambient monitoring sampling point is 2km D/S of Ballincollig so the SSRS may not be representative as v high P levels detected in 2015. If there is an issue, proceed to an IA5 to concentrate on area south of Ballincollig
	FC003504	IA6 Multiple Sources in Large Urban Area		Diffuse urban pressure to be investigated
Bride (Cork City)_020	FC002999	IA6 Multiple Sources in Large Urban Area	LAWPRO	Complete walk along the RWB, identify discharge points, collect field parameters upstream and downstream of discharge points.

6.2 Local Catchment Assessments

Bride (Cork City)_010

The river channel flows alongside the Killeens Road for approximately 3.5 km between Wyse's bridge (Site 6 in figure 6.1) and Blackstone bridge (Site 1 in figure 6.1). Highest development density is between sites 1 and 2 and this area is outside the agglomeration boundary.

- Assess biology and monitor field parameters at site 1.
- Walk 750m upstream of Site 1 to Site 2 looking for evidence of piped discharges and impact. Assess biology where possible, particularly upstream and downstream of pipes. Measure field parameters. Assess sediment extent, depth and type and look for evidence of anoxic (organic rich) sediment. Where pipes are dry, look for evidence of periodic discharges, anoxic sediment, debris etc
- If Site 2 is impacted, repeat between sites 2 and 6, driving or walking between each site.
- Assess biology where possible and measure field parameters, including upstream and downstream of piped discharges.
- If Site 6 is impacted, repeat assessments at site 7.
- Assess sediment extent, type and depth at all locations.

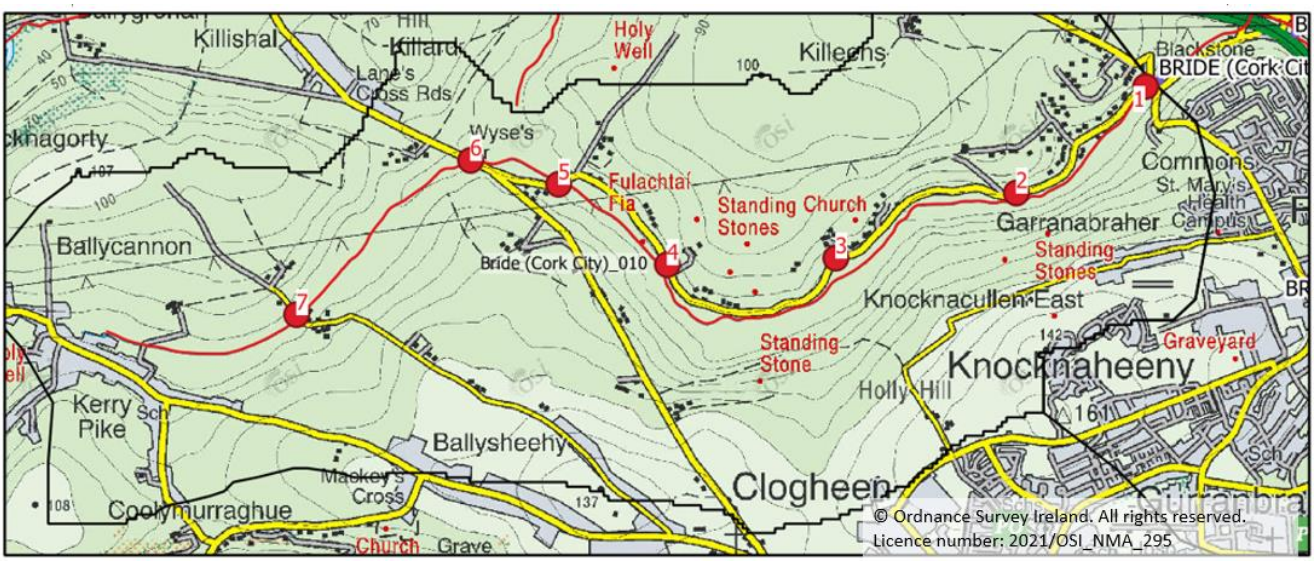


Figure 6.1: LCA Bride (Cork City)_010

Glennamought Trib (Bride)_010

No work is proposed here in Cycle 2 as this waterbody is outside the current PAA. Chemistry data from 2012 to 2017 indicate that if Glennamought Trib (Bride)_010 is impacted, the significant issues are likely to be phosphate and organic pollution.

If the Bride (Cork City) PAA is expanded as proposed in Cycle 3, undertake the following assessments (see figure 6.2 for site locations):

- Assess biology at Site 1 (station M10 Kilnap) in accordance with LAWPRO protocol for unassigned waterbodies.

- If the waterbody is impacted at this location, assess at Site 2. Sites shown on the map appear to be accessible locations for bridge hops. Findings at each location will determine whether/where further fieldwork is required.
- Stream walks will be required to identify urban pressures up to Sites 4 and 5.
- Upstream of Site 4 on the main channel (if impacted) stream walks will be required to identify potential pressures. Lands upstream of Site 4 are under agriculture but soils are well draining and low risk for surface phosphate loss. Nitrogen losses may be significant however as more than 50% of the sub-basin area is at PIP rank 1-3 for nitrate loss to surface waters (see Appendix IX). This is of relevance because catchment area 19 is one of the EPA catchments of concern for nitrate (see appendix X).

Figure 6.2: Recommendations for LCA Glennamought Trib (Bride)_010

Bride (Cork City)_020

- Initial focus should be on the lower 1km between M12 Blackpool (Bride RS19B14) and M15 Leitrim Street as the greatest nutrient and organic loadings are being delivered between these two points (based on 2017 data). Note that there may be difficulties with access due to the urban setting. Start at M15 Leitrim Street and work upstream (Figure 6.3). Where access is possible, undertake SSIS or rapid assessments to assess biology.
- Pressures are likely to also exist upstream of M12 so continue to work upstream on the main channel and on Glen river as access permits.
- Measure field parameters DO, pH and conductivity, assessing upstream and downstream of piped discharges. Look for evidence of impact in the vicinity of all pipes (grey or anoxic sediment, sewage fungus, debris etc).
- Assess sediment extent and type at all locations and look for evidence of anoxic sediment.
- Take samples for MRP, ammonium, total oxidised nitrogen and BOD along the channel and upstream and downstream of discharges. Where active piped discharges are observed, sample for field parameters, nutrients and BOD, measure flow and look for evidence of impact in the vicinity of the discharge.

