Water Framework Directive Compliance Report – 2025



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Front cover: The Grand Canal, at Ticknevin Bridge (near GCW4), in May 2025.

Back cover: Moored barges seen from under Granard Bridge (RCE22) in May 2025.

Executive Summary

1. In 2025, surveillance monitoring was conducted at 43 sites on the Grand & Royal Canals and the Shannon-Erne Waterway, at two sites on Grand Canal Basin and at five designated feeders/drains that discharge to the canals. This is the second year of a three-year WFD reporting cycle for the period 2024 to 2026.

2. Physico-chemical sampling was conducted quarterly (in February/March, May, August and October 2025) at all 50 WFD surveillance monitoring sites. Macrophyte sampling, to include invasive plant species, was conducted at the 41 canal monitoring sites (excluding the feeders/drains, Grand Canal Basin and the Shannon-Erne Waterway) between July and August 2025. Macroinvertebrate sampling, to include invasive macroinvertebrate species, was conducted at 14 of the 41 canal monitoring sites. A total of 13 were sampled in 2024 and the remaining 14 sites will be sampled 2026, in compliance with the WFD monitoring schedule for macroinvertebrate sampling in the canals.

3. Sixteen of the 43 WFD monitoring sites on the canals and Shannon-Erne Waterway reported Good indicative eco-potential on all four sampling occasions in 2025. This compared with 20 in 2024, 22 in 2023, just 10 in 2022 and 23 in 2021. One site at Leitrim Village (SE40) was recorded at Moderate eco-potential in all four quarters. This is the first time that any site has been downgraded to Moderate in all four quarterly samples from 2018 to 2025, inclusive. Of the 172 sets of samples analysed at monitoring sites in 2025 (i.e., 43 sites over four quarters), 132 were assigned Good eco-potential, compared with 133 in 2024, 142 in 2023, 128 in 2022 and 138 in 2021.

4. In 2025, the physico-chemical determinand that was breached most often was BOD, with its threshold limit of 2.5mg/l O_2 being exceeded on 35 occasions during the four quarters. This compared with twenty-three breaches of this parameter in 2024, ten in 2023, ten in 2022 and nine in 2021. The next most breached determinand in 2025 was Ammonia, whose threshold limit of 0.12mg/l N was equalled or breached at monitoring sites on eleven sampling occasions. The Ammonia threshold limit was equalled or breached on 8 occasions in 2024, 16 occasions in 2023, and on 30 occasions in 2022.

5. When the physico-chemical results for the 43 canal and Shannon-Erne Waterway monitoring sites for 2025 were assessed, 31 sites were assigned Good indicative eco-potential (results for Q1 to Q4 combined). This compared with 35 in 2024, 41 in 2023, 38 in 2022 and 36 in 2021. There were no sites with an overall moderate rating on the Grand Canal East, Milltown Feeder, Naas Line or Barrow Line in 2025. The sites with a combined Moderate eco-potential for this year were recorded on the Royal Canal East (5 out of 10 sites), Royal canal West (2 out of 6 sites) and the Shannon-Erne Waterway (2 out of 2 sites).

6. In 2023 and 2024, 14 of the 15 canal and Shannon-Erne Waterway AWBs were assigned Good indicative eco-potential based on the combined results from physico-chemical sampling between

Q1 and Q4, with only SE_26A (the two Shannon-Erne Waterway sites) being assigned Moderate eco-potential in both years. The Shannon-Erne was again downgraded to Moderate in 2025, along with RC_07 and RC_26E. Each of the three AWB's were downgraded because of widespread and persistent breaches in the BOD parameter threshold.

7. Periodically high counts for *E. coli* and *Enterococci* have been reported by WI at Sallins (GCE4) and Hazelhatch (GCE8) in 2025 indicating that faecal-contaminated water is periodically gaining access to these sections of canal, possibly reflecting the proliferating number of permanently moored craft along these canal sections. It must be stated, however, that no evidence of contamination from moored craft at these sites was witnessed during water or biological sampling by INVAS personnel in recent years.

8. Results from bacteriological sampling conducted (INVAS and Waterways Ireland (WI)) on the Naas Line in 2025 indicate that faecal-contaminated water, probably *via* the Rathasker feeder stream, is being discharged into Naas Harbour. Kildare County Council (KCC) has previously conducted surveys to inspect and restrict any potential source(s) of contamination into the Naas line.

9. Results from water sampling conducted by INVAS and WI indicate that contaminant material is, at least occasionally, gaining access to the Royal Canal at Castleknock (RCE22) and there is a need for further investigation to identify the possible source(s) of this contamination. It was noted during sampling that the number of permanently moored craft at this site has significantly increased during 2025 and it is possible that this increased boat load may be a contributor to the unsatisfactory water quality results recorded.

10. For the forty water quality samples taken in 2025 at all 10 RCE sites, excessive BOD values were recorded on eleven occasions across Q1 (2), Q2 (6) and Q3 (3), while elevated values of 2.0 mg/L O_2 were recorded sixteen times. The most significant breaches of the threshold limit (>5.00 mg/L O_2) were all recorded in Q2 at RCE9 (Moy Valley)(8.00 mg/L O_2), RCE12 (9.00 mg/L O_2), RCE19 (5.00 mg/L O_2) and RCE25 (Croke Park)(5.00 mg/L O_2). There were no breaches in BOD on the Royal Canal East in Q4 2025. The reason for these breaches along the Royal Canal East is uncertain but is likely to be linked to the exceptionally low water levels experienced in Lough Owel and throughout the Royal Canal East following unprecedented dry periods in Spring and Summer 2025. The low water experienced on the Royal Canal East was also supplemented from the River Boyne in 2025 to maintain sufficient levels for navigation. In the event that further abstraction is required for the Royal Canal East in 2026 the source rivers should be closely monitored to ensure the quality of the water being used.

11. Results from physico-chemical analysis conducted by INVAS and WI in 2025 at both sites on the Shannon-Erne Waterway indicate that highly deleterious matter, containing sewage, continues to be discharged. The site at SE40 was downgraded to Moderate in all four quarters, the first time this has occurred at a single designated WFD monitoring site in seven years. WI must

continue to work with Leitrim County Council in order to identify and elimenate the source(s) of effluent to this important amenity watercourse.

12. The Ballymullen and Ballylennon feeders continued to discharge poor quality water into the main line of the Grand Canal, west of Daingean in 2025. While the results for some of the physico-chemical parameters such as TON and Nitrate were low and well within acceptable limits in 2025, breaches occurred for five of the six determinands throughout the year across the two streams. The BOD threshold was breached in each of the four quarters for the Ballylennon feeder in 2025, leading to the ninth consecutive Moderate status for the site. In 2025, WI and Offaly County Council staff met with landowners at the sources of these feeder streams in an effort to establish water protection measures and identify sources of nutrient input. This trilateral relationship must strive to improve the quality of water entering the Grand Canal through riparian protection of the drains and the identification of possible sources of pollution.

13. The quality of water being discharged to the canals *via* the Monread and Kilcock Harbour drains was unsatisfactory in 2025 and indicated that deleterious matter, occasionally containing sewage contamination, is continuing to be discharged into these waterways through these drains. Local Authorities must continue to work to identify the sources of this pollution and to take urgent action to eliminate it.

14. A healthy and diverse macrophyte flora continued to occupy the WFD monitoring sites on both the Grand and Royal Canals in 2025. The macrophyte species that were most widespread at monitoring sites on the canals during sampling this year were *Glyceria maxima* (Reed Sweet-grass*), Iris pseudacorus* (Yellow Iris), *Alisma plantago-aquatica* (Water-plantain) *Phalaris arundinacea* (Reed Canary-grass) and *Elodea nuttallii* (Nuttall's Pondweed), present at 39, 38, 37, 34 and 34 of the 41 monitoring sites, respectively. The most uncommon species recorded across the WFD monitoring sites in 2025, each recorded at just a single site, were *Carex paniculata* (Greater Tussock-sedge), *P. crispus* (Curled Pondweed), *P. obtusifolius* (Blunt-leaved Pondweed) and the rare charophyte *Tolypella intricata* (listed as *Chara* sp. in Table 3.3).

15. Extensive plumes of filamentous green algae were the dominant vegetative feature in the Athy section of the Barrow Canal (BL15) in 2025, as was the case during sampling in 2023 and 2024. This reflects the continued poor quality of the water being discharged to this section of canal *via* the Athy drain (BL15.1). This slimy and tangled vegetation densely carpeted any aquatic macrophyte species present. A fish kill near the point of discharge for BL15.1 was reported on the 24th of December 2025 and is currently under investigation with IFI, Kildare County Council and WI.

16. It continues to be those aquatic macrophytes that possess long, streamlined and submerged or floating leaves that pose most problems for canal navigation and for canal maintenance crews in the Grand and Royal Canals, and this was again the case in 2025. The principal species involved are *Sagittaria sagittifolia* (Arrowhead) – most prolific in GCE and Barrow Line sites*, Schoenoplectus lacustris* (Common Club-rush) – very abundant at sites in GCW, the Barrow Line

and Milltown Feeder, and *Sparganium emersum* (Unbranched Bur-reed) – which achieves its best vegetative expression at RCE sites. The problems these plants pose reflects the difficulty experienced while trying to achieve a deep cut on this vegetation, regardless of the types of weed cutting machinery employed. Even where the vegetation grows abundantly and occupies much of the water column, it is difficult for the blades on the cutting craft to gain purchase on the leaves, as their streamlined form helps them sink close to the canal bed and out of the reach of the blades. As a consequence, these troublesome species continue to proliferate in the canals.

17. As in 2024, all 41 WFD monitoring sites on the canals and all 14 AWBs were assigned Maximum ecological potential based on the macrophyte quality element in 2025.

18. Thirty-three aquatic macroinvertebrate families that are used to assess eco-potential were recorded from the 14 monitoring sites in 2025. Numbers of taxa ranged from 21 at GCE10 to 7 at NL1, with an average of 13 taxa across the sites. This is slightly lower than that recorded in 2022, the differences being within the range expected where sampling effort and exact location may differ, where habitats may shift or alter over time, and the rarer species may be missed or detected at random. The Mollusca (snails and mussels), followed by Coleoptera (beetles) and Hemiptera (bugs), had the highest number of families, followed by crustaceans, caddisflies, mayflies, trueflies, damselflies/dragonflies, alderflies, spiders, mites, moths and leeches. This is consistent with the samples from these same sites taken in 2022. In terms of numbers of individuals, Lymnaeidae (snails), Asellidae (crustaceans) and Coenagriidae (damselflies) were generally the most abundant

19. Of the 14 monitoring sites on the Grand Canal and Royal Canal examined in 2025, four were at Maximum, four were at Good, two were at Moderate and four were at Poor eco-potential, based on results from macroinvertebrate sampling in spring. No site was at Bad eco-potential in 2025.

20. A cluster of Moderate and Poor macroinvertebrate eco-potential results occurred from GCE8 to GCE4, including NL1. There is little evidence to suggest that water quality issues or hydromorphological alterations are driving the decline in this section of the Grand Canal East, suggesting that this group of sites that are all immediately hydrologically linked and within the same geographic area may be experiencing an element of disruption that is not yet evident. Two of these four sites a subjected to significant numbers of permanently moored barges resulting in disturbance, shading and possible periodic nutrient inputs. It is likely that a number of contributory factors including plant species composition (especially invasive species), shading and boating activities with associated wave action, as well as other unforeseen issues have impacted aquatic invertebrate communities in these areas.

21. Only one listed invasive aquatic plant species (*Crassula helmsii* – New Zealand Pigmyweed) and no listed invasive macroinvertebrate species were recorded during sampling at the 14 WFD monitoring sites on the canals in 2025.

22. *Crassula helmsii* was recorded at the same seven WFD monitoring sites since 2021. (It is encouraging that no further spread among these sites has been identified.) It was the dominant macrophyte at MF1 on the Milltown Feeder since 2023 and produced large vegetative cushions over much of the riverbed, both in and adjacent to the monitoring site. The channel was dredged by WI in July and again in October 2024 to remove as much of the invasive weed as possible. Sampling in 2025 revealed small numbers of individual plants present but no obvious vegetation stands. It will be important to closely monitor this channel for regrowth of *C. helmsii* in 2026 and to take immediate action if any regrowth is recorded.

23. Twenty-two of the 41 WFD surveillance monitoring sites on the canals were assigned Good ecological potential when physico-chemical, macrophyte, macroinvertebrate (13 sites in 2024 and 14 sites in 2025), invasive species and hydromorphological quality elements were assessed. This compared with 32 sites that were at Good eco-potential in 2024, 33 in 2023 and 33 in 2022. No sites were at Bad eco-potential following assessment in 2025.

24. Out of 14, three AWBs including the Shannon-Erne Waterway (RC_07, RC26E & SE_26A) were assigned Moderate eco-potential based on physico-chemistry analysis. One further AWB (GC_09) was assigned Moderate status and one AWB (GCNL_09) was assigned Poor status based on the macroinvertebrate quality element alone.

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1. INTRODUCTION

Water Framework Directive (WFD) surveillance monitoring at designated sites on the Royal and Grand Canals, the canalised section of the Shannon-Erne Waterway, the Grand Canal Basin in Dublin city and five designated feeders/drains to the canals was carried out by INVAS Biosecurity Ltd. in 2025.

A canal is identified as an Artificial Water Body (AWB) in the WFD and is defined as a body of water created by human activity. In recognition of their navigational role, canal AWBs must achieve good ecological potential as opposed to good ecological status, the latter which applies to natural water bodies, such as rivers and lakes. Ecological potential is assessed using a combination of biological (native and invasive macrophytes and macroinvertebrates), physico-chemical and hydromorphological quality elements. For classification purposes, the ecological potential of a site or water body can be Maximum, Good, Moderate, Poor or Bad. Where physico-chemistry alone is being assessed, sites and AWBs can only achieve either Good or Moderate indicative eco-potential. In assigning ecological potential, the one-out-all-out rule applies, whereby the lowest value quality element determines the overall classification of the water body. A system for classifying British and Irish canals based on macrophyte, macroinvertebrate, invasive species, physico-chemical, and hydromorphological quality elements is used to assess the ecological potential of AWBs (Willby 2012).

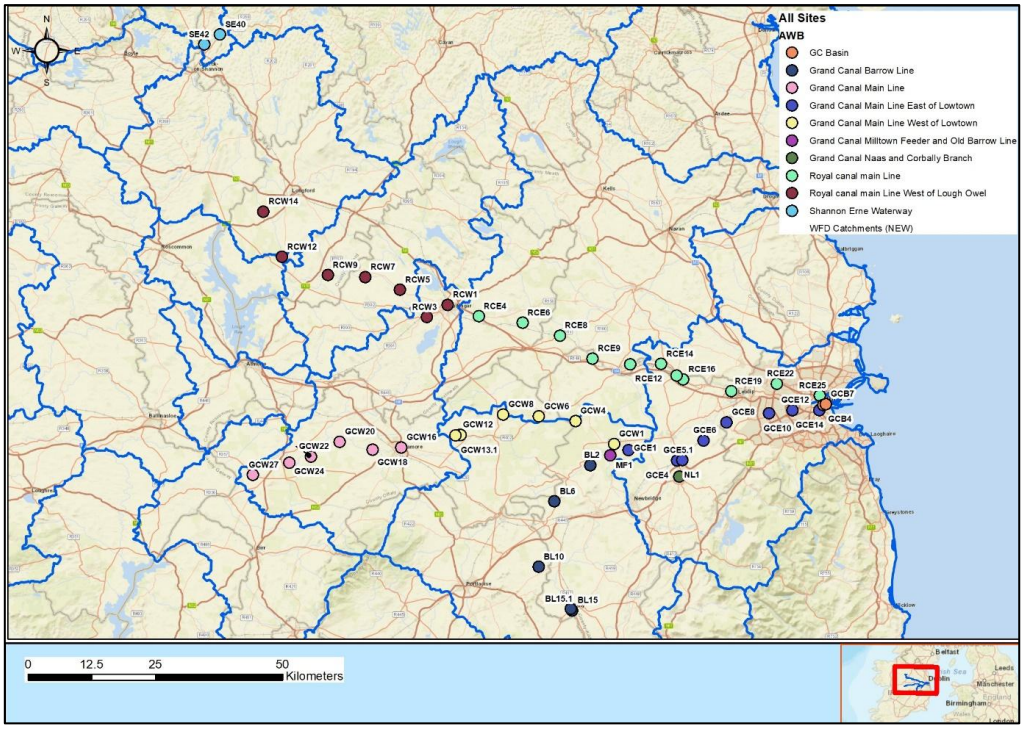


Figure 1.1 Artificial Water Bodies (AWBs), individual canal sites and feeder/drain sites on the Royal and Grand Canals, and the Shannon-Erne Waterway. The AWBs are grouped based on locations within river catchments.

The canals are currently divided into 15 AWBs based on their locations within river catchments (Table 1.1). The Grand Canal supports eight AWBs (this does not include the Grand Canal Basin), the Royal Canal has six AWBs and there is just a single AWB on the Shannon-Erne Waterway. Four of the AWBs have only a single canal monitoring site (Table 1.1), which can be potentially problematic when ecological potential for individual AWBs is being assigned. This reflects the fact that a breach in the threshold level for any determinand parameter can result in the AWB being assigned Moderate rather than Good eco-potential.

For reporting purposes, a simple code has been assigned whereby artificial water bodies (AWB) are labelled according to the river catchment in which they occur (Table 1.1).

Table 1.1 Artificial Water Bodies (AWBs) that are included in the 2023 WFD Canals Surveillance Monitoring Programme. (The Grand Canal Basin is not a designated AWB for the purposes of WFD surveillance monitoring.)

Artificial Water Body (AWB)	Catchment No	New ID Code	New Report Code	Length (km)	No of Sites
GRAND CANAL					
Grand Canal Main Line - Liffey and Dublin Bay	9	IE_09_AWB_GCMLE	GC_09	41.4	6
Grand Canal Main Line East - Barrow	14	IE_14_AWB_GCMLE	GC_14E	15.7	2
Grand Canal Main Line West - Barrow	14	IE_14_AWB_GCMLW	GC_14W	12.9	2
Grand Canal Main Line - Boyne	7	IE_07_AWB_GCMLW	GC_07	14.5	2
Grand Canal Main Line - Lower Shannon	25A	IE_25A_AWB_GCMLW	GC_25A	47.0	6
Grand Canal Naas Line - Liffey and Dublin Bay	9	IE_09_AWB_GCNL	GCNL_09	11.9	1
Grand Canal Milltown Feeder - Barrow	14	IE_14_AWB_GCMF	GCMF_14	10.5	1
Grand Canal Barrow Line - Barrow	14	IE_14_AWB_GCBL	GCBL_14	50.8	4
Grand Canal Basin - Liffey and Dublin Bay	9	IE_09_AWB_GCB	GCB		2
ROYAL CANAL					
Royal Canal Main Line - Boyne Catchment	7	IE_07_AWB_RCMLE	RC_07	42.6	5
Royal Canal Main Line - Liffey and Dublin Bay	9	IE_09_AWB_RCMLE	RC_09	39.4	5
Royal Canal Main Line - Lower Shannon	25A	IE_25A_AWB_RCMLW	RC_25A	13.3	2
Royal Canal Main Line - Upper Shannon	26F	IE_26F_AWB_RCMLW	RC_26F	33.8	3
Royal Canal Main Line - Upper Shannon	26E	IE_26E_AWB_RCMLW	RC_26E	3.7	1
Royal Canal Main Line - Upper Shannon	26C	IE_26C_AWB_RCMLW	RC_26C	14.2	1
SHANNON ERNE WATERWAY					
Shannon Erne Waterway - Upper Shannon	26A	IE_26A_AWB_SEW	SE_26A	25.5	2

Because of the density of permanently moored craft at the Sallins (GCE4) monitoring site in 2023 and the attendant difficulty of obtaining water, macrophyte and macroinvertebrate samples from an open stretch of canal, it was necessary to move this monitoring site some 600m west, to a location close to Soldier's Island.

The overall sampling schedule for the quality elements is presented in Table 1.2. In the current report, AWBs are classified using the physico-chemistry, macrophyte, macroinvertebrate and invasive species quality elements that were sampled at the 41 canal monitoring sites in 2025. As the frequency for macroinvertebrate sampling, including invasive macroinvertebrates, is every three years, it was decided to sample 13 of the 41 canal sites in 2024, 14 in 2025 and 14 in 2026 for this quality element. The results for the 14 sites assessed for macroinvertebrates in 2025 and 13 sites assessed in 2024 are presented in Section 4.

Table 1.2 WFD monitoring schedule for the quality elements used to derive ecological potential for the Royal and Grand Canals, Shannon-Erne Waterway, Grand Canal Basin and designated feeders/drains.

Quality Element	Frequency	Seasonality
Physico-chemical	1 Year	Quarterly
Macrophytes	1 Year	Summer
Macroinvertebrates	3 Year	Spring
Invasive macrophytes	1 Year	Summer
Invasive macroinvertebrates	3 Year	Spring
Hydromorphology	6 Year	Spring-Summer



Plate 1.1. WFD monitoring site at Louisa Bridge (RCW12) on the Royal Canal in October 2025.

2. Physico-chemical Monitoring

2.1. Introduction and Sample Locations

Physico-chemical sampling is conducted annually during four quarters - in February/March, May, August and October. As part of this sampling programme, a total of 50 WFD sites are monitored for a wide range of physico-chemical parameters. These sites include 41 on the Grand (24) and Royal (17) Canals, in addition to five on canal feeder streams or drains (see Figure 1.1), two on the Shannon-Erne Waterway and two in the Grand Canal Basin, Dublin (Figure 2.1). The feeders/drains have been a source of elevated nutrient and coliform inputs to the canals in the past. They include the Monread drain (GCE5.1), the Ballymullen (GCW12.1) and Ballylennon (GCW13.1) feeders on the Grand Canal, the Athy drain (BL15.1) on the Barrow Line, and Kilcock Harbour drain (RCE16.1) on the Royal Canal.

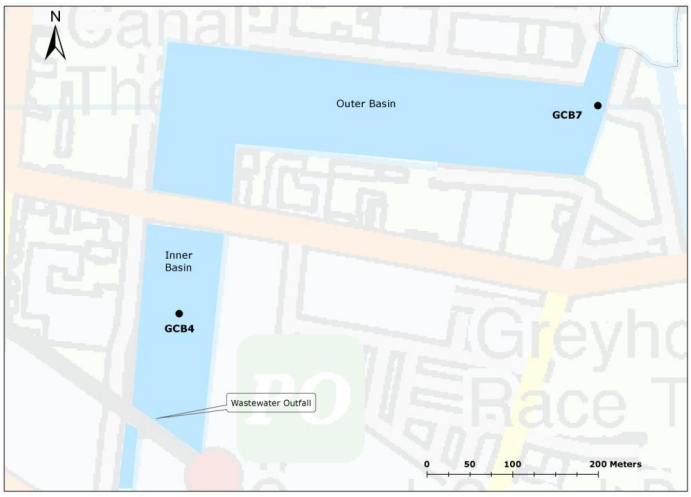


Figure 2.1 Grand Canal Basin (Dublin) showing the two WFD surveillance monitoring sites sampled by INVAS in 2025.

In addition to the quarterly water samples taken by INVAS at two sites in the Grand Canal Basin (GCB4 – inner and GCB7 - outer), as part of the annual WFD Canals Surveillance Monitoring Programme, Waterways Ireland (WI) and Dublin City Council (DCC) have, in recent years, conducted regular bacteriological sampling for *E. coli* and *Enterococci* at up to 11 sites in the basin (three in the inner, eight in the outer) and two in the adjacent Grand Canal (Figure 2.2). Results from this sampling programme have been supplied to INVAS throughout 2025.

Since 2023, WI have regularly taken water samples for bacteriological analysis (*E. coli* and *Enterococci*) at a number of 'recreational and hotspot' sites on the canals and Shannon-Erne Waterway, at Leitrim marina. A small number of these sites roughly correspond with sites monitored as part of the WFD Canals Surveillance Monitoring Programme, including Leitrim marina (SE42), GCE4 (Sallins), GCE8 (Hazelhatch), GCE14 (Baggot Street), RCE12 (Castleknock) and RCE16.1 (Kilcock Harbour drain). Relevant results received from WI for 2025 are commented on in this report.

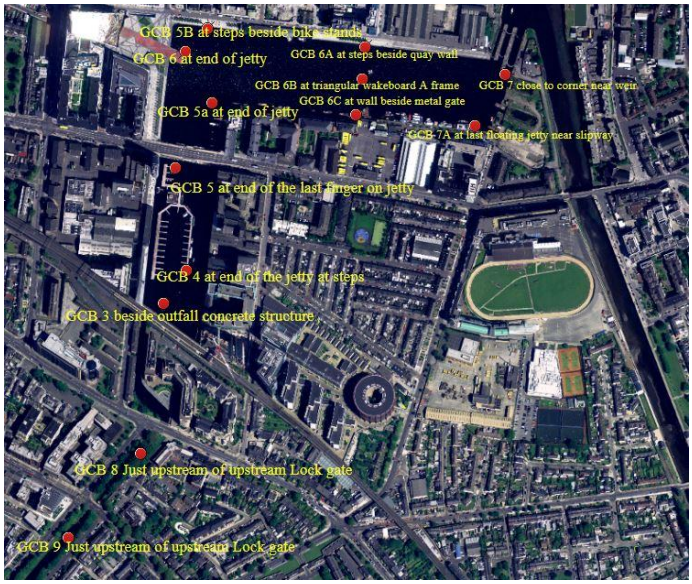


Figure 2.2 Grand Canal Basin (Dublin) showing the 13 sites from which samples have traditionally been taken by Waterways Ireland and Dublin City Council for bacteriological analysis.

Since early summer 2023 to Q3 2025, the water level at the Croke Park monitoring site (RCE25) has been artificially lowered and access to the canal has been blocked, to facilitate Greenway construction activities. It was, therefore, necessary to take water samples at the nearest accessible upstream site, which has been at Binn's Bridge, Drumcondra, in Q1 to Q3 2025. Sampling resumed at the Croke Park site when access to the area was reopened and water levels were returned to normal at RCE25.

2.2. Materials and Methods

Water sampling involves the field deployment of a YSI water logger at each site to measure water temperature, conductivity, pH and dissolved oxygen (% and mg/l O_2). Water samples are collected and returned to the Independent Analytical Supplies (IAS) laboratory in Bagenalstown, Co Carlow for analysis of a range of parameters that includes Total Phosphorus (TP), Molybdate Reactive Phosphorus (MRP), Soluble Reactive Phosphorus (SRP), Total Oxidised Nitrogen (TON), Total coliform, *E. coli*, Biological Oxygen Demand (BOD), Ammonia, Nitrite, Nitrate and Alkalinity. Six of these parameters have been selected as determinands to assess indicative ecological potential. These are Total Phosphorus, Soluble Reactive Phosphorus, Total Oxidised Nitrogen, Ammonia, Biological Oxygen Demand and *E. coli* (count per 100ml) (Table 2.1). Chlorophyll monitoring was discontinued in 2021.

Values in red in the results tables and in Appendices I to VII indicate breaches in the threshold limits for any of the six physico-chemical determinands.

Table 2.1 Physico-chemical determinands measured as part of the WFD monitoring programme in 2025. (Chlorophyll monitoring was discontinued in Q1 2021.)

Determinand	Limit	Determinand	Limit
Total Phosphorus (TP) (mg/l P)*	0.063 mg/l P	Dissolved Oxygen (DO) (mg/l and % saturation)	>5.0 mg/l O_2
Molybdate Reactive Phosphorus (MRP) (mg/l P)	0.025 mg/l P	pH	
Soluble Reactive Phosphorus (SRP) (mg/l P)*	0.025 mg/l P	Conductivity (µS)	
Total Oxidised Nitrogen (TON) (mg/l N)*	4.1 mg/l N	Alkalinity (meq/l)	
Nitrite (mg/l)		Chlorophyll (µg/l)	
Nitrate (mg/l)		Biological Oxygen Demand (B.O.D.) (mg/l O_2)*	<2.5 mg/l O_2
Ammonia (mg/l N)*	0.12 mg/l N	Total Coliforms (TC) (counts/100ml)	5000/100 ml
Temperature (°C)		Faecal Coliforms (counts/100ml)*	1000/100 ml

* Determinands used to assign ecological potential to the Artificial Water Bodies (AWBs)

2.3. Results

Four reports that present the results for the physico-chemistry and classification of indicative eco-potential for the 50 WFD monitoring sites on the Grand and Royal Canals, Grand Canal Basin, Shannon-Erne Waterway, and the designated feeders/drains in each quarter (February/March, May, August and October) in 2025 are presented individually in Appendices IV to VII.

2.3.1. Physico-chemistry at Surveillance Monitoring Sites on the Grand & Royal Canals and the Shannon-Erne Waterway

Water sampling was conducted on 26th February and 6th March, 21st and 28th May, 20th and 28th August and 23rd and 29th October 2025. Water temperatures over the sampling period varied from 7.0°C recorded at RCE8 (Hill of Down) in February to 21.2°C recorded at both GCE10 (Clondalkin) and BL2 (East of Lock 22) in August 2025.

The water quality throughout the seven Grand Canal East sites (GCE1 to GCE14, see Figure 1.1) was excellent in 2025, despite the presence of a significant numbers of moored craft at several sites including GCE8 (Hazelhatch) and GCE4 (Sallins). In Q1, slightly elevated values for Total P of between 0.02mg/L P and 0.04mg/L P were recorded at all seven sites, with further raised values seen sporadically throughout 2025 not exceeding 0.03mg/l P. In Q1, also, high values of 2.0mg/L O_2 were reported at GCE10, GCE12 (Blackhorse) and GCE14 (Baggot Street). In Q2, the only breach in a parameter threshold limit for 2025 at any of the seven Grand Canal East sampling sites occurred at GCE14 where a BOD value of 3.0mg/l O_2 was recorded. Elevated BOD readings of 2.0mg/L O_2 were also reported at this time for GCE1 (Robertstown), GCE4, GCE8, GCE10 and GCE12, but these were not repeated in Q3. In Q3, bacteriological results for *E. coli* were notably elevated at several sites including GCE4 (388), GCE8 (318), GCE12 (880) and GCE14 (285), but there were no reported breaches of the parameter threshold. Water Quality results provided by WI in early July displayed elevated levels of Total coliforms and *E. coli* at Sallins indicating that some faecal contamination may be occurring periodically in proximity to moored craft. In Q4, raised *E.coli* counts were again reported

at Hazelhatch (733) alongside the highest Ammonia value (0.090mg/L N) for all four quarters in the Grand Canal East.



Plate 2.1Water sample collection at the Georges Bridge (GCW6) WFD monitoring site in May 2025.

While the water quality results at most sites on Grand Canal West (GCW) there were a number of issues recorded during 2025. These issues primarily related to BOD across all four quarters, with unacceptably high values (>2.5mg/L O_2) recorded on nine occasions at seven sites (GCW12 West of Daingean (1), GCW4 – Lock 20 (1), GCW6 – George's Bridge (1), GCW16 – Tullamore (2), GCW18 – Ballycowan (2), GCW20 – Cornalaur (1) and GCW24 – Armstrong Bridge (1)) in 2025. Raised values of 2.0mg/L O_2 were also recorded on a further fourteen occasions at sites throughout Grand Canal West. Elevated values for Total P of 0.07 mg/L P were recorded at GCW12 (West of Daingean) in both Q3 and Q4. High Total P was also recorded at this site in both Q1 (0.07 mg/L P) and Q2 2024 (0.06mg/L P). The raised Total P levels appear to correspond to high levels of rainfall in the first half of 2024 and the second half of 2025. An excessively high BOD value of 5.0 mg/L O_2 was also recorded at this site in Q4 2025. The GCW12 results almost certainly reflect similar issues observed in the Ballymullen (GCW12.1) and Ballylennon (GCW13.1) feeder streams (see Section 2.3.5), that regularly discharge contaminated water into the main canal. Although *E. coli* counts were generally low across all sites, there were high Total coliform counts seen across several sites from Q2 to Q4 (see Appendices V to VII). In Q4 the classification standard for Ammonia was exceeded with values of 0.130 mg/L N recorded at both GCW16 and GCW24. A high TON value of 2.50 mg/L N was recorded at GCW20 in Q3 2025, but this returned to a low level of 1.00 mg/L N in Q4.

There were no breaches in any of the determinands at NL1 On the Naas Line, however the trend in persistently high TON and Nitrate was observed in each quarter apart from Q3 in 2025. In Q1 and Q4 slightly elevated Total P was recorded (both 0.03mg/L P), while bacteriological results showed high Total coliforms and *E. coli* values in Q3 and Q4. There was no return to the unexplained opaque appearance of the water at this site during the four sampling occasions in 2025, but it is apparent that some deleterious matter is entering the water near Naas Harbour. Kildare County Council (KCC) have carried out surveys in an effort to identify the source of these issues in the past and further

efforts may be required on point sources such as the Rathasker feeder stream if a return to more significant elevations in determinand values are recorded in the future.

Water quality in the Milltown Feeder (MF1) was generally good in 2025, however elevated TON was recorded in all four quarterly water samples. This may be as a result of dredging the invasive aquatic plant species New Zealand Pigmyweed (*Crassula helmsii*) in July 2024. For the first time since Q2 2019, the parameter limit was exceeded for a single determinand at this WFD monitoring site. High Ammonia levels of 0.120 mg/L N were recorded in Q4 2025. While the breach may be related to the natural decomposition of organic material, this site should be closely monitored in Q1 2026 to ensure this usually pristine water quality on this section of canal is maintained.

The levels of TP, MRP and SRP in samples analysed during 2025 at all four WFD monitoring sites on the Barrow Line were low and well within acceptable limits (see Appendices IV to VII). Elevated BOD values were recorded at all sites on the Barrow Line in Q2 with the parameter limit being breached at all sites except for Athy. There were elevated levels recorded for TON and Nitrate in Q1 and Q2 at BL10 (upstream of Vicarstown) and BL15 (Athy) (see Appendix I). In Q3 excessively high values were recorded for both TON (4.300 mg/L N) and Nitrate (4.290 mg/L N) at BL10. There were also high counts for Total coliforms recorded at all sites in Q3. A raised value for Ammonia was recorded at all Barrow Line sites in Q4, while the parameter limit was breached at Athy (0.120 mg/L N).



Plate 2.2. Water samples collected from the Grand Canal, Royal Canal and Shannon-Erne Waterway delivered to the laboratory for analysis in May 2025.

Relatively low values for MRP, SRP, TON, Nitrate, and *E. coli* were recorded at sites on RCE (Royal Canal East) during the four quarters of 2025. High Total coliform counts were recorded at several the RCE sites, with notably high results in Q2 at RCE8 (Hill of Down), RCE14 (Fern's Lock) and RCE22 (Castleknock) and in Q3 at RCE6 (Thomastown Harbour), RCE12 (Cloncurry), RCE14, RCE16 (East of Kilcock) and RCE19 (Louisa Bridge) (see Appendices V and VI). Raised Ammonia levels were reported at some sites in Q4 with both RCE4 (McNeads Bridge) and RCE9 reaching the threshold limit of 0.120 mg/L N.

For the forty water quality samples taken in 2025 at all 10 RCE sites, excessive BOD values were recorded on eleven occasions across Q1 (2), Q2 (6) and Q3 (3), while elevated values of 2.0 mg/L O_2 were recorded sixteen times. The most significant breaches of the threshold limit (>5.00 mg/L O_2) were all recorded in Q2 at RCE9 (Moy Valley)(8.00 mg/L O_2), RCE12 (9.00 mg/L O_2), RCE19 (5.00 mg/L O_2) and RCE25 (Croke Park)(5.00 mg/L O_2) (Appendix I). There were no breaches in BOD on the Royal Canal East in Q4 2025. Low levels for BOD (1mg/l O_2) were recorded at only four of the ten RCE sites in Q4 2024. Breaches in the BOD threshold were recorded on seven occasions in 2024 and just once in 2023 at all RCE sites. While high BOD values generally recorded from Q1 to Q3 at all sites across the canal network in 2025 may be partially attributed to warm environmental conditions and the natural decay of organic matter such as aquatic macrophytes, the very high values recorded in Q2 on the RCE may indicate the input of organic material such as sewage, agricultural or industrial runoff. High BOD readings were recorded in each quarter of 2024 at RCE9. In 2025, high readings have been recorded in all four quarters at RCE9, RCE12 and RCE14. Further investigations should be conducted on the Royal Canal East starting at Moy Valley (RCE9) where there has been a notable increase in moored craft in recent years and raised BOD values in ten of the last 12 physico-chemical samples.