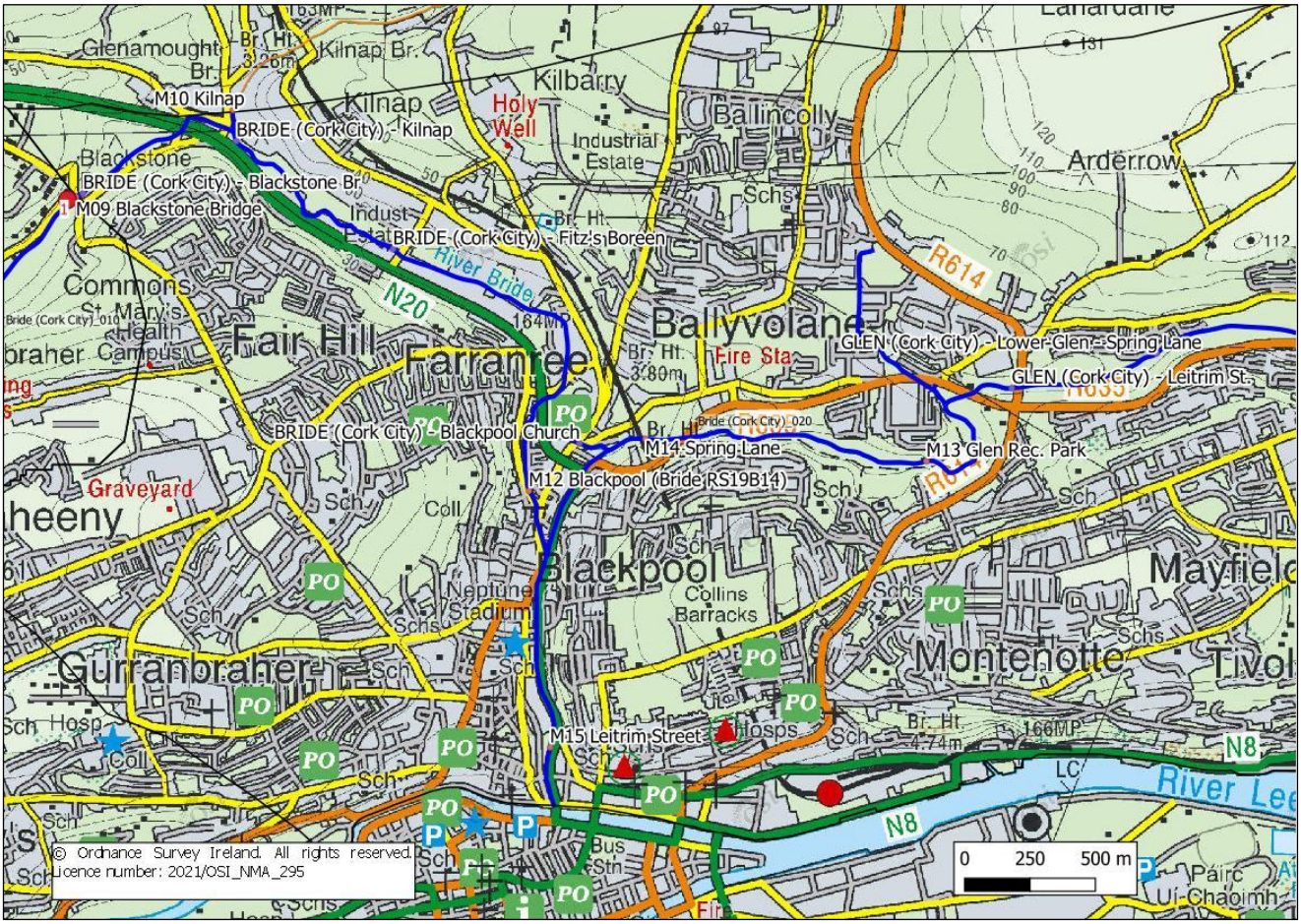


Figure 6.3: LCA Bride (Cork City)_020

7 Communications

The public meeting for the Bride (Cork City) PAA took place via Zoom on the 24th June 2021.

Key messages

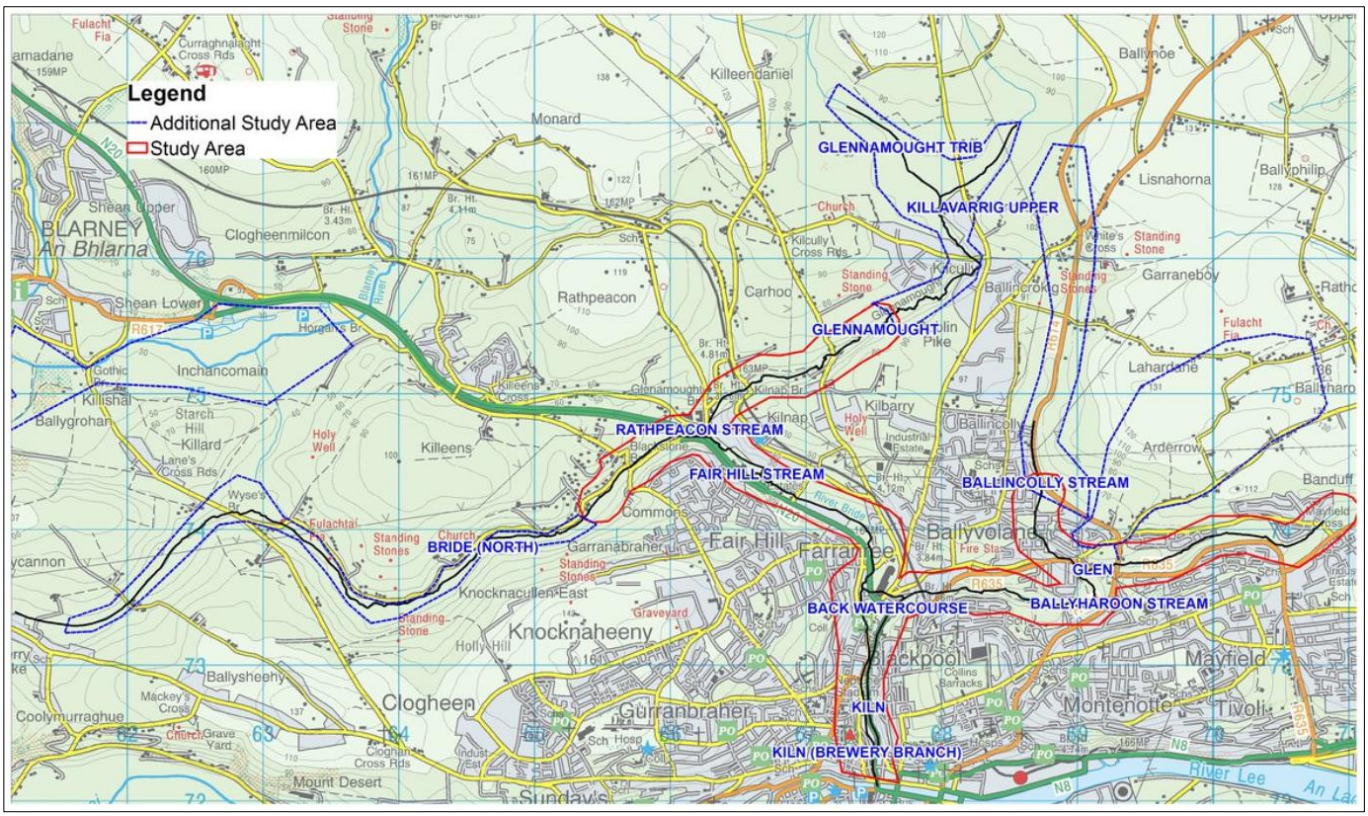
- The two waterbodies in this PAA are unassigned but both are *At Risk* of not achieving good ecological status by December 2027.
- Monitoring results from 2012 to 2017 indicate that nutrient and organic pollution are the significant issues impacting on water quality in both waterbodies.
- For Bride (Cork City)_020, data indicate that the greatest nutrient and organic load contributions are arising along the lower 1km stretch between two monitoring stations, M12 Blackpool and M15 Leitrim Street. The reason for this is not yet known but may possibly be linked to storm overflows or misconnections.
- Hydromorphological pressures already exist in both waterbodies and new works are proposed under the River Bride (Blackpool) Certified Drainage Scheme. Local catchment assessments will focus mainly on looking for nutrient, organic and sediment inputs to the river because irrespective of existing and possible future hydromorphological pressures, reducing nutrient and sediment losses to the river will improve water quality in both PAA waterbodies and will also be beneficial for *At Risk* receiving waters Lee (Cork) Estuary Upper.

Summary of issues raised

- Attendees discussed the value of the river and the importance of preserving nature.
- Concern was expressed about the level of fly tipping. Locals feel this a major problem in the lower reaches and leads to a negative perception of the river.
- Questions were asked about planning conditions and how misconnections can be identified and addressed.
- The value of citizen science was discussed as was the possibility of a community project in the future.

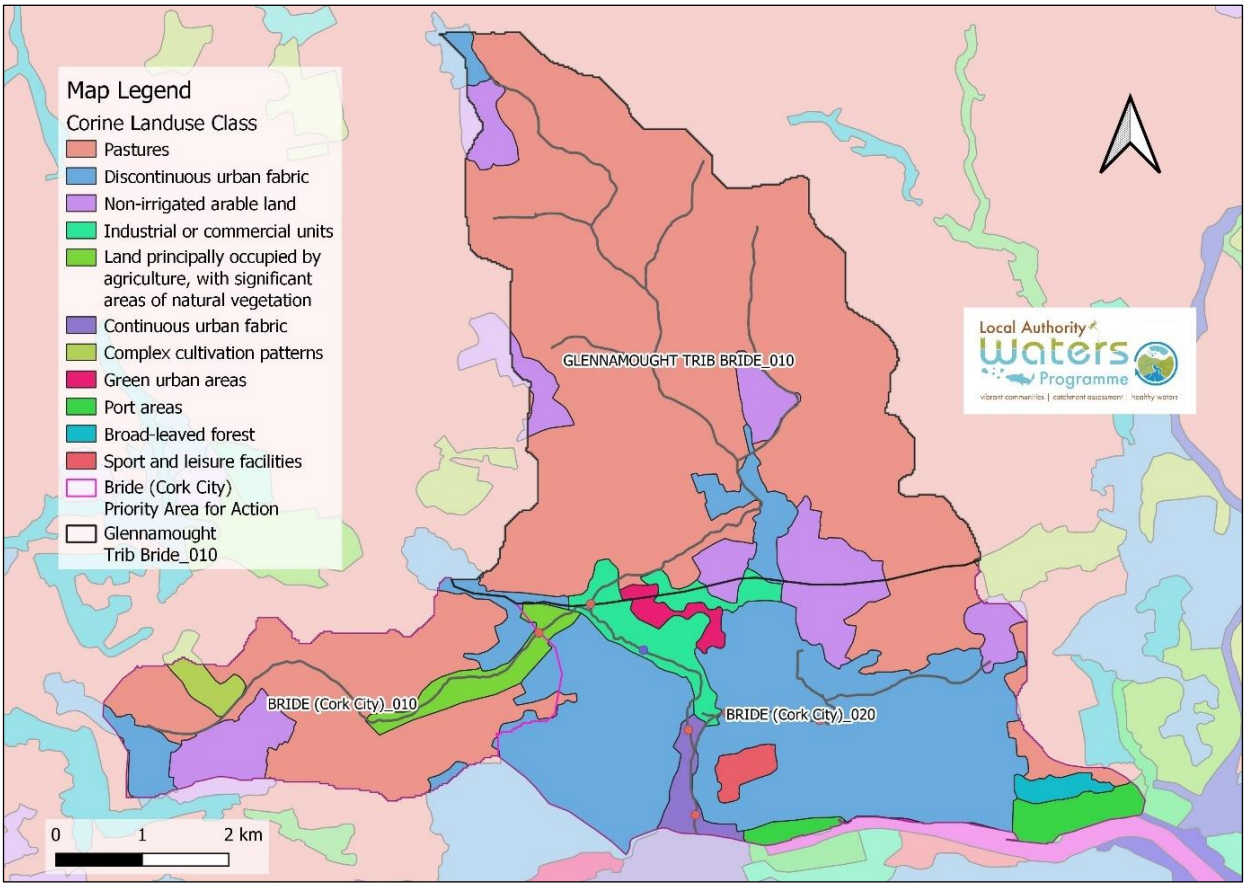
8 Appendices

Appendix I: Catchment area for Bride (Blackpool) proposed drainage works

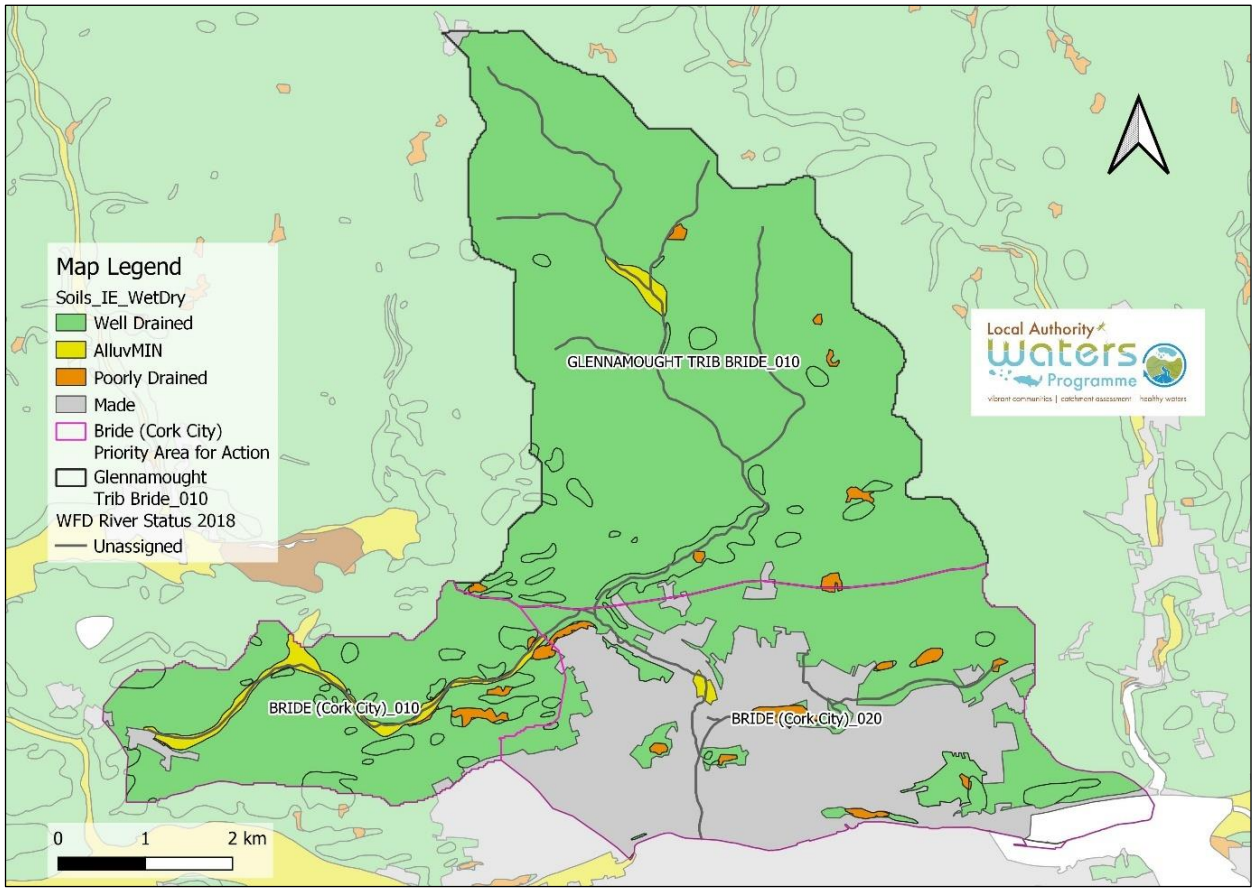