Water quality conditions were generally good on RCW (Royal Canal West) in 2025 and low values for TP, MRP, SRP, TON, Nitrate and *E. coli* were recorded at all seven sites between Q1 and Q4 (see Appendices IV to VII). The only slightly raised values recorded for TON and Nitrate occurred in Q3 at RCW5 (Kildallan). Elevated counts for Total coliforms were reported in Q2 at RCW1 (Mullingar) and in Q3 at RCW5, RCW7 (Kellys Bridge), RCW9 (Allards Bridge) and RCW12 (Island Bridge) (see Appendix I). There were four breaches in the BOD threshold limit all occurring in Q3 at RCW7, RCW9, RCW12 and RCW14 (West of Ballydrum Bridge) (all 5.00mg/L O_2). There were no further breaches in BOD at any RCW sites in Q4 2025. Three sites (RCW3 (Belmont Bridge), RCW12 and RCW14) exceeded the threshold limit for Ammonia in Q2 with all three sites returning to low levels in Q3 and Q4.

At SE40 (east of Leitrim village), although no breaches in this parameter were recorded in 2025, values for TP have only fallen below 0.05mg/l P on one sampling occasion since an extremely high value of 0.14mg/l P recorded here in Q3 2023. However, values for MRP, SRP, TON and Nitrate have remained low throughout this time (see Appendix I). The threshold limit for Ammonia was exceeded in Q2 2025 with a value of 0.140mg/L N. BOD readings have consistently been elevated or high at SE40 in 2024 and 2025, with readings exceeding the threshold limits in all four samples taken in 2025. High total coliform counts were recorded in both Q2 and Q4 2025 (see Appendices IV to VII). This site continues to display undesirable results in relation to several physico-chemical parameters.

At SE42 (Leitrim marina), high TP readings were recorded throughout 2025 with the highest value of 0.090 mg/L P breaching the parameter threshold in Q4. Low values for MRP, SRP, TON, Nitrate, Ammonia and *E. coli* were recorded in 2025. The BOD classification standard was exceeded in Q2 (3.00 mg/l O_2), Q3 (5.00 mg/l O_2) and Q4 (3.00 mg/l O_2), with an elevated recording of 2 mg/l O_2 in Q1. This follows on from high BOD values recorded in 2024. High Total coliforms were recorded

in Q3 and Q4 with values of 1,223 and 9,804, respectively. The results recorded throughout 2025 continue to highlight the discharge of highly deleterious matter into the Shannon-Erne Waterway in proximity to the marina and Leitrim village. WI must continue to work with Leitrim County Council to determine and mitigate the source(s) of pollution in the area to avert the detrimental impacts of these inputs on the ecology of this important amenity watercourse.

2.3.2. *Indicative Ecological Potential of Surveillance Monitoring Sites on the Grand & Royal Canals and the Shannon-Erne Waterway*

In 2025, some 31 of the 43 WFD monitoring sites on the Grand and Royal Canals and Shannon-Erne Waterway were assigned Good indicative eco-potential in all four quarters, based on an analysis of the physico-chemistry of the canal water at each site (see Appendix I). This compared with 20 at Good in all four quarters in 2024, 22 in 2023, just 10 in 2022 and 23 in 2021. Fourteen sites were assigned Good indicative eco-potential in three quarters, eleven were assigned Good in two quarters and two were assigned Good in just one quarter (see Appendix I). Despite the overall increase in the number of sites being assigned Good status, a monitoring site on the canals (SE40) was assigned Moderate indicative eco-potential in all four quarters for the first time in the past seven years.

Of the 172 canal and Shannon-Erne Waterway sites monitored in 2024 (i.e., 43 sites on four sampling occasions), 133 were assigned Good indicative eco-potential (see Appendix I). This compared with 133 sites that were assigned Good indicative eco-potential in 2024, 142 in 2023, 128 in 2022 and 138 in each of 2021, 2020 and 2019.



Plate 2.3. Collecting water samples for physico-chemical analysis from Umeras Bridge (BL6) in August 2024.

Just six of the 43 monitoring sites breached the threshold limit for one or more of the six determinand parameters in Q1 2025 and, consequently, were assigned Moderate rather than Good indicative eco-potential (see Appendix I). This compared with 4 sites at Moderate status in Q1 2024, 10 in Q1 2023, 15 in Q1 2022 and eight in Q1 2021. Some 19 sites breached threshold limits for at least one determinand parameter in Q2, 11 in Q3 and 9 in Q4 2025 (see Appendix I). In 12 sites breached threshold limits for at least one determinand parameter in Q2, 11 in Q3 and 12 in Q4 2024. In 2023,

nine sites breached threshold limits for at least one determinand parameter in both Q2 and Q3, while in Q4 the number of sites where breaches were recorded was only two. In 2022, the number of sites that breached threshold limits in Q2, Q3 and Q4 was seven, seven and 14, respectively, while in 2021, the numbers were 11, eight and seven, respectively.

The physico-chemical determinand whose threshold limit was breached most often at canal and Shannon-Erne Waterway sites in 2025 was BOD, where the designated threshold limit of 2.5mg/l O_2 was exceeded on 35 occasions (see Appendix I). The highest level recorded was 9mg/l O_2, reported at RCE12 (Cloncurry) in Q2. This compared with twenty-three breaches in 2024, ten breaches in 2023 and ten in 2022.

The next most breached determinand in 2025 was Ammonia, whose threshold limit of 0.12mg/l N was equalled or breached at monitoring sites on ten sampling occasions, with a maximum value of 0.3mg/l N reported at RCW3 (Belmont Bridge) in Q2. This compared with 10 breaches in 2024, 16 in 2023 and 30 in 2022.

The third most breached parameter was TP, where the threshold limit of 0.063mg/l P was exceeded at canal and Shannon-Erne Waterway sites on three occasions in 2025. This compared with five, two and two breach events for this determinand in 2024, 2023 and 2022, respectively.

The TON threshold limit was breached on just one occasion on the canal and Shannon-Erne Waterway sites in 2025 (see Appendix I). The threshold limit was not breached for SRP or *E. coli* at any time in 2025. The threshold limit for TON was breached at three sites in 2024, two in 2023 and nine in 2022, while that for *E. coli* was breached at three, three and two sites, respectively, in 2024, 2023 and 2022. The threshold for SRP at any site was breached twice in 2024, zero sites in 2023 and five sites in 2022.

Six of the seven sites on GCE were assigned Good indicative eco-potential in all four quarters of 2024, compared with five in 2024, three in 2023 and one in 2022 (see Appendix I). The only breach in any of the six determinand parameters at any of the GCE sites in 2025 was for BOD and occurred at GCE14 (Baggot Street), resulting in Moderate status for Q2.

Four of the 11 monitoring sites on GCW were at Good indicative eco-potential on all four quarters in 2025, three were at Good in three quarters, four were at Good in two quarters and no site was at Good on just one sampling occasions (see Appendix I). Breaches for TP in Q3 and TP and BOD in Q4 resulted in GCW12 (west of Daingean) being assigned Moderate indicative eco-potential on two occasions. This site is located between the discharge points from the Ballymullen (GCW12.1) and Ballylennon (GCW13.1) feeder streams, both of which are known to discharge polluted water into the Grand Canal close to this monitoring site. All other breaches were as a result of occasional high values in BOD (7 times), Ammonia (1 time) or both (1 time).

NL1 on the Naas Line was at Good indicative eco-potential for all four quarters in 2025, with no breaches in any of the determinand parameters. On the Milltown Feeder (MF1) there was slightly elevated TON throughout 2025, with one breach in Ammonia (0.120 mg/L N) in Q4, however the site was at Good indicative eco-potential following sampling in all four quarters. This is most likely attributable to the ongoing efforts to manage the invasive alien species *Crassula helmsii* in the section.

None of the four monitoring sites on the Barrow Line were at Good indicative eco-potential in all four quarters of 2025. BL2 (south of Lock 20), BL6 (Umeras) and BL10 (Vicarstown) were all assigned Moderate indicative eco-potential in Q2 because of excessive BOD values (all 3.00 mg/L O_2). The only breach in the TON threshold for any site in 2025 occurred at BL10 in Q3. While no breaches of this parameter were recorded in 2024 the threshold limit for this determinand have been regularly breached at sites on this canal in previous years. The only breach for Athy (BL15) in 2025 was an Ammonia value of 0.120 mg/L N recorded in Q4.

Just three of the ten WFD monitoring sites on RCE were assigned Good indicative eco-potential on all four sampling occasions in 2025. This compared with two in 2024, eight in 2023 and just one in 2022. Two sites were at Moderate indicative eco-potential following sampling in just one quarter, four sites were at Moderate following two sampling events and one site was at Moderate after three sampling events (see Appendix I). BOD (11) and Ammonia (2) were the determinand parameters responsible for most breaches. As mentioned in Section 2.3.1 persistently high values and several significant breaches in BOD limits were recorded throughout the Royal Canal East.

Two of the seven sites on RCW achieved Good indicative eco-potential following the four sampling events in 2024, compared with four in 2024, four in 2023 and one in 2022. Three sites were at Moderate status in just one quarter and 2 sites in two quarters. BOD (4 times in Q3 only) and Ammonia (3 times in Q2 only) were the determinand parameter responsible for the breaches at these five sites (see Appendix I).

Of the sites on the Shannon-Erne Waterway SE42 was at Moderate indicative eco-potential in three of the four quarterly sampling events and SE40 was Moderate in all four quarters of physico-chemical analysis in 2025. Good status was only achieved at SE42 in Q1. High BOD levels were responsible for seven of the eight breaches, although breaches in the threshold limit for Ammonia at SE40 in Q2 and TP for SE42 in Q4 were also reported (see Appendix I).

When the physico-chemical results for the 43 WFD surveillance monitoring sites on the canals and Shannon-Erne Waterway for the four quarters of 2025 were assessed, 31 sites were assigned Good indicative eco-potential (Table 2.3). This compared with 35 sites in 2024, 41 in 2023 and 38 in 2022. No sites breached for two determinand parameters (Table 2.3). All 12 sites each breached the threshold limit for one determinand parameter, BOD. Generally elevated or high BOD levels over the four quarters resulted in these sites being assigned Moderate status (see Appendix I).

Table 2.3 Physico-chemical results for the six classifying determinands at WFD monitoring sites on the Grand & Royal Canals, the Shannon-Erne Waterway and the Grand Canal Basin between Q1 and Q4 2025, combined. The indicative ecological potential for each site is presented.

AWB	Site Code	Year	Total P (mg/L P)	SRP (mg/L P)	TON (mg/L N)	*E. coli* (Count/100ml)	B.O.D. (mg/L O2)	Ammonia (mg/L N)	Indicative Physico-chemical Potential
GCE_09	GCE4	2025	0.025	0.010	1.375	129.000	1.250	0.035	Good
	GCE6	2025	0.023	0.010	1.225	18.250	1.000	0.030	Good
	GCE8	2025	0.025	0.010	1.100	313.250	1.250	0.045	Good
	GCE10	2025	0.015	0.010	1.000	20.000	1.500	0.035	Good
	GCE12	2025	0.015	0.010	1.000	244.750	1.500	0.028	Good
	GCE14	2025	0.023	0.010	1.000	79.250	1.750	0.033	Good
GCNL_09	NL1	2025	0.020	0.010	2.425	297.500	1.000	0.040	Good
GCMF_14	MF1	2025	0.013	0.010	1.900	39.500	1.250	0.053	Good
GCBL_14	BL2	2025	0.015	0.010	1.025	16.250	2.000	0.035	Good
	BL6	2025	0.015	0.010	1.000	31.500	1.500	0.033	Good
	BL10	2025	0.018	0.010	2.300	38.500	1.750	0.043	Good
	BL15	2025	0.018	0.010	1.275	34.500	1.250	0.050	Good
GC_14E	GCE1	2025	0.018	0.010	1.000	120.750	1.500	0.063	Good
	GCW1	2025	0.018	0.010	1.200	40.500	1.250	0.038	Good
GC_14W	GCW8	2025	0.015	0.010	0.875	35.500	1.250	0.030	Good
	GCW12	2025	0.050	0.010	0.875	67.250	2.250	0.038	Good
GC_07	GCW4	2025	0.015	0.010	0.875	96.250	1.750	0.033	Good
	GCW6	2025	0.013	0.010	0.875	111.250	1.750	0.035	Good
GC_25A	GCW16	2025	0.028	0.010	0.875	64.000	3.250	0.055	Moderate
	GCW18	2025	0.020	0.010	0.875	91.250	3.000	0.035	Moderate
	GCW20	2025	0.018	0.010	1.250	7.750	3.000	0.043	Moderate
	GCW22	2025	0.013	0.010	0.885	5.000	1.000	0.040	Good
	GCW24	2025	0.018	0.010	0.875	5.250	2.250	0.050	Good
	GCW27	2025	0.015	0.010	0.875	12.250	1.500	0.045	Good
GCB*	GCB4	2025	0.048	0.010	1.000	82.000	2.000	0.055	Good
	GCB7	2025	0.053	0.013	1.000	79.500	1.250	0.063	Good
RC_07	RCE4	2025	0.025	0.010	0.875	16.750	2.500	0.055	Moderate
	RCE6	2025	0.023	0.010	1.070	129.250	1.500	0.045	Good
	RCE8	2025	0.025	0.010	0.875	112.000	1.500	0.043	Good
	RCE9	2025	0.023	0.010	1.000	12.250	3.750	0.063	Moderate
	RCE12	2025	0.033	0.010	1.075	9.250	4.250	0.043	Moderate
RC_09	RCE14	2025	0.020	0.010	1.000	36.000	2.500	0.053	Moderate
	RCE16	2025	0.018	0.010	1.000	7.250	1.500	0.043	Good
	RCE19	2025	0.023	0.010	1.000	106.250	2.750	0.043	Moderate
	RCE22	2025	0.028	0.010	1.000	67.250	2.250	0.045	Good
	RCE25	2025	0.020	0.010	1.000	172.250	2.000	0.033	Good
RC_25A	RCW1	2025	0.023	0.010	0.875	26.750	1.500	0.043	Good
	RCW3	2025	0.023	0.010	0.875	8.500	1.500	0.065	Good
RC_26F	RCW5	2025	0.018	0.010	1.350	73.750	1.500	0.045	Good
	RCW7	2025	0.015	0.010	0.875	7.250	2.000	0.038	Good
	RCW9	2025	0.028	0.010	0.950	10.500	2.500	0.045	Moderate
RC_26E	RCW12	2025	0.013	0.010	0.950	21.500	2.500	0.060	Moderate
RC_26C	RCW14	2025	0.015	0.010	0.875	7.000	2.000	0.055	Good
SE_26A	SE40	2025	0.055	0.010	0.875	73.750	3.500	0.083	Moderate
	SE42	2025	0.060	0.010	0.875	69.250	3.250	0.058	Moderate

***Grand Canal Basin is not a designated AWB

2.3.3. Indicative Ecological Potential for the 15 Artificial Water Bodies

The physico-chemical results for the six determinands in the 15 AWBs, in each sampling quarter of 2025, are presented graphically in Figures 2.3 to 2.5 and also in Appendix II. Three of the AWBs were assigned Good indicative eco-potential on all four sampling occasions in 2025. This compared with eight in 2024, eight in 2023 and six in 2022. In 2025, eight AWBs were assigned Good indicative eco-potential in three quarters, four at Moderate in two of the sampling quarters and none at

Moderate on three sampling occasions (see Appendix II). One AWB (SE_26A) was assigned Moderate indicative eco-potential on all four sampling occasions.

All 12 of the determinand threshold breach events recorded among the 15 AWBs in 2025 were for BOD (see Appendix II).

Of the five AWBs that contain WFD monitoring sites on the Grand Canal system no determinand breaches were reported for the GC_09 (6 sites) or GC_14E (2 sites) AWBs. The threshold limit for BOD was breached for GC_14W (2 sites) in Q2, GC_07 (2 sites) in Q4 and GC_25A (6 sites) in Q1 and Q2 (see Appendix I).

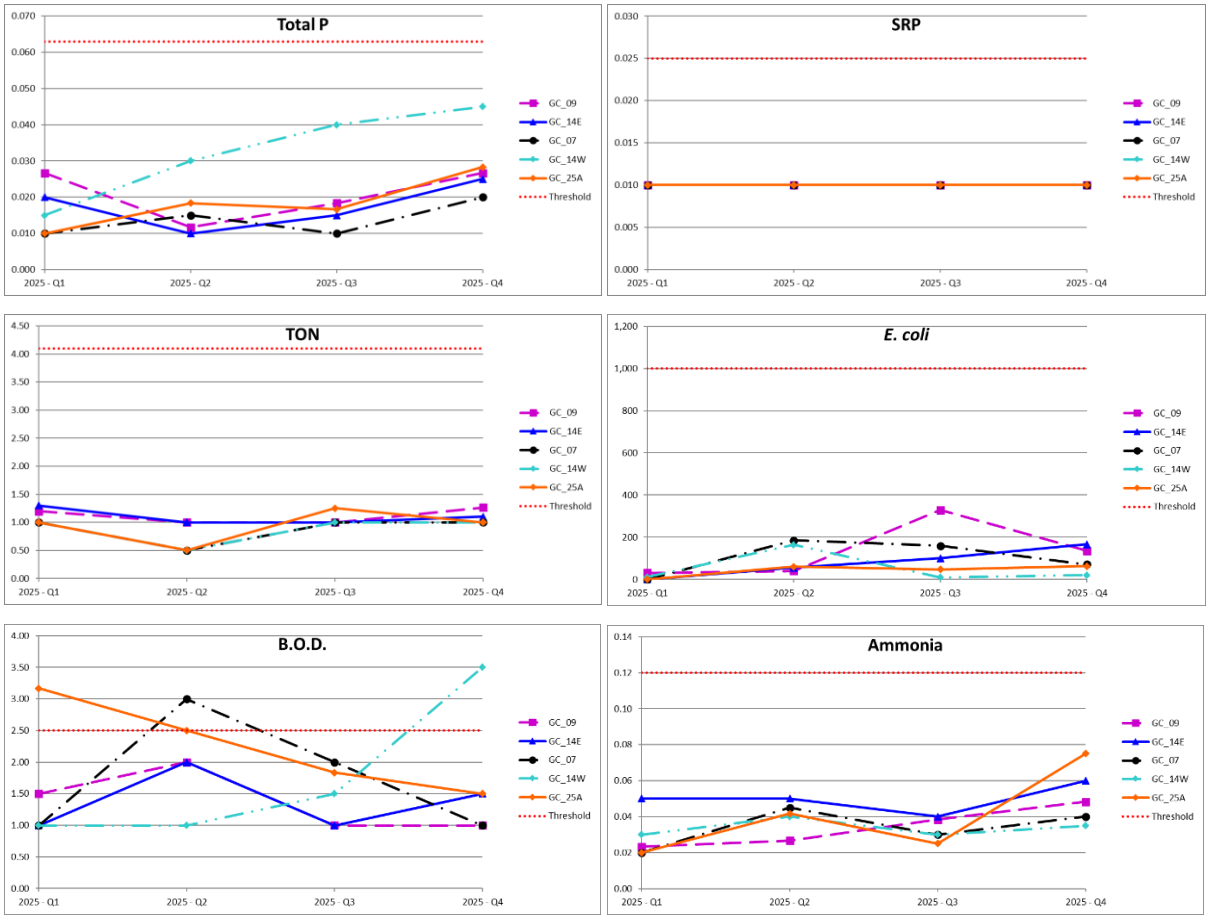


Figure 2.3 Physico-chemical results for the six classifying determinand parameters in the Artificial Water Bodies (AWB) that contain Grand Canal sites for each quarter in 2025.

The Naas Line (GCNL_09, one site) did not exceed any of the parameter limits throughout 2025 (Figure 2.4). The Ammonia determinand threshold was breached once at the Milltown Feeder (GCMF_1, one site) in Q4 2025. The Barrow Line AWB (GCBL_14, 4 sites) displayed an excessive BOD value owing to breaches at three of the four sites in Q2 2025 (Figure 2.4 and Appendix II).

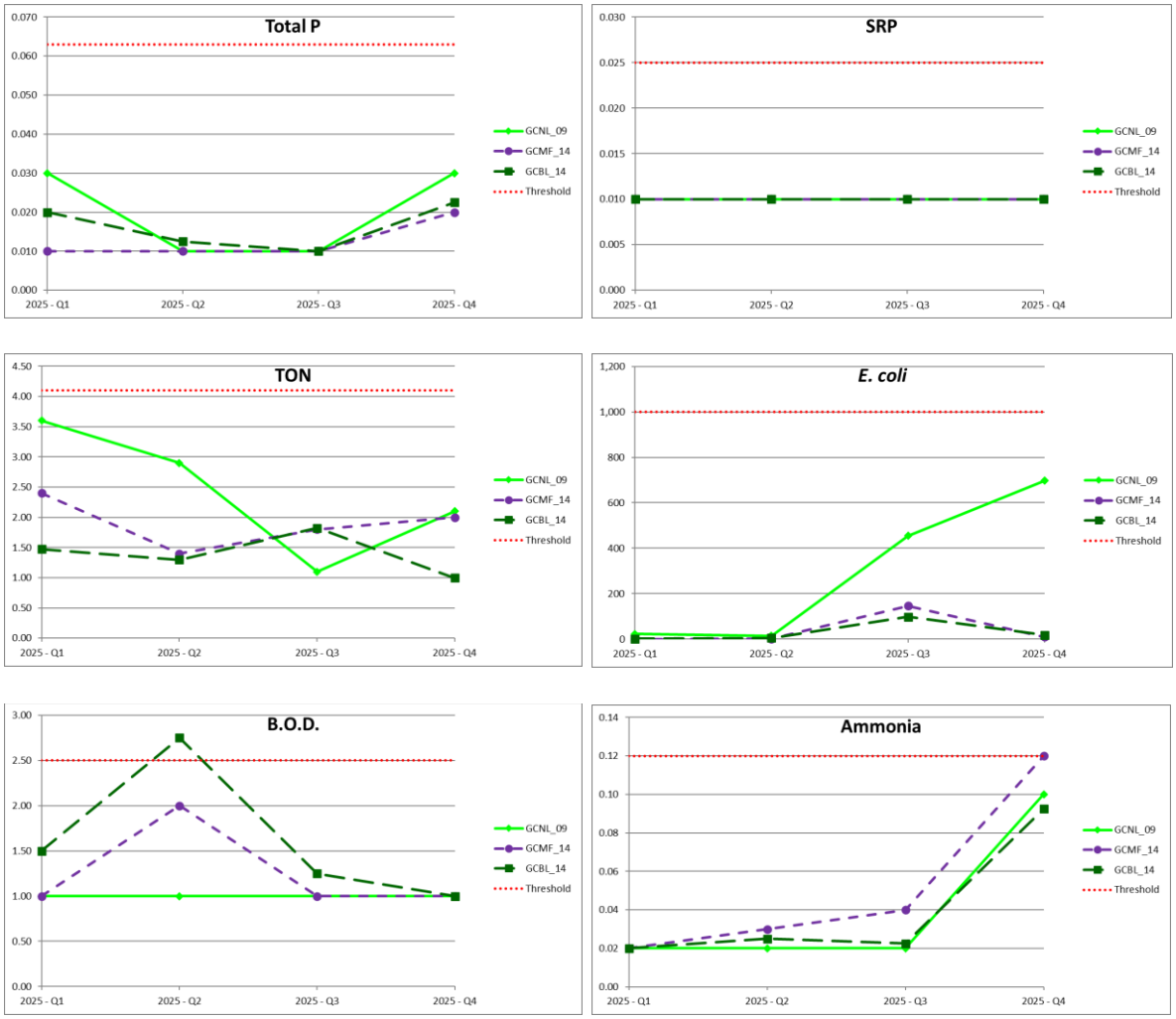


Figure 2.4 Physico-chemical results for the six classifying determinand parameters in the Artificial Water Bodies (AWB) that contain Naas Line, Milltown feeder and Barrow Line sites for each quarter in 2025.

Six of the 15 AWBs contain WFD monitoring sites on the Royal Canal (RC_07 - 5 sites, RC_09 - 5 sites, RC_25A - 2 sites, RC_26F - 3 site, RC_26E - 1 site and RC_26C - 1 site). None of these AWBs achieved Good indicative eco-potential on all four sampling occasions in 2025. Three of these AWBs (RC_25A, RC_26E and RC_26C) breached for Ammonia in Q2 (Figure 2.5 and Appendix II). RC_07 was assigned Moderate indicative eco-potential in Q2 as a result of significant breaches in the threshold limit for BOD at two (RCE9 and RCE12) of the five sites in the AWB (Figure 2.5). RC_09 was also assigned Moderate status due to breaches in four of the five sites in the AWB for the same period. In Q3, high BOD values resulted in the RC_26F, RC_26E and RC_26C AWBs receiving a Moderate rating. There were no breaches in any determinand thresholds on the Royal Canal in Q1 or Q4 2025 .

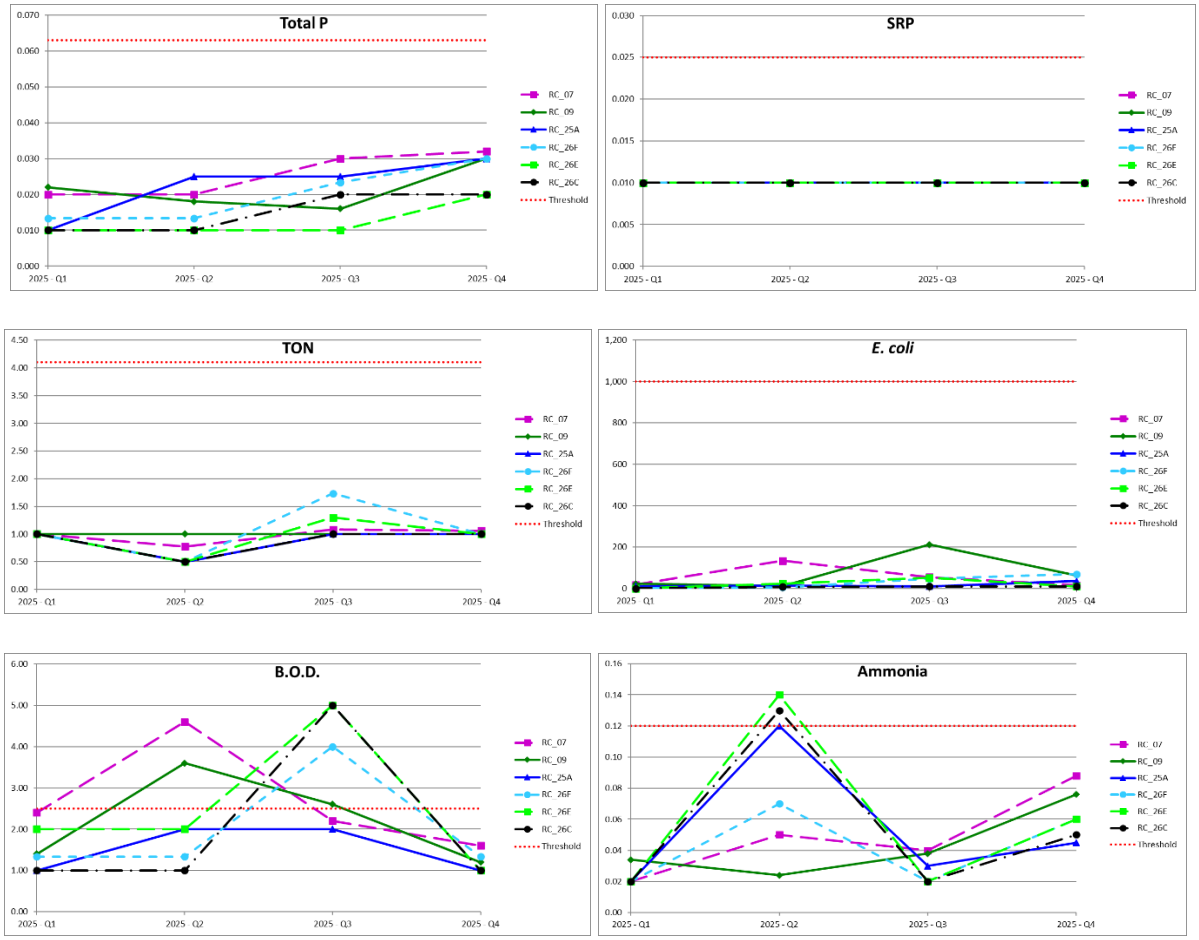


Figure 2.5 Physico-chemical results for the six classifying determinand parameters in Artificial Water Bodies (AWB) that contain the Royal Canal sites for each quarter in 2024.

The Shannon-Erne Waterway AWB (SE_26A) was at Moderate status in Q1, Q2, Q3 and Q4. The breaches occurred as a result of high BOD values recorded at both sites on these sampling occasions, while that in Q4 also resulted from an additional breach in the TP limit at SE42 (see Appendix II).

Twelve of the 15 AWBs were assigned Good indicative eco-potential based on the combined results from physico-chemical sampling between Q1 and Q4 2025 (Table 2.4). This compares with 14 AWBs at Good status in 2024, 2023 and 2022, respectively. The AWBs to register a breach following water sampling this year were RC_07, RC_26E and SE_26A (Table 2.4). Elevated (2mg/L O_2) and high ($\geq$3mg/L O_2) BOD values recorded during sampling resulted in these AWBs being assigned Moderate rather than Good indicative eco-potential (see Appendix I). Shannon-Erne Waterway AWB recorded persistent breaches across both sites, whereas the RC_26E AWB contains a single site and was assigned Moderate based on a single breach in Q3 and elevated BOD levels recorded in Q1 and Q2. The RC_07 AWB, containing 5 sites, was assigned Moderate status as a result of five breaches from 20 samples in 2025. A value of 8.00 mg/L O_2 (RCE9) and 9.00 mg/L O_2 (RCE12) recorded in Q2 as well as elevated BODs of 2mg/l O_2 recorded in eleven of the 20 samples contributed to the overall downgrading of this AWB. The reason for these breaches along the Royal Canal East is uncertain but is likely to be linked to the exceptionally low water levels experienced in Lough Owel (Figure 2.6)

and throughout the Royal Canal East following unprecedented dry periods in Spring and Summer 2025. The low water experienced on the Royal Canal East was also supplemented from the River Boyne, near Longwood, in 2025 to maintain sufficient levels for navigation. The WFD monitoring site at Moy Valley is located *circa*. 3.7km downstream of the abstraction point. The EPA Waterbody Status of the feeder (reviewed 2026) was classified as 'Poor status and at risk', however no recent water chemistry data was available. The waterbody was also 'Poor' for invertebrate status with a Q value for 2024 of Q3. In the event that further abstraction is required for the Royal Canal East in 2026 the source rivers should be closely monitored throughout the abstraction process to ensure the quality of the water being added to the canal system.

Table 2.4 Indicative ecological potential of the Artificial Water Bodies on the Grand & Royal Canals, the Shannon-Erne Waterway and the Grand Canal Basin, based on results from physico-chemical analysis for classifying determinands during Q1 to Q4 2025, combined.

AWB	Year	Total P (mg/L P)	SRP (mg/L P)	TON (mg/L N)	*E. coli* (Count/100ml)	B.O.D. (mg/L O2)	Ammonia (mg/L N)	Indicative Physico-chemical Potential
GCE_09	2025	0.021	0.010	1.117	134.083	1.375	0.034	Good
GCNL_09	2025	0.020	0.010	2.425	297.500	1.000	0.040	Good
GCMF_14	2025	0.013	0.010	1.900	39.500	1.250	0.053	Good
GCBL_14	2025	0.016	0.010	1.400	30.188	1.625	0.040	Good
GC_14E	2025	0.018	0.010	1.100	80.625	1.375	0.050	Good
GC_14W	2025	0.033	0.010	0.875	51.375	1.750	0.034	Good
GC_07	2025	0.014	0.010	0.875	103.750	1.750	0.034	Good
GC_25A	2025	0.018	0.010	0.939	30.917	2.333	0.045	Good
GCB*	2025	0.050	0.011	1.000	80.750	1.625	0.059	Good
RC_07	2025	0.026	0.010	0.979	55.900	**2.700**	0.050	Moderate
RC_09	2025	0.022	0.010	1.000	77.800	2.200	0.043	Good
RC_25A	2025	0.023	0.010	0.875	17.625	1.500	0.054	Good
RC_26F	2025	0.020	0.010	1.058	30.500	2.000	0.043	Good
RC_26E	2025	0.013	0.010	0.950	21.500	**2.500**	0.060	Moderate
RC_26C	2025	0.015	0.010	0.875	7.000	2.000	0.055	Good
SE_26A	2025	0.058	0.010	0.875	71.500	**3.375**	0.070	Moderate

* Grand Canal Basin is not a designated AWB. While the overall indicative eco-potential for the Basin in 2024 was assessed as Good, it should be noted that there were ongoing water quality issues through the year, particularly at GCB4 (see Appendix I).

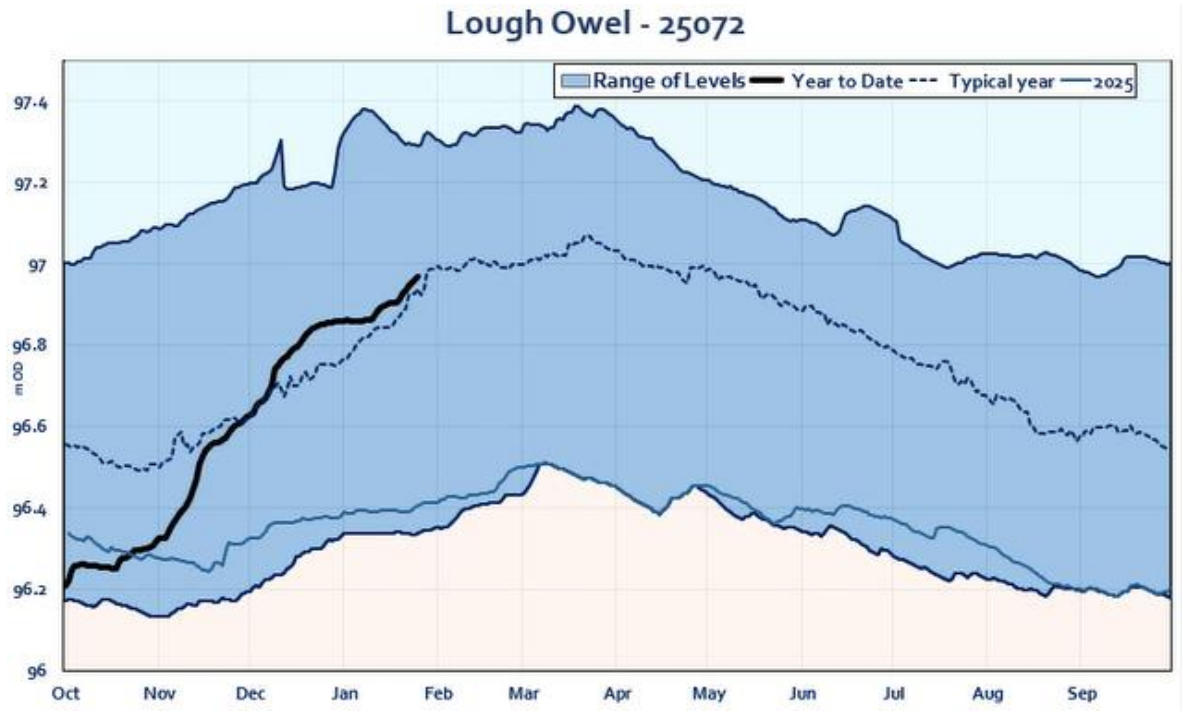


Figure 2.6 Mean long-term water levels (dashed blue line) recorded in Lough Owel and data indicating some of the lowest levels on record from mid Spring to Autumn 2025 (solid light blue line).