Source: [Blackpool FRS - Timeframe (floodinfo.ie)] *accessed 30th April 2021*

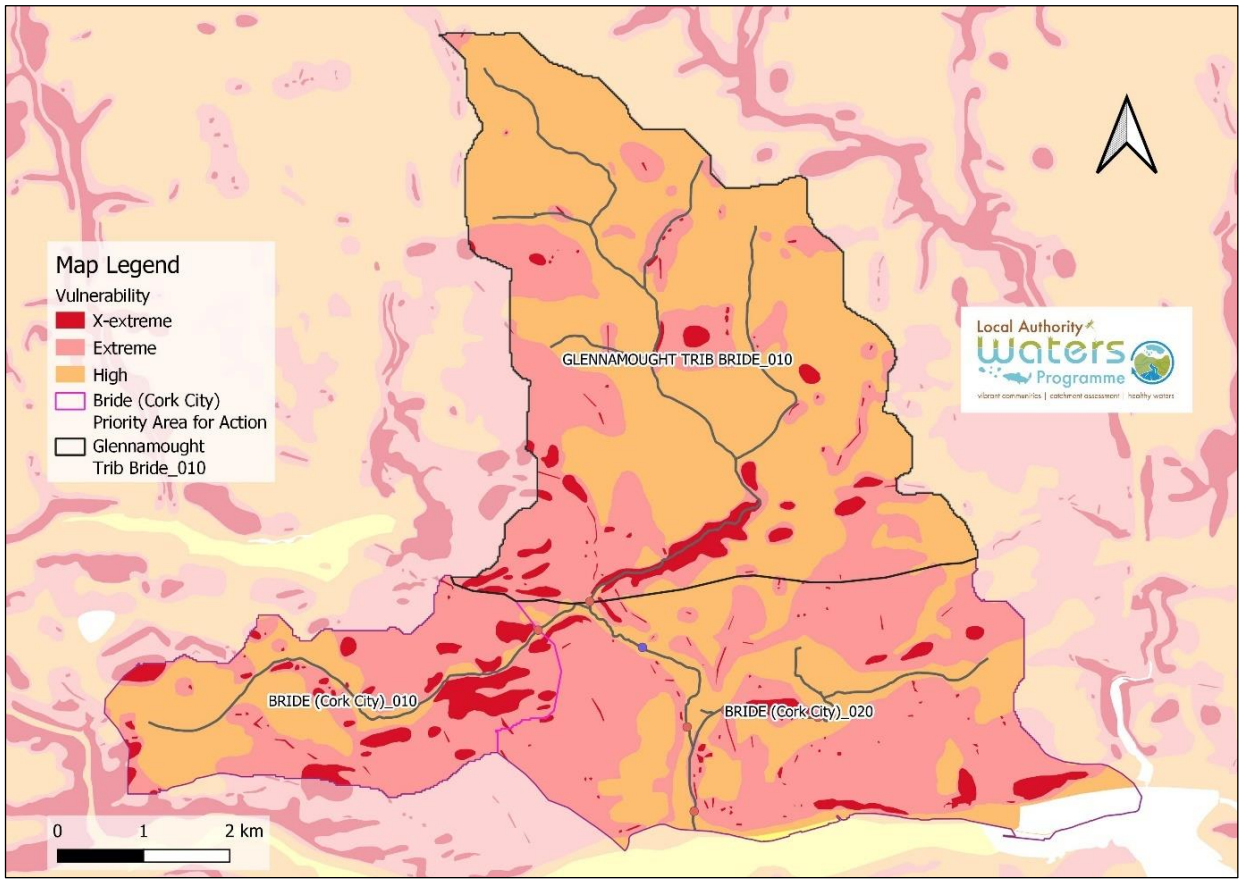
Appendix II: Corine Landuse Map



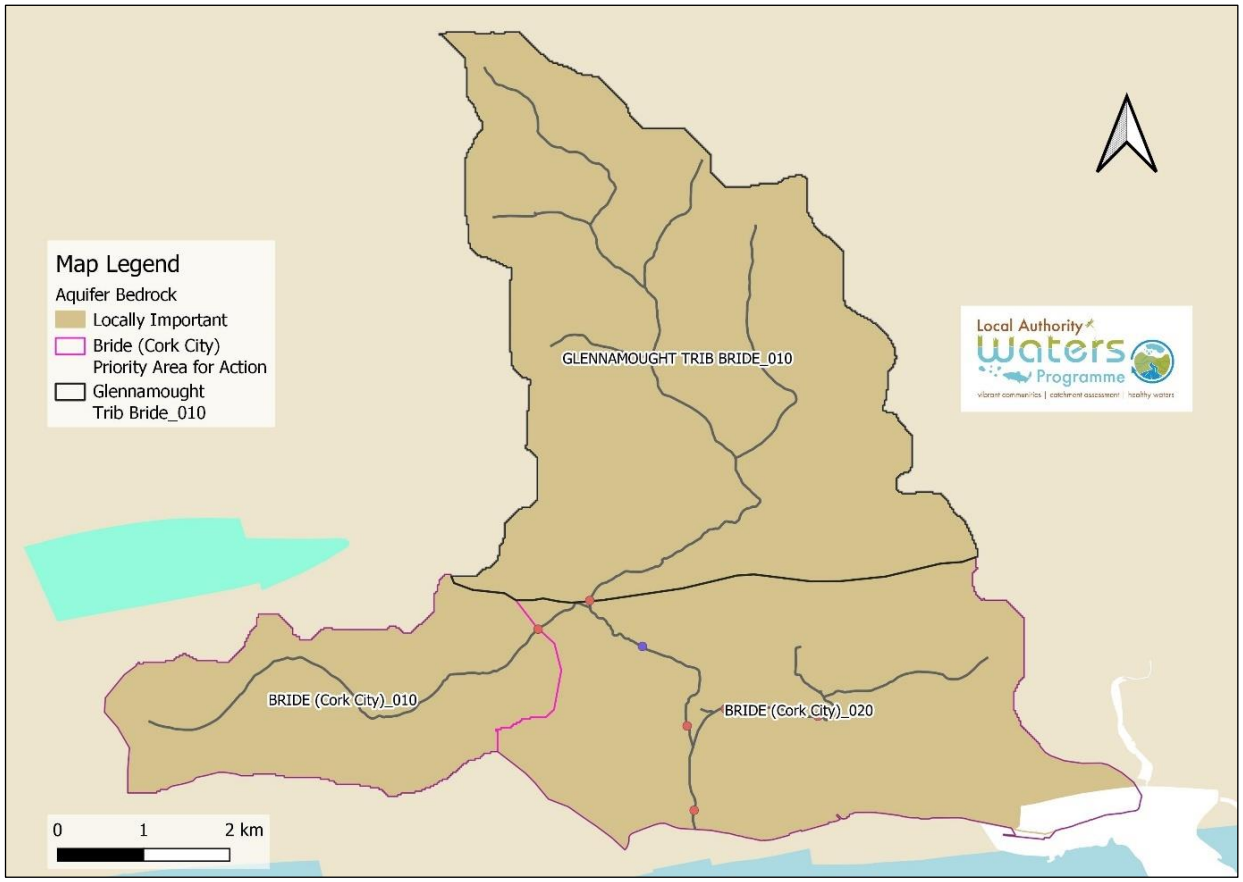
Appendix III: Soils Map



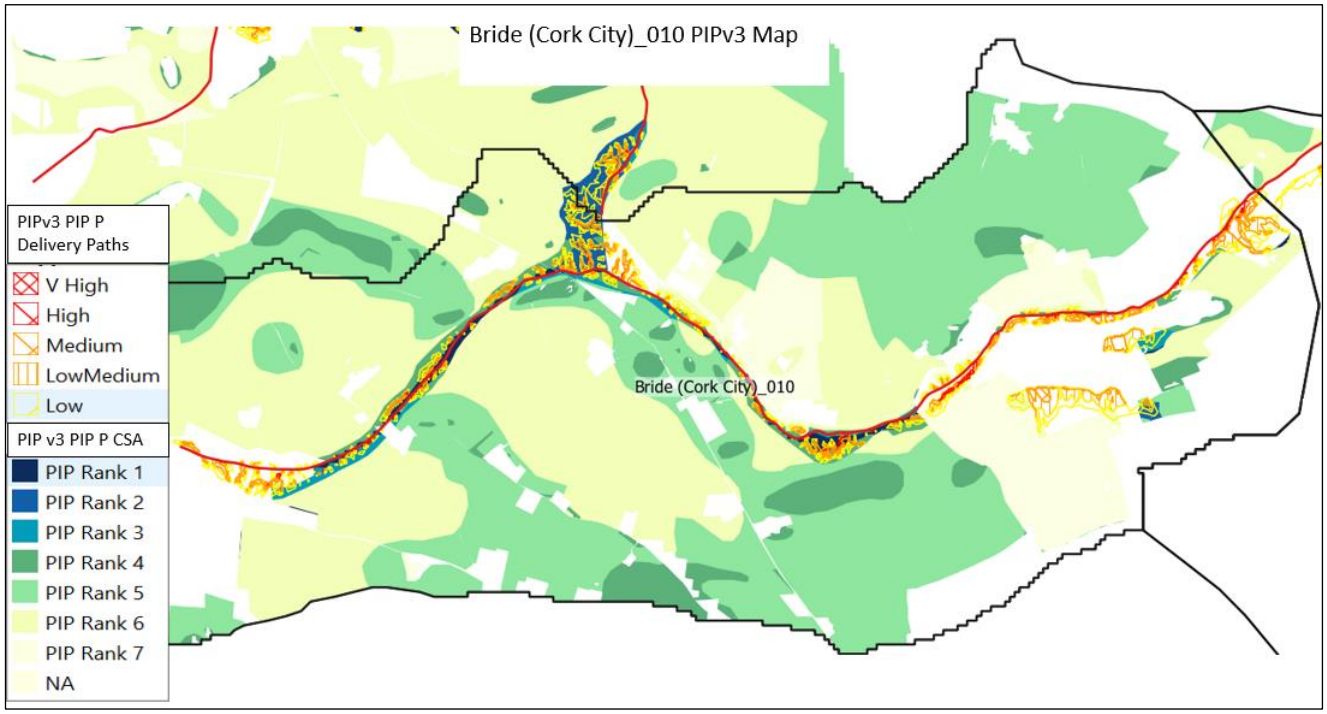
Appendix IV: Groundwater Vulnerability Map



Appendix V: Aquifer Map

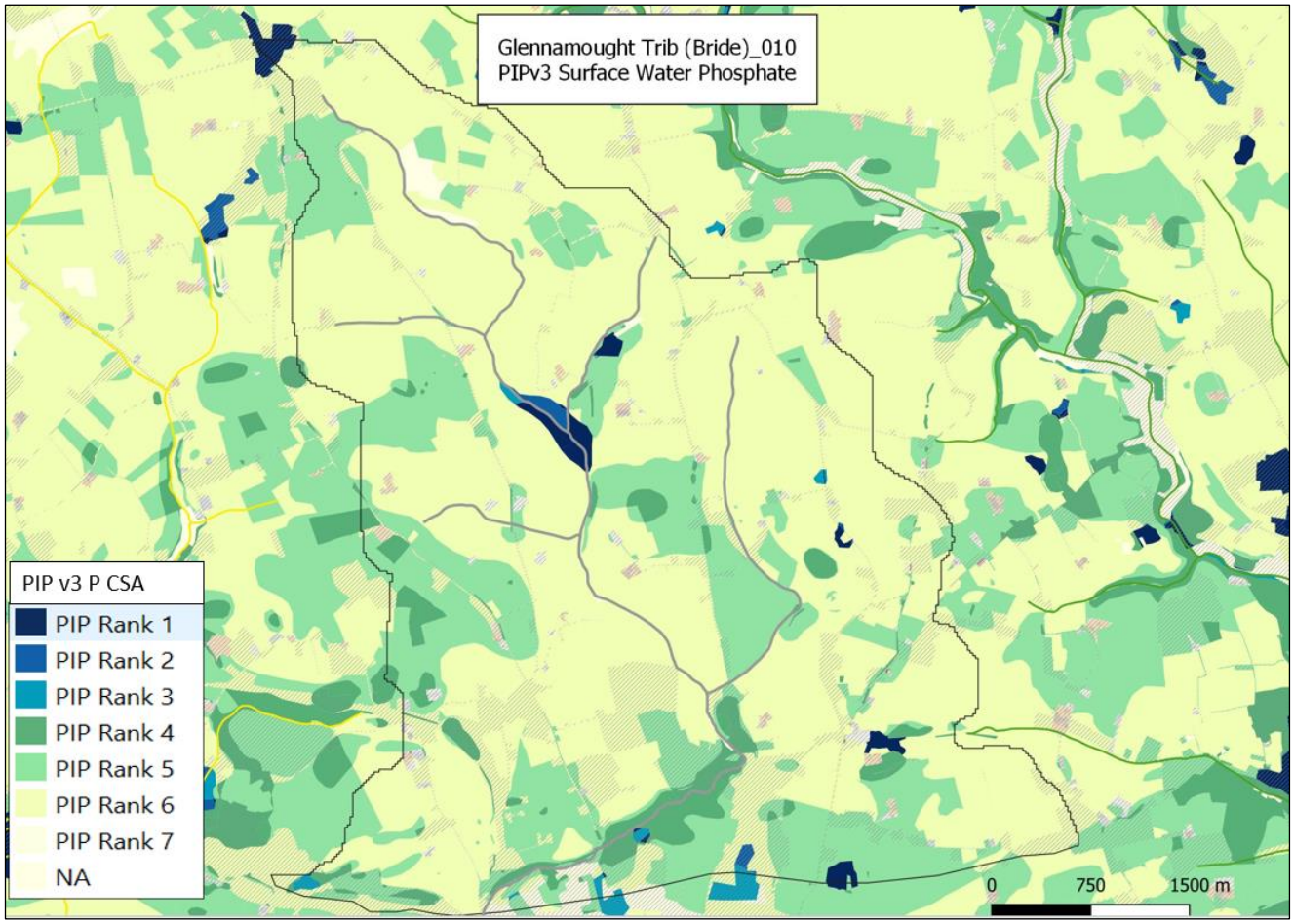


Appendix VI Phosphorus pollution impact potential (Bride (Cork City)_010)