2.3.4. Physico-chemistry and Indicative Ecological Potential of Sites on Grand Canal Basin

Grand Canal Basin is an important amenity in the heart of Dublin City and is used by the general public for a variety of water-based activities. A Dublin City Council (DCC) urban wastewater outfall is located in the inner basin (Figures 2.1 and 2.2). This pipe is used to carry storm water overflow but, on occasion, sewage contamination is discharged to the basin *via* this outfall.

A major fish kill occurred in the basin in November 2004 (Caffrey *et al*. 2006) and an intensive water sampling programme was implemented for several years after this episode. This monitoring programme revealed intermittent (and occasionally serious) breaches of Total and Faecal coliform threshold limits over the years, particularly in the vicinity of the DCC outfall in the inner basin.

In order to monitor this situation more thoroughly, Waterways Ireland (WI) and DCC have, in recent years, conducted regular bacteriological sampling, for *E. coli* and *Enterococci.* This sampling programme has been in addition to the quarterly water sampling programme operated by INVAS at two sites in the Grand Canal Basin (GCB4 and GCB7), as part of the annual WFD Canals Surveillance Monitoring Programme. The WI and DCC sampling has taken place at up to 11 sites in the basin (three in the inner basin, eight in the outer basin) and two in the adjacent Grand Canal. Fifty-four sets of samples for bacteriological analysis (*E. coli* and *Enterococci*) were taken by WI/DCC in and immediately upstream of the Grand Canal Basin between the January and December 2025 (Table 2.5). DCC sampling took places at sites 4, 5, 6, 7 and 8 with one site on the Grand Canal, two in the

inner basin and two in the outer basin. WI sampling took place at 3, 5, 6, 6B, 7 and 8 (Figure 2.2) with one site on the Grand Canal, two in the inner basin and three in the outer basin.

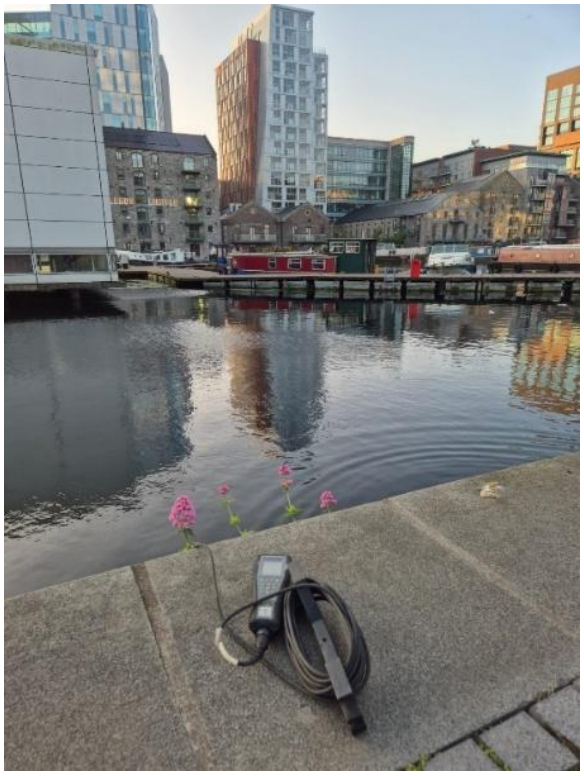


Plate 2.4. Deploying the YSI Pro Plus probe at the Grand canal inner basin monitoring site (GCB4) in August 2025.

Across all sampling by DCC and WI, a total of 61 breach events involving *E. coli* and *Enterococci* were reported from the water samples taken between January and December 2025 (Table 2.5). Of the 61, seventeen of these occurred in samples tested between the 28th of January to the 25th of February. A further 11 of the breaches were recorded on samples taken between the 28th of May and the 16th of June. Thirteen subsequent breaches were recorded from the 21st and 23rd of July 2025. The acceptable limits were exceeded fourteen times from the 21st of October to the 4th of November. The dates for most of these breaches corresponded with high levels of rainfall recorded at the weather station in Phoenix Park.

A total of five breaches were recorded in the Grand Canal before it entered the basin, one for E. coli and four for *Enterococci* counts. In the inner basin, thirty-nine breaches were reported, with twenty for *E. coli* and nineteen for Enterococci. The highest bacteriological counts detected were from the 21st of July and 21st of October 2025, with >24196 *E. coli* per 100ml and on the 23rd of July 2025 with 12,000 *Enterococci* per 100ml. It is notable that following a relatively dry July there was 48.1mm of rainfall recorded at Phoenix Park on the 21st of July 2025. In the outer basin, there were seventeen breaches reported, with nine for *E. coli* and eight for *Enterococci*. Eleven of the seventeen breaches were recorded in January, June, October and November when both sites in the inner basin failed on counts for both parameters (Table 2.5).

Table 2.5. Number of sites that breached acceptable limits for *E. coli* (>900 counts per 100ml) and *Enterococci* (>250 counts per 100ml) in water samples taken by Waterways Ireland and Dublin City Council with third party testing in Level 1 of the Grand Canal (1 site) and in the inner (2 sites) and outer (2 or 3 sites) Grand Canal Basins between January and December 2025.

Date	Canal *E. coli*	Canal Enterococci	Inner *E. coli*	Inner Enterococci	Outer *E. coli*	Outer Enterococci
14/01/2025	0	0	0	0	0	0
28/01/2025	0	1	2	2	2	2
11/02/2025	0	0	2	2	0	0
25/02/2025	0	0	2	2	0	0
11/03/2025	0	0	0	0	0	0
25/03/2025	0	0	0	0	0	0
07/04/2025	0	0	0	0	0	0
08/04/2025	0	1	0	0	0	0
14/04/2025	0	0	0	0	0	0
16/04/2025	0	0	2	1	0	0
22/04/2025	0	0	0	0	0	0
23/04/2025	0	0	0	0	0	0
28/04/2025	0	0	0	0	0	0
30/04/2025	0	0	0	0	0	0
06/05/2025	0	0	0	0	0	0
07/05/2025	0	0	0	0	0	0
12/05/2025	0	0	0	0	0	0
14/05/2025	0	0	0	0	0	0
19/05/2025	0	0	0	0	0	0
26/05/2025	0	0	0	0	0	0
28/05/2025	0	0	0	0	1	0
03/06/2025	0	0	2	2	0	1
04/06/2025	0	0	0	0	0	0
09/06/2025	0	0	0	0	0	0
11/06/2025	1	0	0	0	0	0
16/06/2025	0	0	2	2	0	0
17/06/2025	0	0	0	0	0	0
23/06/2025	0	0	0	0	0	0
25/06/2025	0	0	0	0	0	0
30/06/2025	0	0	0	0	0	0
01/07/2025	0	0	0	0	0	0
07/07/2025	0	0	0	0	0	0
09/07/2024	0	0	0	0	0	0
14/07/2024	0	0	0	0	0	0
15/07/2025	0	0	0	0	0	0
21/07/2025	0	0	2	2	0	0
23/07/2025	0	0	2	2	3	1
28/07/2025	0	0	0	0	0	0
29/07/2025	0	0	0	0	0	0
06/08/2025	0	0	0	0	0	0
11/08/2025	0	0	0	0	0	0
12/08/2025	0	0	0	0	0	0
18/08/2025	0	0	0	0	0	0
20/08/2025	0	0	0	0	0	0
25/08/2025	0	0	0	0	0	0
26/08/2025	0	1	0	0	0	0
01/09/2025	0	0	0	0	0	0
03/09/2025	0	1	0	0	0	1
08/09/2025	0	0	0	0	0	0
09/09/2025	0	0	0	0	0	0
23/09/2025	0	0	0	0	0	0
07/10/2025	0	0	0	0	0	0
21/10/2025	0	0	2	2	2	2
04/11/2025	0	0	2	2	1	1

2.3.4.1. Results from Quarterly Sampling conducted by INVAS Biosecurity Ltd.

The results of physico-chemical analysis of water samples taken from the inner and outer basins (GCB4 and GCB7, respectively) in Q4 2025 revealed breaches in the classification standard for Total P at both sites. Prior to the breach in Q4, Total P was slightly elevated at both sites in Q1 and Q3 in 2025 and also at GCB7 in Q4 2024. Although elevated BOD readings were reported for both sites during sampling in 2025 there were no breaches in this parameter limits of this determinand in 2025. This contrasts with 2024 when the BOD limit was exceeded on two occasions at the GCB4 site. The threshold limit for Ammonia was equalled at GCB7 in Q3 2025, resulting in a Moderate status for that sampling occasion.

Based on the combined results from physico-chemical sampling between Q1 and Q4 2025 for GCB4 and GCB7, this AWB was assigned Good indicative eco-potential (see Table 2.4).

2.3.5. Physico-chemistry and Indicative Ecological Potential of Canal Feeders and Drains

Results for physico-chemical analysis of water samples from the five feeders/drains that discharge to the canals for the four quarters of 2025 are presented in Appendices IV to VII.

Water quality conditions for the Monread drain (GCE5.1) displayed elevations in values for TON and Nitrate throughout the year but did not exceed the classification standards in any of the quarterly samples (see Appendix III). This continues a trend for this site with slightly elevated levels for TON also recorded in 2024. Bacteriological results for the site showed high Total coliforms across all quarterly samples, with breaches in the threshold limit for *E. coli* reported in Q2 and Q3. This appears to show a continued trend for *E. coli*, where the parameter limits were exceeded in Q3 2024, as well as in Q2, Q3 and Q4 2023. The drain was assigned Moderate indicative eco-potential when results for Q1 to Q4 in 2025 were combined (Table 2.5). The persistently high *E. coli* values suggest that water continues to enter the Grand Canal containing deleterious matter containing sewage at this point. An investigation by Kildare County Council should be conducted to determine the origin of this pollution and preventative measures be put into place to safeguard the water quality on this section of the Grand Canal.



Plate 2.5. A light flow of water discharging from the Ballymullen Feeder (GCW12.1) during light rain in February 2025.

The Ballymullen (GCW12.1) and Ballylennon (GCW13.1) feeders continued to discharge poor quality water into the main line of the Grand Canal, west of Daingean in 2025. While the results for some the physico-chemical parameters such as TON and Nitrate were low and well within acceptable limits in 2025, breaches occurred across several of the other determinands (see Appendices VI to VII).

The Ballymullen feeder was assigned Moderate status for 2025 (Table 2.5) as water quality results exceeded the parameter limit for four of the six determinands including TP (0.23 mg/L P), SRP (0.04 mg/L P), BOD (5.00 mg/L O_2) and Ammonia (0.19 mg/L N) in Q3. Breaches were again recorded in Q4 for Total P (0.1 mg/L P) and BOD (3.00 mg/L O_2). In 2024, the values for Total P exceeded the limits in Q1 and Q2 and were elevated in both Q3 and Q4. Very high Total coliforms combined with elevated *E. coli* were also recorded in Q2, Q3 and Q4 at this site in 2025.

For the ninth consecutive quarterly sample the Ballylennon feeder has exhibited poor water quality conditions as the stream was assigned Moderate status following each sampling event in 2024 and 2025 (Table 2.5). The threshold limit for BOD was exceeded on all four sampling occasions in 2025, bringing the number of consecutive quarterly breaches of this parameter to seven. *E. coli* values recorded in Q2 breached the threshold limit and Total coliform counts were notably high in both Q2 and Q3 (see Appendix III). As in Q1 2024, it was reported that the value for Ammonia in Q1 breached the limit in 2025. Although elevated TP was recorded throughout 2025, the values did not exceed the classification standards for this parameter.

Following the analysis of both the Ballymullen and Ballylennon feeders in 2025 and previous years, it is evident that deleterious material continues to be discharged into the main Grand Canal line to from these streams. In 2025, Waterways Ireland and Offaly County Council staff met with landowners at the sources of these feeder streams in an effort to establish water protection measures and identify sources of nutrient input. This relationship must continue to strive to improve the quality of water entering the Grand Canal through riparian protection of the drains and the identification of possible sources of pollution.

The Athy drain (BL15.1) was the only one of the five documented feeder streams to be assigned overall Good status in 2025 (see Appendix III). Despite this, there were several breaches in a range of determinands throughout 2025 including Total P (0.07 mg/L P) and BOD (3.00 mg/L O_2) in Q1. There were no breaches in Q2, but high Total P (0.09 mg/L P) and E. coli (2,420) values resulted in the site being assigned Moderate indicative physico-chemical potential in Q3 2025. The site again received Moderate status in Q4 owing to a high Ammonia result of 0.14 mg/L N. High Total coliforms and elevated TON and Nitrate values were also recorded in all four quarterly samples with no breaches in the classification standards. High values recorded across several factors have meant that no one determinand was excessively high when all four quarterly samples were combined, resulting in a Good overall status for the Athy drain. Beyond of the scope of the 2025 quarterly sampling, it was reported that significant quantities of turbid water were entering the Barrow line *via* the drain at BL15.1 on the 24th of December 2025. There has been a reported fish kill in the area on the same date that may be associated with the discharge from the Athy drain. WI are liaising with Inland Fisheries Ireland and Kildare County Council regarding the matter and will continue to push for further investigations into the origins of the water being discharged at this location into the

Barrow Canal and ultimately The River Barrow and River Nore SAC (IE002162) Natura 2000 site downstream.



Plate 2.6. An image of the WFD monitoring site at Athy drain (BL15.1) provided to INVAS by WI staff following a reported fish kill with turbid water in December 2025.

Table 2.5 The indicative ecological potential of the five feeders/drains monitored as part of the WFD surveillance monitoring programme, based on the physico-chemical results for Q1 to Q4 2025, combined.

AWB	Site Code	Year	Total P (mg/L P)	SRP (mg/L P)	TON (mg/L N)	*E. coli* (Count/100ml)	B.O.D. (mg/L O2)	Ammonia (mg/L N)	Indicative Physico-chemical Potential
Monread	GCE5.1	2025	0.045	0.010	1.775	1,012	1.000	0.040	Moderate
Ballymullen	GCW12.1	2025	0.110	0.018	0.900	344	2.500	0.070	Moderate
Ballylennon	GCW13.1	2025	0.050	0.010	0.875	643	4.500	0.085	Moderate
Athy	BL15.1	2025	0.063	0.010	2.050	928	1.750	0.085	Good
Kilcock Harbour	RCE16.1	2025	0.035	0.010	1.225	1,302	1.250	0.085	Moderate

* While the overall indicative eco-potentials for the Athy drain in 2025 was assessed as Good, it should be noted that there were ongoing water quality issues with the drain through the year (see Appendix III).

In previous years the Kilcock Harbour drain has been implicated in the discharge of contaminated water directly into the harbour. While BOD and SRP values were generally good, slightly elevated TP, Nitrate and TON were recorded in Q1 and Q4 although no breaches were recorded for these determinands in 2025. Ammonia values exceeded the threshold limit in Q1 2025 with a value of 0.16 mg/L N. Following an analysis of results from Q1 to Q4, very high Total coliforms were recorded for all quarterly samples, while breaches were detected in *E. coli* limits in Q2 (2,420) and Q4

(1,670)(see Appendix VII). The physico-chemical sample from Q4 2024 also highlighted a breach for the *E. coli* determinand. Results from bacteriological sampling conducted roughly weekly in 2025 by WI at five sites in the vicinity of Kilcock Harbour and this drain reported counts for *E. coli* and *Enterococci* in breach of the threshold limit in April, June, July, August, September, October and in November. The frequently high records for bacteriological testing by both WI and INVAS highlight the presence of sewage being discharged into Kilcock Harbour and the Royal Canal *via* the Kilcock drain on a regular basis. Kildare County Council must engage with WI to identify the source(s) of this pollution and to take urgent action to eliminate it.

3. Macrophyte Monitoring

3.1. Introduction

Macrophytes, in the context of the present report, comprise aquatic (submerged, floating-leaved and free-floating) and emergent species, the latter more commonly associated with the canal marginal and riparian zones.

Macrophyte sampling was carried out at the 41 WFD monitoring sites on the Royal and Grand Canals between 23rd June and 15th August 2025. In previous years, macrophyte monitoring on the Shannon-Erne Waterway had been conducted but, in 2020, it was decided to omit this Waterway from macrophyte (and macroinvertebrate) sampling as it's hydromorphology is not conducive to the establishment and growth of diverse macrophyte communities and it is, thus, incapable of achieving Maximum eco-potential.

3.2. Materials and Methods

The survey area at each site consists of a 150m-long canal reach that is divided into ten roughly equidistant sampling points. At each point aquatic macrophytes are collected using a standardised, 8-pronged grapnel with a 7m-long rope attachment. Samples are collected by standing at the edge of the canal and throwing the grapnel as far as possible across the channel towards the opposite bank. The grapnel is permitted to settle on the canal bed before being slowly retrieved. Each grapnel sample is allowed to drip for *circa* 1 minute before being weighed. All aquatic macrophyte species retrieved by the grapnel are identified and recorded. An estimate of the percentage cover (see below) occupied by each aquatic plant species is made using a combination of the grapnel sample and a visual assessment of the plant species present in the canal at each sampling point. The figures presented in the report are those recorded on the date of sampling and do not take into account prior weed cutting operations at these sites. The width of the reed fringe (emergent species) on both banks at each sampling point is measured, or estimated, and an assessment of the relative cover (see below) occupied by each species is made.

Cover for aquatic macrophyte species is assessed relative to the area of water between the two banks and expressed on a version of the DAFOR scale:

- D – Dominant (>70% cover)
- A – Abundant (31-70% cover)
- F – Frequent (11-30% cover)
- O – Occasional (3-10% cover)
- R – Rare (<3% cover).

For the purposes of quantifying percentage cover, the DAFOR scores are converted to a numerical scale of 1 to 5 (Dominant = 5; Abundant = 4; Frequent = 3; Occasional = 2; Rare = 1). Results for the ten grapnel samples at each site are averaged to give an overall value for each aquatic macrophyte species. The overall percentage cover for each emergent plant species that occupies

both margins along the 150m-long canal site is assigned by carrying out a visual assessment of the canal reach.

To assess the ecological potential of a site using macrophyte data, a number of metrics are calculated:

- Aquatic Plant Biomass (APB) (based on grapnel samples)
- Number of BMWP (Biological Monitoring Working Party) scoring aquatic plant taxa (N_AQUA)
- Macrophyte Fertility Index (MFI)
- Number of BMWP (Biological Monitoring Working Party) scoring emergent taxa (N_EMERG)
- Relative extent of emergent vegetation (REL_EMERG).

The MFI represents a cover-weighted index score for a site based on a set of fertility ranks for different macrophyte species. Most scores lie in the range 6 – 8.5 for canals, the higher values indicating greater fertility. Not all macrophyte species recorded on our Irish canals are included in the MFI list provided by SNIFFER and, in such instances, the species that is deemed to be most ecologically similar from the list is scored (e.g., in 2025 both *Equisetum arvense* (Field Horsetail) and *E. variegatum* (Variegated Horsetail) were scored as *E. fluviatile* (Water Horsetail), *Carex remota* was scored as *Carex* sp., *Juncus conglomeratus* (Compact Rush) was scored as *J. inflexus* (Hard Rush) and the rare *Tolypella intricata* was scored as *Chara* sp.). The REL_EMERG metric represents the proportion of channel occupied by emergent plants, with values ranging from 0 (no fringing vegetation) to 1 (the entire channel margin is occupied by emergent macrophytes).

In recent years the Latin nomenclature for a small number of the macrophyte species, including some recorded on the canals, has changed. This is reflected in Tables 3.1 to 3.3 and Figures 3.1 to 3.3, and the species in question are: *Apium nodiflorum* (now *Helosciadium nodiflorum*), *Rorippa nasturtium-aquaticum* (now *Nasturtium officinale*) and *Potamogeton pectinatus* (now *Stuckenia pectinata*). Reference to these changes will be made in the text that follows.

The classification involves calculating an Ecological Quality Index (EQI) for each metric based on the ratio of 'observed value : expected value'. The expected value is based on reference conditions using alkalinity, boat traffic and channel type data. For the purpose of standardisation, each EQI value is converted to an Ecological Quality Ratio (EQR), which ranges from 0 – 1, with class boundaries at intervals of 0.2 (1 - 0.8 = Maximum, 0.79 - 0.6 = Good, 0.59 - 0.4 = Moderate, 0.39 - 0.2 = Poor, 0.19 – 0 = Bad).

The overall EQR for a site is determined by calculating the average value from three groups of metrics: (i) EQR_{MFI} (reflecting water quality), (ii) EQR_{APB} and EQR_{N_AQUA} (reflecting in-channel disturbance) and (iii) EQR_{N_EMERG} and EQR_{REL_EMERG} (reflecting bank-related disturbance). To calculate the overall EQR for an AWB, EQR values are averaged across all sites in that AWB. The presence of invasive plant species (see Section 5) at a site will automatically result in a lowering of ecological potential for the macrophyte quality element (e.g., from Maximum to Good or from Good to Moderate).

The histograms that present results from annual macrophyte sampling (Figures 3.1 to 3.3) use the ten most commonly recorded species in the named canal systems in the year of sampling. Thus, the ten macrophyte species that were most commonly recorded across the Naas Line, Milltown Feeder and the Barrow Line in 2025 are presented in Figure 3.1, even though the species presented may not include species that were particularly vegetatively abundant at individual sampling sites.



Plate 3.1: The new towpath along the rewatered section of the Barrow Canal at Umeras (BL6) in July 2025.

3.3. Results

The results from macrophyte sampling conducted during summer 2024, including macrophyte species, communities and status at individual canal sites, are presented below.

The macrophyte species that were most widespread at monitoring sites on the canals in 2025 were *Glyceria maxima* (Reed Sweet-grass*), Iris pseudacorus* (Yellow Iris), *Alisma plantago-aquatica* (Water-plantain) *Phalaris arundinacea* (Reed Canary-grass) and *Elodea nuttallii* (Nuttall's Pondweed), present at 39, 38, 37, 34 and 34 of the 41 monitoring sites, respectively (Tables 3.1 to 3.3 and Figures 3.1 to 3.3). The most uncommon species recorded across the WFD monitoring sites on the canals system in 2025, each recorded at just a single site, were *Carex paniculata* (Greater Tussock-sedge), *P. crispus* (Curled Pondweed), *P. obtusifolius* (Blunt-leaved Pondweed) and the uncommon charophyte *Tolypella intricata* (listed as *Chara* sp. in Table 3.3) (see Tables 3.1 to 3.3).

3.3.1. Macrophyte Species and Assemblages in the Milltown Feeder (MF1)

At the time of sampling in mid-July 2025, the water level in the Milltown River at WFD monitoring site MF1 was relatively high and the water was clear. The weeds in the channel had recently been cut. Some 23 macrophyte species were recorded at this site, 13 of which were aquatic and 12 emergent, with *Sagittaria sagittifolia* (Arrowhead) and *Schoenoplectus lacustris* (Common Club-rush) being common to both categories (Table 3.1 and Figure 3.1).

In an effort to eradicate or at least significantly control the highly invasive submerged species *Crassula helmsii* (New Zealand Pigmyweed), which grew abundantly in sections of the Milltown Feeder and particularly at the WFD monitoring site MF1, Waterways Ireland (WI) conducted a dredging program in July 2024. During a previous survey of the entire length of the Milltown Feeder, the locations of all stands of this invasive species were identified and mapped. The dredging effort targeted and removed each *C. helmsii* stand from the channel and deposited it on the off-bank, which was subsequently closed to pedestrian users. Using the wheels of the excavator, the deposited weed was crushed into the ground, and the bankside area was later sprayed with Roundup Biactive. Further targeted dredging took place later in 2024 when, following a site survey, some regrowth of the invasive species was recorded.

When sampled in mid-July 2025 the macrophyte vegetation in the dredged channel and at the MF1 monitoring site was reasonably well recovered. The central channel at MF1 was dominated by trailing, mainly submerged stands of *S. lacustris* while the marginal channel areas supported occasional dense growths of trailing *S. sagittifolia* (Table 3.1). Among the submerged macrophyte species present, the spiny, low-growing *Chara hispida* (Bristly Stonewort) was the most common. A number of other species were present but each with low vegetative abundance (Table 3.1). While no *Eleogiton fluitans* (Floating Club-rush) was recorded at this site in 2024, where moderate stands of this delicate submerged plant were present in 2023, small stands were recorded close to the margins in 2025. No *E. nuttallii* (Nuttall's Pondweed) has been recorded at this site since 2020.

The extensive, bright green cushions of *Crassula helmsii* that previously dominated this WFD monitoring site were absent during sampling in 2025 and only a few individual live plants were recovered (in four of the ten grapnel hauls). Close observation of the channel at this site revealed no large or even moderate stands of the invasive plant, although the presence of even individual live plants is a cause for concern. It is recommended that the site be closely monitored over the coming winter period and that the status of the weed is determined and documented. As *C. helmsii* is winter-green and much of the native macrophyte vegetation will be dead at this time, it should be possible to identify and map any new stands of this invasive species that may appear.

During dredging operations in 2024, it had been necessary to remove much of the marginal and riparian vegetation along the off-bank. Some recovery among this vegetation was recorded during sampling in 2025. On the tow-bank, tall and mostly monospecific stands of *S. lacustris* and *Phragmites australis* (Common Reed) dominated this bankside. Along the wetted margins, a diversity of emergent species was present, with some forming locally dense stands (e.g., *Alisma plantago-aquatica, Iris pseudacorus, Carex acutiformis, Equisetum fluviatile* and *Glyceria maxima*) (Table 3.1).

3.3.2. *Macrophyte Species and Assemblages in the Naas Line of the Grand Canal*

The water in this section of the Naas Canal (NL1) was clear to the canal bed when sampled in July 2025. The aquatic vegetation had not been recently cut and much of the channel was overgrown with extensive, bright green cushions of the submerged species *Callitriche obtusangula* (Blunt-

fruited Water-starwort) (Plate 3.2). Nineteen macrophyte species were recorded at NL1 this year, with ten aquatic and ten emergent species present (*S. sagittifolia* was common to both categories).

Again this year, *Callitriche obtusangula* was clearly the dominant macrophyte species present, being recorded with a cover abundance score of 5 (>70%) throughout most of the site (Table 3.1). The only area where its dominance receded was in the short upstream section where tall trees caused significant shading of the channel. Floating carpets of filamentous green algae, both *Cladophora* and *Spirogyra*, were commonplace along the margins and trapped in the surface-growing stands of Water-starwort in the channel (Plate 3.2). In the gaps present between the dense *C. obtusangula* stands, a variety of other submerged species was recorded, most prominent among which was *Fontinalis antipyretica* (Greater Water-moss) (Table 3.1 and Figure 3.1). This dark green species formed bottom-covering, low-growing stands in exposed areas but also beneath the cushions of Water-starwort. Another species that was well represented in the exposed areas of channel was *Elodea nuttallii*, a species that was previously categorised as an invasive species in Irish canals. *Oenanthe fluviatile* (River Water-dropwort), *Myriophyllum verticillatum* (Whorled Water-milfoil), *S. sagittifolia* and *Sparganium emersum (*Unbranched Bur-reed) were also locally abundant in this weeded channel (Table 3.1).



Plate 3.2: Dense submerged cushions of Callitriche obtusangula (Blunt-fruited Water-starwort), many reaching the water surface, in the Naas Canal at NL1 in mid-July 2025.

In 2023, a single stem of the highly invasive species *Crassula helmsii* was retrieved in a grapnel haul from NL1. This was the first time that this species had been recorded from any location in the Naas Canal. This and adjacent sections of the Naas Canal were thoroughly monitored for the presence of this invasive plant in 2023, 2024 and 2025, but no further specimens were recorded.

As in previous years, *Glyceria maxima* clearly dominated the tall, emergent vegetation growing along both banksides at NL1 (Table 3.1 and Figure 3.1), alongside discrete stands of *Phalaris arundinacea*

(Reed Canary-grass) and *Phragmites australis*. Small stands of the fringing herbs *Berula erecta* (Lesser Water-parsnip), *Mentha aquatica* (Water Mint) and *Veronica anagallis-aquatica* (Blue Water-speedwell) were also present at the water's edge (Table 3.1).

3.3.3. Macrophyte Species and Assemblages in the Barrow Line (Grand Canal)

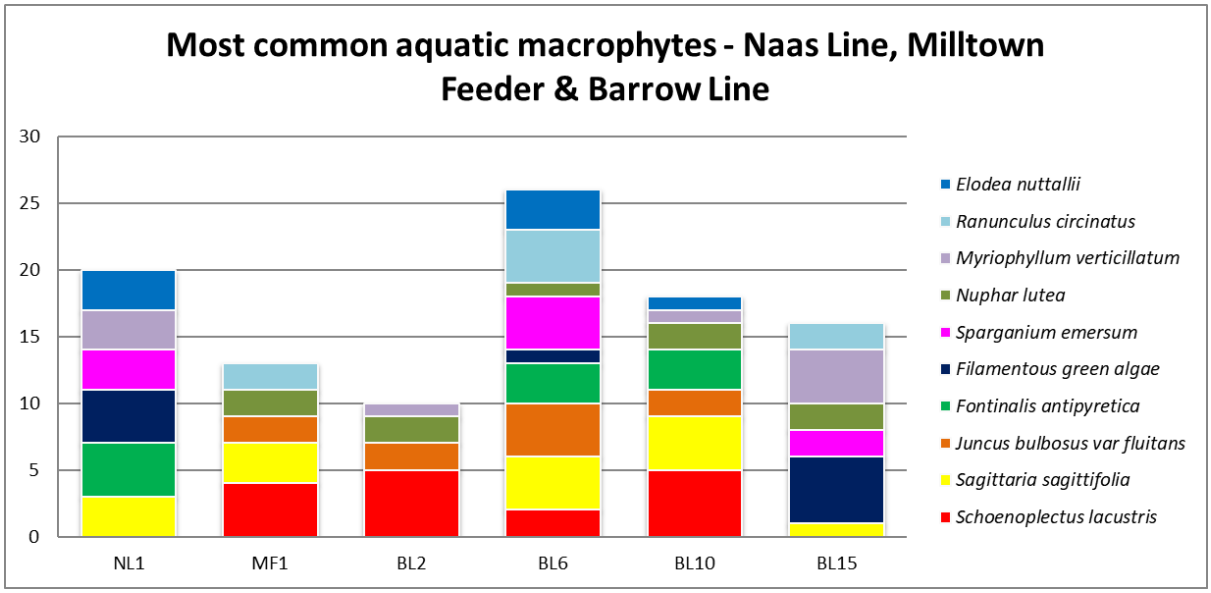
The aquatic weed in the Barrow Canal had been cut in the weeks prior to sampling, although significant stands of long, grassy vegetation occupied the main channel in many places. The water was generally clear.

Thirty-seven macrophyte species were recorded at the four Barrow Line monitoring sites in 2025, comprising 22 aquatic and 17 emergent species (*Schoenoplectus lacustris* and *Sagittaria sagittifolia* were common to both categories). Among the aquatic species, only *Nuphar lutea* (Yellow Water-lily) was present at all four WFD monitoring sites while, among the emergent species, *Alisma plantago-aquatica* (Water-plantain)*, Glyceria maxima* (Reed Sweet-grass) and *Iris pseudacorus* (Yellow Iris) were recorded at these four sites (Table 3.1 and Figure 3.1).



Plate 3.3: Submerged stands of Schoenoplectus lacustris (*Common Club-rush*) *densely carpet the full channel width at BL20 (south of Lock 20) on the Barrow Line in July 2025.*

The submerged flora at BL2 (south of Lock 20) was dominated with very dense, trailing stands of *S. lacustris* (Plate 3.3). While the majority of the vegetation in the channel comprised long and tangled, submerged leaves, significant numbers of tall, erect stems also occupied this aquatic zone. The dense and shade-inducing growth of this dominant vegetation has clearly impacted the colonisation and establishment of other submerged macrophyte species, although small and localised stands of *Eleogiton fluitans* (Floating Club-rush) and *Juncus bulbosus* var *fluitans* (Aquatic Bulbous Rush) dotted the channel (Table 3.1).



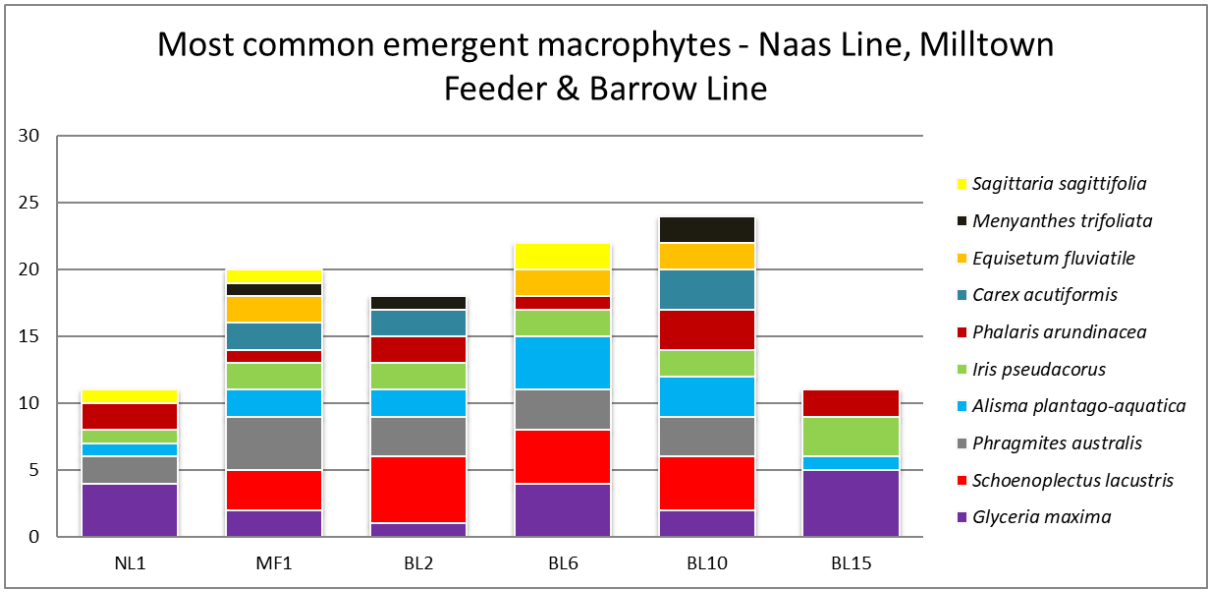


Figure 3.1 Relative representations, based on DAFOR abundance, of the ten most commonly recorded aquatic and emergent macrophyte species at WFD sites in the Naas Line, Milltown Feeder and Barrow Line in 2025. (The figures presented are those recorded on the date of sampling and do not take into account prior weed cutting operations at these sites.)

The channel margins and lower bankside zones of the canal at this site were dominated with tall, emergent and often continuous stands of *S. lacustris* (Table 3.1 and Figure 3.1). This monospecific vegetation was occasionally interrupted by very tall, monodominant stands of *Phragmites australis,* which tended to grow further up the banksides in drier soil. This vegetation had been severely cut in 2024 but had regrown to its typical height. In the wetted margins, occasional discrete stands of *Alisma plantago-aquatic, Menyanthes trifoliata* (Bogbean), *Carex acutiformis* (Lesser Pond-sedge), *I. pseudacorus* and *Glyceria maxima* were present (Table 3.1).