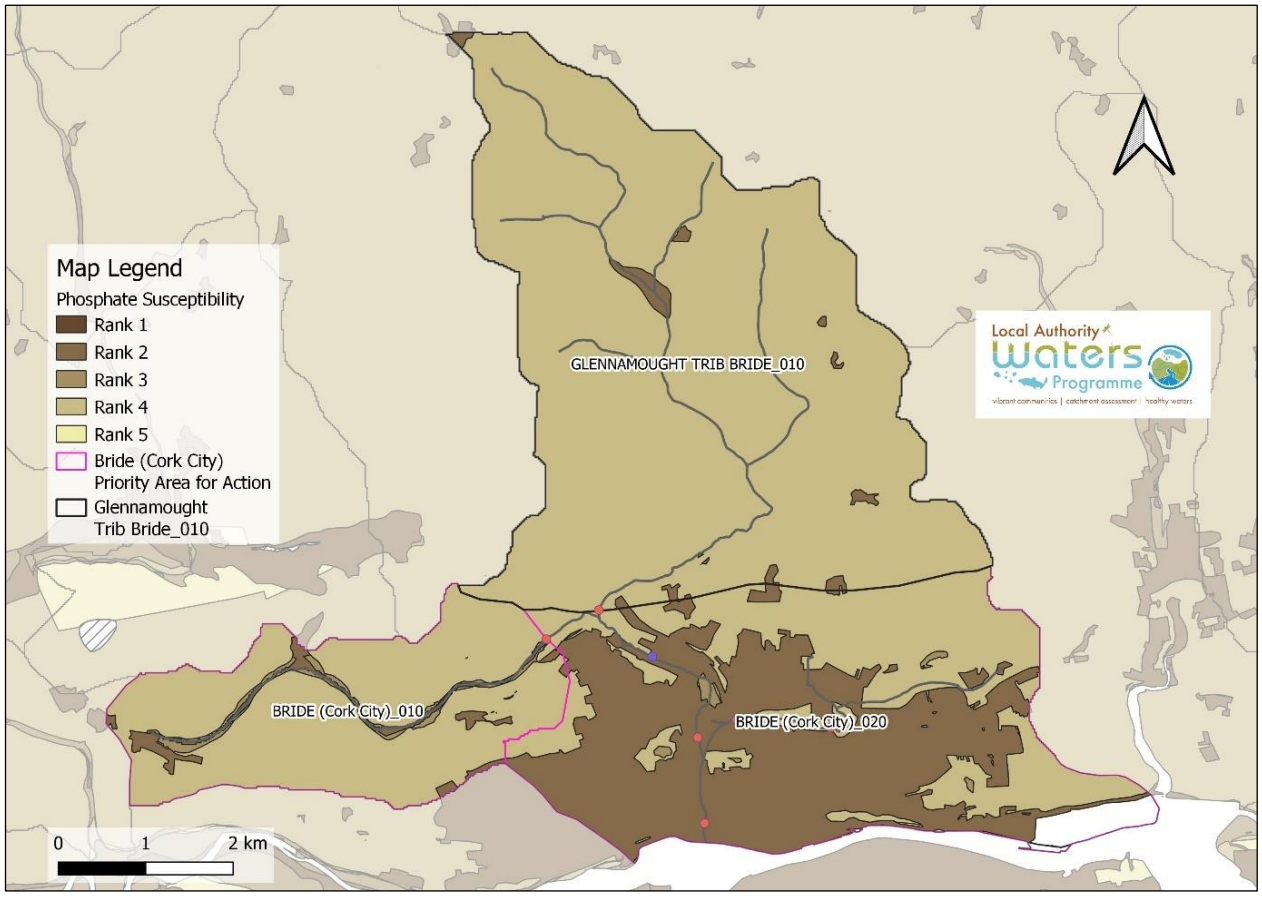
Source: EPA

Appendix VII Phosphorus pollution impact potential (Glennamought Trib (Bride)_010)

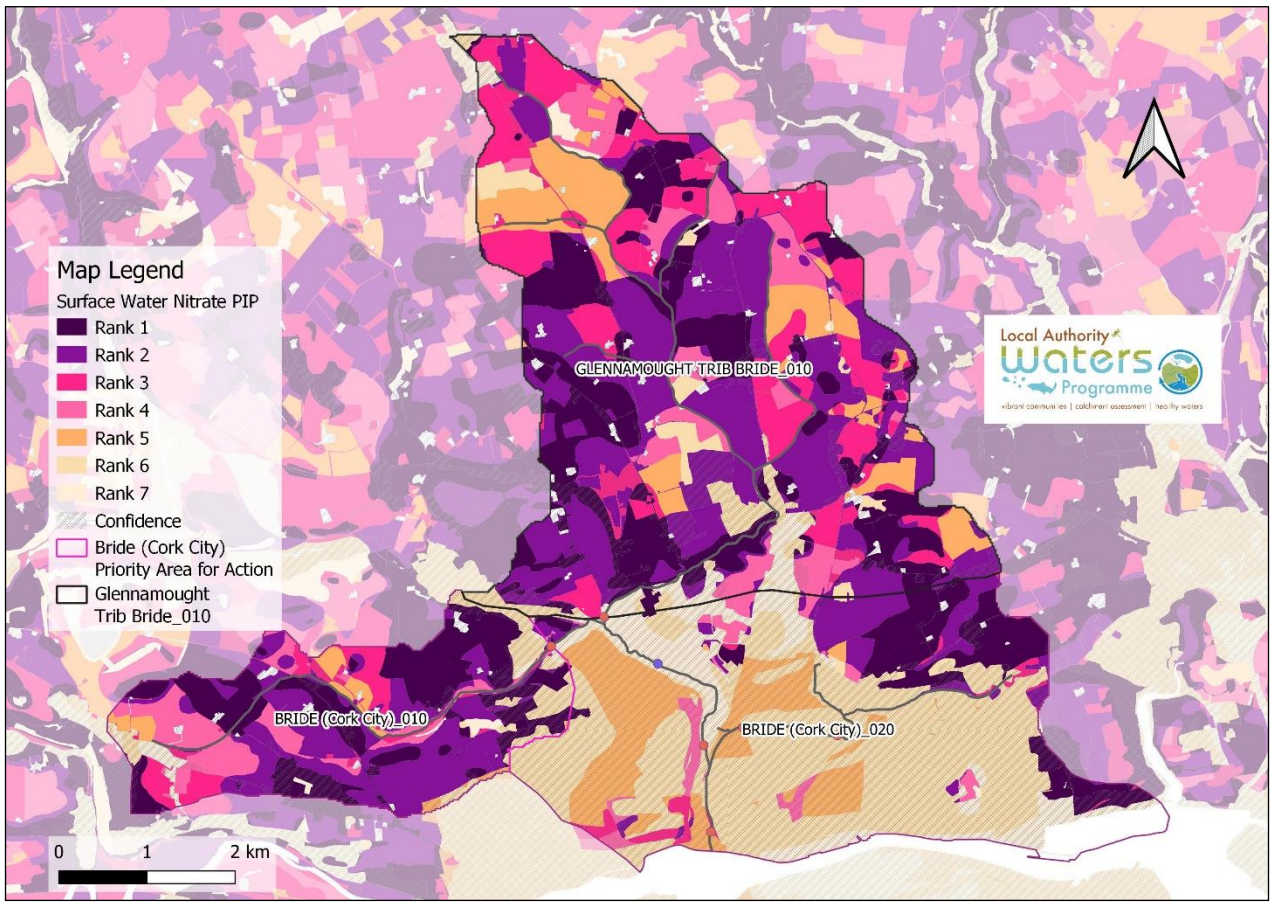


Source: EPA

Appendix VIII: Phosphate Susceptibility Map



Appendix IX: Nitrate PIP Map



Appendix X: Assessment of nitrogen contribution from Bride (Cork City) river system to Lee (Cork) Estuary Upper

From EPA Catchments Unit June 2021 report '*Assessment of the catchments that need reductions in nitrogen concentrations to achieve water quality objectives':* in the Lee catchment in 2019, a reduction of **183** tonnes of nitrogen would be required for the receiving coastal waters to meet the dissolved inorganic nitrogen (DIN) limit of 2.6mg/l.

There are no WFD monitoring data available for the Bride (Cork City) PAA for 2019 but the local authority undertook chemistry monitoring between 2021 and 2017 on the three waterbodies within the subcatchment. Average data between 2015 and 2017 was used here to estimate nitrogen load from the Bride system as follows:

- OPW flow data was obtained for station 19058 Blackpool Retail Park (waterlevel.ie).
- Flow results for each chemistry monitoring station were obtained by adjusting the data from station 19058 for contributing catchment area.
- Individual loading estimates were obtained by multiplying concentration by flow estimate for each sampling event. This is a rough approximation which doesn't take into account variation in flow or concentration over the day but rather assumes that the result is representative of a 24 hour mean.
- Daily averages were obtained from these estimates and results converted to tonnes per annum.

Estimated annual TN loadings for each station are illustrated in figure i and table i.