The section of the Barrow Canal that hosts the Umeras (BL6) site has endured disturbance and seriously fluctuating water levels in recent years, resulting from adjacent Greenway construction works. At the time of sampling in July 2025, these works had been completed and water levels were

back to normal (see Plate 3.1). Accepting all of the disturbance that the channel, and this WFD monitoring site, endured, it continued to host the most diverse aquatic and emergent macrophyte flora of the four Barrow Canal sites sampled in 2025 (Table 3.1). Aquatic macrophytes with long trailing leaves dominated the channel flora in 2025, with *S. sagittifolia, S. emersum* and *S. lacustris* being most prominent. Other species that were well represented at this site were *J. bulbosus* var *fluitans* and *Ranunculus circinatus* (Fan-leaved Water-crowfoot), both recorded with an abundance score of 4 (31–70%). Locally dense and commonly discrete stands of *Elodea nuttallii* and *Fontinalis antipyretica* were present throughout the site. Both the broad-leaved *Potamogeton perfoliatus* (Perfoliate Pondweed) and the narrow-leaved *Stuckenia pectinata* (Fennel Pondweed – previously named *P. pectinatus*) were also present in the channel (Table 3.1). In 2023, the channel at this site was dominated by *Myriophyllum verticillatum* (Whorled Water-milfoil). In 2024, this species was recorded in only one of the ten grapnel hauls taken, while no specimens of the plant were recorded in 2025. Two charophyte species were recorded in the channel, although none with any significant abundance (Table 3.1).

During water sampling in August 2024, a fragment of live *Crassula helmsii* was recorded floating at this site. A subsequent survey that year failed to recover any *C. helmsii* specimens. The site was closely examined during sampling in 2025 to determine if any stands of this highly invasive species were present, but none were recorded.

As in previous years, tall stands of *S. lacustris, G. maxima* and *A. plantago-aquatica* dominated the emergent flora along the wetted margins on both banksides in 2025 (Table 3.1 and Figure 3.1). Amongst this tall vegetation, a number of low-growing fringing herb species, including *Mentha aquatica* (Water Mint), *Myosotis scorpioides* (Water Forget-me-not) and *Nasturtium officinale* (Water-cress – previously named *Rorippa nasturtium-aquatica*) were recorded. No *Baldellia ranunculoides* (Lesser Water-plantain), first recorded here in 2023, was recorded from the shallow margins of BL6 on this sampling occasion.

At the monitoring site upstream of Vicarstown (BL10), dense trailing stands of *S. sagittifolia* and *S. lacustris* occupied practically the full channel width and depth during sampling in August 2025 (Table 3.1, Figure 3.1 and Plate 3.4). Beneath this tangled and trailing vegetation, low-growing stands of *Fontinalis antipyretica* (Greater Water-moss) grew on the canal bed. Small, localized stands of another species with trailing leaves, *J. bulbosus* var *fluitans,* were also present here, but with significantly less vegetative abundance (Table 3.1). Just a single stand of the large, broad-leaved pondweed species *Potamogeton praelongus* (Long-stalked Pondweed) was recorded in 2025.

Tall, monodominant stands of *Schoenoplectus lacustris* proliferated along both banksides, although dense stands of *Phragmites australis* commonly alternated with these monospecific growths. Tall and leafy stands of *Phalaris arundinacea* grew scattered in this upper bankside habitat. As in previous years, tall and dense stands of *Carex acutiformis* (Lesser Pond-sedge) formed continuous grassy stands at the water's edge, in places. Other emergent species recorded growing along these wet

margins included *A. plantago-aquatica, I. pseudacorus, E. fluviatile* (Water Horsetail), *Menyanthes trifoliata* and *G. maxima* (Table 3.1).



Plate 3.4: Trailing submerged stands of Schoenoplectus lacustris (Common Club-rush) and *Sagittaria sagittifolia (Arrowhead) dominate the aquatic macrophyte flora in the Barrow Canal north of Vicarstown (BL10) in August 2025.*

As in 2024, the aquatic flora in the Athy section of the Barrow Canal (BL15) was overgrown with long, tangled plumes of filamentous green algae when sampled in July 2025. There were few surface scums but much of the water column was filled with this alga. It is surprising but in the relatively shaded habitat beneath this algal cover, healthy and extensive stands of both *Myriophyllum verticillatum* (Whorled Water-milfoil) and *M. spicatum* (Spiked Water-milfoil) were present (Table 3.1 and Figure 3.1). While both species formed discrete stands, they also grew together in relatively tangled masses. Occasional robust stands of *Hippuris vulgaris* (Mare's Tail) broke the water surface, only to be draped with scum-like green algae. A single small stand of the free-floating *Utricularia vulgaris* (Greater Bladderwort) was recovered in a grapnel haul taken close to the lock gates, where the canal discharges to the River Barrow. In 2019 and 2020, the rare charophyte *Tolypella intricata* was recorded at this site but no specimens of this species have been recorded here since.

The emergent flora along the water margins at BL15 was totally dominated by relatively tall, mostly monospecific stands of *Glyceria maxima*. Occasional dense stands of *Iris pseudacorus* and *Phalaris arundinacea* (Reed Canary-grass) were also present along these well vegetated banksides (Table 3.1).

3.3.4. Macrophyte Species and Assemblages on the Grand Canal

A total of 52 macrophyte species, including 30 aquatic and 25 emergent species, were recorded from the 18 WFD monitoring sites on the Grand Canal during 2025 (*S. lacustris, S. sagittifolia* and *S. emersum* were common to both categories). Grand Canal East (GCE) and Grand Canal West (GCW) sites each supported 43 species (Tables 3.1 and 3.2).

Table 3.1. Abundance values for aquatic and emergent macrophyte species in Grand Canal sites east of the summit (GCE), the Naas Line, Milltown feeder and Barrow Line in summer 2025. Abundance values - Dominant (>70%) = 5; Abundant (31 – 70%) = 4; Frequent (11 – 30%) = 3; Occasional (3 – 10) = 2; Rare (< 3%) = 1

Name	GCE1	GCE4	GCE6	GCE8	GCE10	GCE12	GCE14	NL1	MF1	BL2	BL6	BL10	BL15
Submerged													
Callitriche obtusangula			3	3				5					2
Chara globularis					3								
Chara hispida	1				5	3			3	1	2		
Chara sp.	1	1				3	1		1		1		
Crassula helmsii	2						2		1				
Eleogiton fluitans									1	2			
Elodea canadensis	3				1		3	2	2		1		
Elodea nuttallii	3	2	4	5	2		1	3			3	1	
Filamentous green algae	1	1	5	2		2	3	4			1		5
Fontinalis antipyretica	1	1		2			2	4			3	3	
Hippuris vulgaris	1	1	3				1	2	1				3
Juncus bulbosus var *fluitans*	2	3							2	2	4	2	
Lemna trisulca			4	3		2			1				
Myriophyllum spicatum													4
Myriophyllum verticillatum	1		3					3		1		1	4
Nuphar lutea	1		4	3			3		2	2	1	2	2
Oenanthe fluviatilis	3	2			4	3		3					
Persicaria amphibia	1	1		1					1	1			1
Potamogeton lucens		2	1										
Potamogeton natans	1												
Potamogeton perfoliatus											2		
Potamogeton praelongus												1	
Ranunculus circinatus				1	1				2		4		2
Sagittaria sagittifolia	5	5	3	4	5	5	3	3	3		4	4	1
Schoenoplectus lacustris	3			1					4	5	2	5	
Sparganium emersum	1						2	3			4		2
Stuckenia pectinata											1		
Utricularia vulgaris s.l.													1
Emergent													
Alisma plantago-aquatica		2		1	1	1	2	1	2	2	4	3	1
Berula erecta								1					
Butomus umbellatus					3	1	1						
Carex acutiformis	2	3		2					2	2		3	
Carex sp.			2				2						
Equisetum fluviatile	2		3	2	2		2		2		2	2	
Glyceria maxima	3	4	5	4	3		4	4	2	1	4	2	5
Helosciadium nodiflorum						1							
Hippuris vulgaris	1		3						1	2			1
Iris pseudacorus	3	3	3	1	1	3	3	1	2	2	2	2	3
Juncus inflexus		2	1	2				1			1		
Mentha aquatica		1		2	1		3	1			2		
Menyanthes trifoliata	1								1	1		2	
Myosotis scorpioides											2		
Nasturtium officinale									1		2		
Phalaris arundinacea	2	3	3	3	1	1	2	2	1	2	1	3	2
Phragmites australis	4	3			3	5	2	2	4	3	3	3	
Ranunculus lingua											2	1	
Sagittaria sagittifolia	3	2	2	3	4	3	1	1	1		2		
Schoenoplectus lacustris	3		1	2					3	5	4	4	
Sparganium emersum		1											
Sparganium erectum		3	2	3	4	2	2						
Typha latifolia			1	2						1			
Veronica anagallis-aquatica agg.								1					



Plate 3.5: A cruiser berthed immediately upstream to the WFD monitoring site at Robertstown (GCE1) in July 2025.

Species that were recorded at monitoring sites in GCE but not at sites in GCW in 2025 were – *Callitriche obtusangula* (Blunt-fruited Water-starwort), *Hippuris vulgaris* (Mare's-tail), *Oenanthe fluviatile* (River Water-dropwort), *Helosciadium nodiflorum* (Fool's-water-cress – previously named *Apium nodiflorum*), *Butomus umbellatus* (Flowering Rush), *Carex remota* (Remote Sedge – listed as *Carex* sp. in Table 3.1), *Nasturtium officinale* (Water-cress – previously named *Rorippa nasturtium-aquaticum*) and *Veronica anagallis-aquatica* (Blue Water-speedwell), while species present at GCW but not at GCE sites included – four *Potamogeton* species *P. obtusifolius* (Blunt-leaved Pondweed), *P. perfoliatus* (Perfoliate Pondweed), *P. praelongus* (Long-stalked Pondweed) and *P. pectinatus* (Fennel Pondweed – now named *Stuckenia pectinata*), in addition to *Chara vulgaris* (Common Stonewort), *Eleogiton fluitans* (Floating Club-rush), *Myriophyllum spicatum* (Spiked Milfoil), *Utricularia vulgaris* (Greater Bladderwort), *Berula erecta* (Lesser Water-parsnip), *Juncus acutiflorus* (Sharp-flowered Rush) and *Ranunculus lingua* (Greater Spearwort) (Tables 3.1 and 3.2).

In 2025, only *I. pseudacorus* (Yellow Iris) and *S. sagittifolia* (Arrowhead) were recorded at all 18 WFD sites on the Grand Canal (Tables 3.1, 3.2 and Figure 3.2). Three species were present at all seven GCE sites (*S. sagittifolia, I. pseudacorus* and *Phalaris arundinacea* (Reed Canary-grass)), while *S. sagittifolia, Iris pseudacorus, A. plantago-aquatica* and *Schoenoplectus lacustris* were recorded at all 11 sites on GCW (Tables 3.1, 3.2 and Figure 3.2).

It has generally been those aquatic macrophytes that possess long, streamlined and submerged, or occasionally floating, leaves that have posed most difficulty for canal navigation and for canal maintenance crews (be it on the Grand or Royal Canals). This reflects the difficulty experienced while trying to achieve a deep cut on this vegetation, regardless of the types of weed cutting machinery employed. Even where the vegetation grows abundantly and occupies much of the water column, it

has always proved difficult for the blades on the cutting craft to gain purchase on the leaves as their streamlined form helps them sink close to the canal bed and out of the reach of the blades (which cannot cut too close to the canal bed for fear of damaging the blades or tearing the canal membrane). As a consequence, these troublesome species continue to proliferate in the canals. The principal species involved are *Sagittaria sagittifolia, Schoenoplectus lacustris* and *Sparganium emersum*.

Throughout the WFD monitoring sites on the Grand Canal in 2025, *S. sagittifolia* was by far the dominant species, being present at all 18 sites (Tables 3.1, 3.2 and Figure 3.2). The plant, in its submerged or floating-leaved form, achieved its greatest expression at sites on GCE, where it recorded cover abundance values of $\geq$4 (31-70%) at five of the seven sites and of 3 (11-30%) at the other two sites (Table 3.1 and Plate 3.6). *Sagittaria sagittifolia*, again in its submerged or floating leaved form, was recorded with less abundance at sites on GCW and was only recorded with a cover abundance value of 5 (>70%) at one site – GCW22 (west of Pollagh). It was recorded with a score of 3 (11-30%) at three sites and a score of 2 (3-10%) at five sites. *Schoenoplectus lacustris*, in its submerged form, was recorded at ten of the 11 monitoring sites on GCW but at only two sites, with low cover abundance, at GCE sites (Tables 3.1 and 3.2). The plant was recorded with an abundance score of 5 (>70%) at just one site (GCW1 - Bond Bridge) and a score of 4 at three sites (GCW20 – Cornalaur, GCW24 – east of Armstrong Bridge and GCW27 – L'Estrange Bridge). *Sparganium emersum,* in its submerged and floating-leaved form, was present at only three monitoring sites on the Grand Canal, two on GCE and one on GCW, and all with relatively low cover abundance (Tables 3.1 and 3.2). It is notable that *S. emersum* is the dominant species among these three species at monitoring sites on the Royal Canal and particularly at RCE sites (see Table 3.3). The three of these streamlined-leaved species were only recorded growing together at two Grand Canal sites – GCE1 (Robertstown) and GCW24 (east of Armstrong Bridge).



Plate 3.6: Very dense submerged and floating-leaved macrophyte growth (mainly Sagittaria sagittifolia) on the Grand Canal at Hazelhatch (GCE8) (left), prior to weed cutting taking place in July 2025 (right).

Elodea nuttallii, previously categorised as an invasive species for WFD canal classification purposes, was recorded from 16 of the 18 monitoring sites on the Grand Canal in 2025. The two sites from which the species was not recorded in grapnel hauls this year were GCE12 (Blackhorse) and GCW1 (Bond Bridge). Because of the height and density of *Phragmites australis* on the banksides of the

former site, it was difficult relatively low abundance and did not represent a problem for the native flora or the canal habitat. The closely related species *Elodea canadensis* (Canadian Pondweed) was recorded at just five sites and, generally, with low cover abundance (Tables 3.1 and 3.2).



Plate 3.7: Submerged stands of the invasive macrophyte Crassula helmsii (New Zealand Pigmyweed) along the shallow margins of the Grand Canal at GCW8 (east of Rhode) in August 2025.

The highly invasive submerged macrophyte *Crassula helmsii* (New Zealand Pigmyweed) continued to grow with considerable abundance (cover abundance value of 5) at GCW4 (Lock 20) and large clumps of the plant were retrieved in each of the ten grapnel hauls at this site. While stands of this weed were previously restricted to the margins of the channel, it now grows vigorously across the full width and in water to 1.8m deep. In 2025 this invasive weed grew more abundantly (score – 3) at GCW1 (Bond Bridge) and GCW6 (George's Bridge) than in previous years. It is notable, however, that the species has not expanded its range in the Grand Canal since 2021 and continues to be recorded from two in GCE and four sites in GCW (Tables 3.1 and 3.2). As stated in previous reports, this is encouraging as the plant has not demonstrated the explosive spread in the canals for which it is renowned elsewhere.

Six *Potamogeton* species, including *Potamogeton pectinatus* (Fennel Pondweed - now named *Stuckenia pectinata*), were recorded at monitoring sites on the Grand Canal in 2025. *Potamogeton obtusifolius* (Blunt-leaved Pondweed) and *P. praelongus* (Long-stalked Pondweed) were each recorded at just one site, while *P. perfoliatus* (Perfoliate Pondweed) and *P. pectinatus* were present at three and five sites, respectively, and at none with any significant vegetative cover (Tables 3.1 and 3.2). *Potamogeton natans* (Broad-leaved Pondweed) and *P. lucens* (Shining Pondweed) were better represented at Grand Canal sites, and particularly those in GCW. The latter species was recorded at all seven GCW sites from GCW12 (Daingean) westward to GCW27 (L'Estrange Bridge), and at none with a cover abundance value of <3 (Table 3.2). *Potamogeton* species were very poorly represented at GCE sites, with only three records for two species at three sites (Table 3.1).

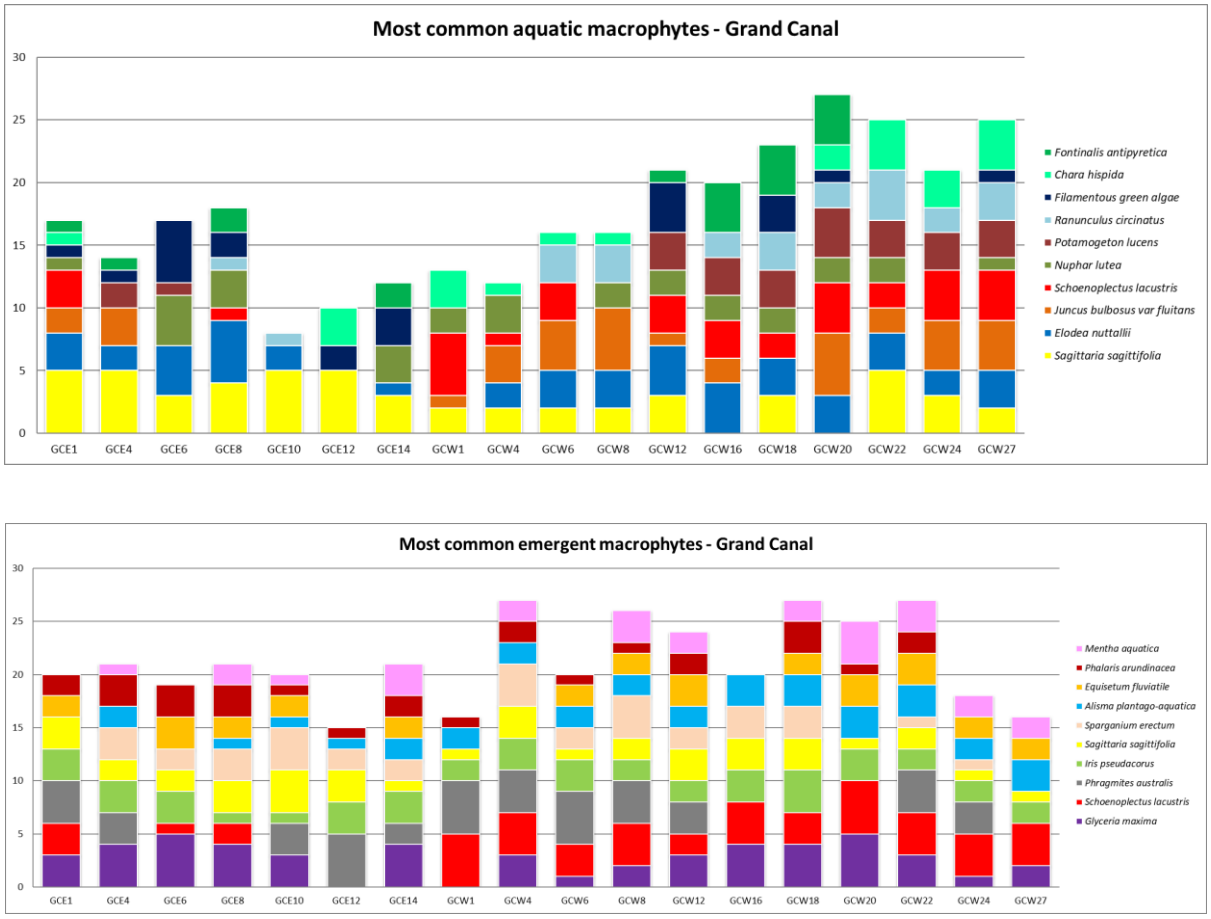


Figure 3.2 Relative representations, based on DAFOR abundance, of the ten most commonly recorded aquatic and emergent macrophytes at WFD sites in the Grand Canal in 2025. (The figures presented are those recorded on the date of sampling and do not take into account prior weed cutting operations at these sites.)