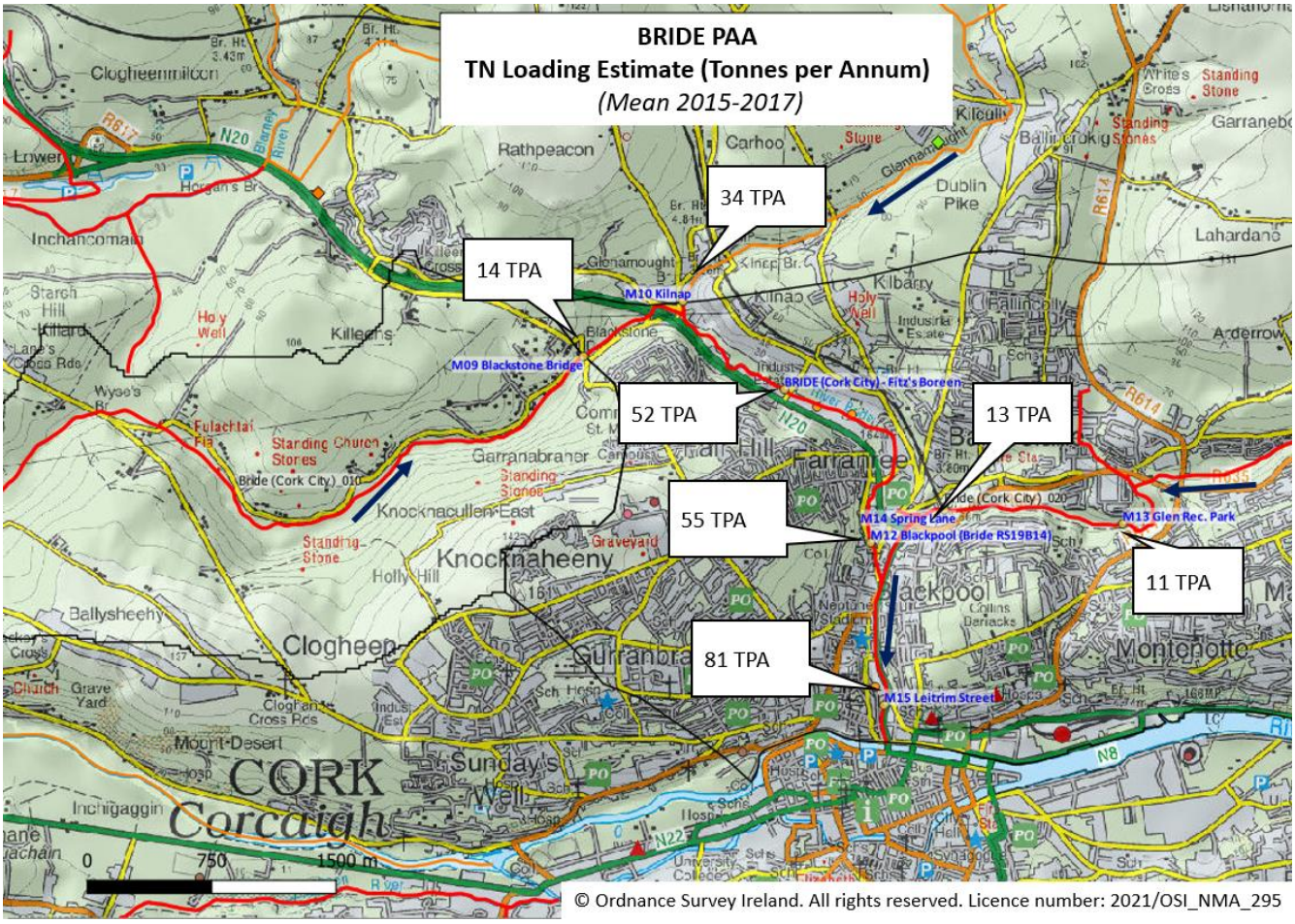


Figure i: Total nitrogen loading estimates, sample locations in SC_19_1_Kiln_SC_01 (Bride River System)

Table i: Total nitrogen loading estimates at each waterbody outlet (Bride River System)

River Waterbody	Monitoring Location (waterbody outlet)	Average TN 2015-2017 (mg/l)	Average Load (kg/d))	Total Nitrogen Load (tonnes/annum)
Bride (Cork City)_010	M09 Blackstone Bridge	3.46	37	14
Glennamought Trib (Bride)_010	M09 Kilnap	3.65	92	34
Bride (Cork City)_020	M15 Leitrim Street	4.1	222	81

Nitrogen from urban sources:

From the table, the **minimum** nitrogen loading associated with urban diffuse pressures at the outlet of Bride (Cork City)_020 = **33** tonnes per annum* (assuming that there hasn't been an significant change in nitrate concentration since 2017). Given that the significant pressures associated with nitrogen losses in an urban setting are most likely point sources such as misconnections/stormwater overflows etc, it should be possible to achieve a significant reduction in N loss in this setting if significant pressures can be identified and addressed.

Nitrogen from agricultural sources:

Land use in two of the three sub-basins in subcatchment 19_1_Kiln_SC_01 is mainly under agriculture (Bride (Cork City)_010 and Glennamought Trib (Bride)_010). Both sub-basins have significant areas at high risk for nitrate loss (PIP rank 1 to 3). The N reduction required to meet a concentration limit of 2.6mg/l total nitrogen was calculated from average TN results at the outlet of both waterbodies (2015-2017). Results are summarised in table ii.

Table ii: Required N reduction per hectare

River waterbody	Total N load (TPA)	Required load reduction to bring N concn under 2.6mg/l (TPA)	Area under N PIP Rank 1-3 (Ha)	Required load reduction per hectare per year, assuming all N is from agricultural sources (Tonnes)
Bride (Cork City)_010	14	3.5	600	0.010
Glennamought Trib (Bride)_010	34	9.4	1200 (approx.)	0.008

As the table shows, assuming that the entire N contribution to Glennamought Trib (Bride)_010 and Bride (Cork City)_010 is from agricultural sources (which is unlikely given that there are believed to be diffuse urban pressures in both waterbodies), the required N reduction is less than 10 grammes per hectare per year (<55mg per hectare per day).

Local catchment assessments in the Bride (Cork City) PAA will focus on identifying and assessing impact from urban pressures. Quantifying N losses from these sources will help to refine estimates of agricultural N contributions in the subcatchment. If agricultural N contributions are deemed to be significant, they will be addressed via the referrals process, focussing on source and mobilisation control measures in critical source areas (see nitrate PIP map Appendix IX).

Note: this figure was obtained by subtracting Bride (Cork City)_010 and Glennamought Trib (Bride)_010 TN contribution from the total TN load at M15 Leitrim street on the basis that the additional loading arising in Bride (Cork City)_020 must be from urban sources. The actual urban contribution is likely to be higher than 33 tpa because urban pressures are also identified as potential significant pressures in Bride (Cork City)_010 and Glennamought Trib (Bride)_010.*