Four charophyte species were recorded from monitoring sites in GCW, while three were recorded from sites in GCE. The most widespread and vegetatively abundant species was *Chara hispida* (Bristly Stonewort), which was recovered in grapnel hauls from three GCE and eight GCW sites (Tables 3.1 and 3.2). This robust and bristly charophyte formed extensive, bushy stands across the channel at GCE10 (Clondalkin), GCW22 (west of Pollagh) and GCW27 (L'Estrange Bridge). Elsewhere, it was present with relatively low abundance.

In the past, *Myriophyllum verticillatum* (Whorled Water-milfoil) posed significant problems for navigation and canal maintenance crews in both the Grand and Royal Canals. Its dense and tangled vegetation grew from bank to bank and commonly filled the water column. In recent years, however, its status as a problematic species in the canals has significantly diminished and, at most sites from which it is currently recorded, the plant grows with relatively low abundance (Tables 3.1 and 3.2).

Table 3.2. Abundance values for aquatic and emergent macrophyte species in Grand Canal sites west of the summit (GCW) in summer 2025. Abundance values - Dominant (>70%) = 5; Abundant (31 – 70%) = 4; Frequent (11 – 30%) = 3; Occasional (3 – 10%) = 2; Rare (<3%) = 1.

Name	GCW1	GCW4	GCW6	GCW8	GCW12	GCW16	GCW18	GCW20	GCW22	GCW24	GCW27
Submerged											
Chara globularis											1
Chara hispida	3	1	1	1				2	4	3	4
Chara sp.			1			1				1	2
Chara vulgaris			2								
Crassula helmsii	3	5	3	2							
Eleogiton fluitans		3	3								
Elodea canadensis										1	2
Elodea nuttallii		2	3	3	4	4	3	3	3	2	3
Filamentous green algae					4		3	1			1
Fontinalis antipyretica					1	4	4	4			
Juncus bulbosus var *fluitans*	1	3	4	5	1	2		5	2	4	4
Lemna trisulca						3					
Myriophyllum spicatum			1		1		1				1
Myriophyllum verticillatum			1	1	4		3		2	1	2
Nuphar lutea	2	3		2	2	2	2	2	2		1
Persicaria amphibia		1					1				
Potamogeton lucens					3	3	3	4	3	3	3
Potamogeton natans		3	2	2	1			3	1		1
Potamogeton obtusifolius							1				
Potamogeton perfoliatus		2	1	1							
Potamogeton praelongus	1										
Ranunculus circinatus			3	3		2	3	2	4	2	3
Sagittaria sagittifolia	2	2	2	2	3		3		5	3	2
Schoenoplectus lacustris	5	1	3		3	3	2	4	2	4	4
Sparganium emersum										3	
Stuckenia pectinata					2			1	3	1	1
Utricularia vulgaris s.l.				1	2		2		1		
Emergent											
Alisma plantago-aquatica	2	2	2	2	2	3	3	3	3	2	3
Berula erecta		1			3	1					
Carex acutiformis		3	3	3		2			2		2
Equisetum fluviatile			2	2	3		2	3	3	2	2
Glyceria maxima		3	1	2	3	4	4	5	3	1	2
Iris pseudacorus	2	3	3	2	2	3	4	3	2	2	2
Juncus acutiflorus									1		
Juncus inflexus			2	1	2				1		3
Mentha aquatica		2		3	2		2	4	3	2	2
Menyanthes trifoliata		3		2	1					2	1
Myosotis scorpioides		1									
Phalaris arundinacea	1	2	1	1	2		3	1	2		
Phragmites australis	5	4	5	4	3				4	3	
Ranunculus lingua										3	
Sagittaria sagittifolia	1	3	1	2	3	3	3	1	2	1	1
Schoenoplectus lacustris	5	4	3	4	2	4	3	5	4	4	4
Sparganium emersum					1						
Sparganium erectum		4	2	4	2	3	3		1	1	
Typha latifolia		2		3			2		2		

At only one site, GCW12 (Daingean), did this species grow with a cover abundance value >3. As in 2024, no specimens of the related *M. spicatum* (Spiked Water-milfoil) were recorded at any GCE site and this species was only recorded with very low vegetative abundance at four GCW sites (Tables 3.1 and 3.2).

The low-growing moss *Fontinalis antipyretica* (Greater Water-moss), a species more typical of the Royal Canal, was recorded at four GCE sites and all with low abundance (Table 3.1). It found its best

vegetative expression at three sites in GCW (GCW16 (Tullamore), GCW18 (Ballycowan) and GCW20 (Cornalaur) where it formed a major component of the submerged flora. It is interesting that no specimens of this species were recovered in grapnel hauls at the three monitoring sites downstream of these sites (Table 3.2).



Plate 3.8: Carpets of floating filamentous algae present amongst the marginal vegetation on the Grand Canal west of Daingean (GCW1) in July 2025.

Juncus bulbosus var *fluitans* (Aquatic Bulbous Rush) was recorded from ten of the 11 monitoring sites in GCW and at five of these with a cover abundance of ≥4. It was only recorded from two of the seven sites in GCE (Table 3.1).

Among the emergent species, *Iris pseudacorus* (Yellow Iris) and *Sagittaria sagittifolia* (Arrowhead) were the only two that were present at all 18 Grand Canal monitoring sites in 2025. *Glyceria maxima* grew abundantly and dominated the physiognomy of many sites, often forming continuous, light green stands that grew both in the water and on the lower, drier bankside margins. In a similar aquatic habitat, a number of other macrophyte species proliferated, including *Alisma plantago-aquatica* (Water Plantain), *Carex acutiformis* (Lesser Pond-sedge), *Sparganium erectum* (Branched Bur-reed) and *Equisetum* spp. (Horsetails) (Tables 3.1, 3.2 and Figure 3.2). *Equisetum fluviatile* is the species listed in Tables 3.1 to 3.3 as it is the only *Equisetum* species that is listed for WFD classification purposes. The dominant *Equisetum* species recorded along the banksides at most Grand Canal (and Royal Canal) sites was *Equisetum arvense* (Field Horsetail) although, at one site (GCW12 – Daingean), the more aquatic *Equisetum variegatum* (Variegated Horsetail) was the most common Horsetail species present. (This was the only site of the 41 sites monitored where *E. variegatum* was recorded.) This marginal aquatic habitat was also the habitat favoured by those fringing herbs that were present at Grand Canal sites, including *Berula erecta* (Lesser Water-parsnip), *Helosciadium nodiflorum* (Fool's Water-cress) – previously named *Apium nodiflorum*, *Nasturtium officinale* (Water-cress) – previously named *Rorippa nasturtium-aquaticum, Myosotis*

scorpioides (Water Forget-me-not) and *Mentha aquatica* (Water Mint) (Tables 3.1 and 3.2). *Butomus umbellatus* (Flowering Rush) was recorded at three sites, all of which were in GCE (Table 3.1).

Often growing in the water but also up the banksides was the tall, deep green, spear-shaped *Schoenoplectus lacustris*. This rush dominated the bankside flora at many sites in GCW but was poorly distributed and grew with less vegetative abundance at GCE sites (Tables 3.1, 3.2 and Plate 3.9). In the former, this species formed long, continuous and mostly monodominant stand along both banksides, although at some sites, notably those five sites from GCW1 (Bond Bridge) to GCW12 (Daingean), equally tall and dense stands of *Phragmites australis* (Common Reed) commonly interrupted the dominance of the latter. This species was better represented and occasionally dominated the emergent flora at sites in GCE (Table 3.1). Another tall emergent species that occupied the banksides at 15 of the 18 monitoring sites was *Phalaris arundinacea* (Reed Canary-grass). This plant rarely formed dense monodominant stands but rather grew in more straggling stands alongside the more robust reed and rush species.



Plate 3.9: Stands of Schoenoplectus lacustris (Common Club-rush) densely encroach from both margins on the Grand Canal at Cornalaur (GCW20) in July 2025.

3.3.5. Macrophyte Species and Assemblages on the Royal Canal

Fifty-one macrophyte species were recorded at the 17 WFD monitoring sites on the Royal Canal in 2025. These comprised 29 aquatic and 25 emergent species (*S. lacustris, S. sagittifolia* and *S. emersum* were common to both categories). At sites in Royal Canal East (RCE), some 24 aquatic and 23 emergent species were recorded, while west of the summit in Royal Canal West (RCW), some 25 aquatic and 15 emergent species were present (Table 3.3).



Plate 3.10: Grey Heron aboard a moored cruiser along the reeded margins of the Royal Canal east of Kilcock (RCE16) in July 2025.

Species that were recorded at monitoring sites in RCE but not in RCW in 2025 were – *Callitriche obtusangula* (Blunt-fruited Water-starwort)*, Elodea canadensis* (Canadian Pondweed), *Utricularia vulgaris* (Greater Bladderwort), *Helosciadium nodiflorum* (Fool's-water-cress – previously named *Apium nodiflorum*), *Berula erecta* (Lesser Water-parsnip)*, Carex paniculata* (Greater Tussock-sedge), *Hippuris vulgaris* (Mare's-tail), *Juncus effusus* (Soft Rush), *Menyanthes trifoliata* (Bogbean), *Nasturtium officinale* (Water-cress – previously named *Rorippa nasturtium-aquaticum*) and *Veronica anagallis-aquatica* (Blue Water-speedwell), while those species recorded at RCW sites but not at RCE sites were – *Chara curta* (Lesser-bearded Stonewort), *Chara vulgaris* (Common Stonewort), *Myriophyllum spicatum* (Spiked Water-milfoil), *Potamogeton crispus* (Curled Pondweed), *P. perfoliatus* (Perfoliate Pondweed) and *Phragmites australis* (Common Reed) (Table 3.3). *Glyceria maxima* (Reed Sweet-grass) was the only macrophyte species recorded at all 17 WFD monitoring sites on the Royal Canal in 2025. *Elodea nuttallii* (Nuttall's Pondweed) and *Alisma plantago-aquatica* (Water-plantain) were each present at 15 sites (Table 3.3 and Figure 3.3).

As in 2024, *Sparganium emersum* (Unbranched Bur-reed), in its submerged and floating-leaved form, was a significant component of the aquatic flora and was present at eight RCE and three RCW site. At the time of sampling, it dominated the aquatic flora at six of these sites, being present with an abundance score of 5 (>70%) at three sites (RCE6 – Thomastown, RCE8 – Hill of Down, RCE14 – Fern's Lock) (see Plate 3.12) and 4 (31-70%) at another three sites (RCE9 – Moyvalley, RCE16 – east of Kilcock, RCW5 – Kildallan Bridge). As stated previously, this is an extremely difficult plant to cut effectively and despite trojan efforts by canal maintenance crews, it remains an annual problem for canal navigation at the above sites and in long sections of the canal. It is interesting that this species poses few problems at Grand Canal sites and that the problems for navigation here are primarily posed by another species with long, trailing and streamlined leaves - *S. sagittifolia* (Tables

3.1 to 3.3). The latter species, in its submerged or floating-leaved form, was present at seven RCE but at no RCW sites. A single small stand of emergent *S. sagittifolia* was recorded along the margins at RCW1 (Mullingar). At RCE4 (McNead's Bridge) this species, in its submerged, floating-leaved and emergent forms, grew so abundantly that it totally filled the water column and occupied the channel practically from bank to bank. Water was only visible in a narrow channel that had been cleared by weed cutting crews (see Plate 3.12). Dense growths of this species also posed problems for navigation at RCE16 (east of Kilcock).

Elodea nuttallii, previously categorised as an invasive species in Irish canals, was present at all RCW sites and grew abundantly (cover abundance of 4 – 31-70%) at three of the sites (Table 3.3). At these sites, this was not necessarily the dominant submerged plant and occasionally grew alongside or beneath species such as *Potamogeton lucens, P. praelongus* and *Juncus bulbosus* var *fluitans*. In RCE, *E. nuttallii* was the dominant submerged species at just one site – RCE12 (Cloncurry), although here it grew alongside dense, spreading stands of the low-growing moss *Fontinalis antipyretica* (Greater Water-moss). Another site where this species has regularly been recorded with considerable abundance was RCE25 (Croke Park), as was again the case in 2025, when the species was recorded with a cover abundance value of 4 (31-70%). This site had been practically dewatered for many months while Greenway construction works were ongoing but was back in-water at the time of sampling. While *E. nuttallii* was the dominant submerged macrophyte present here, the weed in the channel was carpeted with dense plumes of filamentous green algae (Plate 3.11). In 2025, the related *Elodea canadensis* (Canadian Pondweed) was not recorded at any RCW sites but was present at six of the ten RCE sites. This species grew with more vegetative abundance than *E. nuttallii* at a number of these sites (Table 3.3).



Plate 3.11: The newly rewatered section of the Royal Canal at Croke Park (RCE25), supporting dense stands of Nuttall's Waterweed (Elodea nuttallii) that are carpeted with filamentous green algae, in July 2025.

Table 3.3. Abundance values for aquatic and emergent macrophyte species for the Royal Canal (east and west of the summit) in summer 2025. Abundance values - Dominant (>70%) = 5; Abundant (31 – 70%) = 4; Frequent (11 – 30%) = 3; Occasional (3 – 10%) = 2; Rare (<3%) = 1.

Name	RCE4	RCE6	RCE8	RCE9	RCE12	RCE14	RCE16	RCE19	RCE22	RCE25	RCW1	RCW3	RCW5	RCW7	RCW9	RCW12	RCW14
Submerged																	
Callitriche obtusangula		1								3							
Chara curta																	1
Chara globularis	1									3	1						
Chara hispida	3			3		3	3							2		3	3
Chara sp.						3	1		1					2			
Chara vulgaris														1			
Elodea canadensis				3	3	1	2	4	3								
Elodea nuttallii	3	3		1	5	1	2	3		4	3	4	2	2	3	4	4
Filamentous green algae	1	3				1	3	3	3	5	4				3		3
Fontinalis antipyretica		1		3	4	4	4	1			1	2		3	5	3	1
Hippuris vulgaris		1			3		2	5	1				1				1
Juncus bulbosus var *fluitans*				2									2	4		5	4
Lemna trisulca		1			3		3	3	4	3		1			3	2	
Myriophyllum spicatum											1		4	2			1
Myriophyllum verticillatum		1	2		3	2	5		4		1						3
Nuphar lutea	3	2	2	4	4	3	2	4	3			2	3	3	3	2	
Oenanthe fluviatilis	2				1		1					1	3	5	3	3	1
Persicaria amphibia	2	2	1	2		2	1		1	1	2	1					2
Potamogeton crispus											1						
Potamogeton lucens			4	4	3	3		1								3	4
Potamogeton natans	1	2	3		2		1	3				2			1	3	2
Potamogeton perfoliatus											1					1	
Potamogeton praelongus		1									3	4	3		1		
Ranunculus circinatus		1	1	2	3	2	1						1	2			1
Sagittaria sagittifolia	5		1	3	2	3	4		2								
Schoenoplectus lacustris			1					1				2		3			
Sparganium emersum		5	5	4	3	5	4	3	2				4			2	1
Stuckenia pectinata				2								2		3			
Utricularia vulgaris s.l.		3				3											
Emergent																	
Alisma plantago-aquatica	2	2	3	2	3	3	2	2	3		2		1	2	1	1	2
Berula erecta	1	2		1													
Carex acutiformis	4		3	4		2		2			3	2	3	3	5	3	4
Carex paniculata			1														
Carex spp.									1								
Equisetum fluviatile	2		2		2	2		2	3	1	2		1	1		2	2
Glyceria maxima	3	5	3	3	4	3	4	3	4	3	5	4	4	4	4	4	4
Helosciadium nodiflorum										3							
Hippuris vulgaris					2		1			1							
Iris pseudacorus	2	3	2	3	2		2	3	4		3	3		3	2	2	3
Juncus articulatus	1																3
Juncus effusus								1									
Juncus inflexus	1		3	3		1					1	2		2		4	3
Mentha aquatica	3		2	1				3					1	1		3	3
Menyanthes trifoliata			1														
Nasturtium officinale										4							
Phalaris arundinacea	4	3		2	3	3	3	2	2	3	3	4	1	1	1		
Phragmites australis													2				
Ranunculus lingua	2		2	3	2			3	1				1			2	2
Sagittaria sagittifolia	5			2	2	3	2			1	1						
Schoenoplectus lacustris	3		4	4			4	2						4	2	2	
Sparganium emersum			1	1			3	1	1								
Sparganium erectum	2	2	3	1	3	4		4	2			2		4	2	3	4
Typha latifolia	3		2					1			3					3	1
Veronica anagallis-aquatica agg.										3							

The status of the submerged species *Myriophyllum verticillatum*, a previously problematic species in Irish canals, has significantly decreased since 2021, when it was present at all 17 monitoring sites and with an abundance value of ≥4 at four of these sites. In 2025, *M. verticillatum* was recorded at eight sites, six in RCE and two in RCW, but with a cover abundance value of ≥4 at only two sites –

RCE16 (east of Kilcock) and RCE22 (Castleknock) (Table 3.3). As in 2024, the closely related *M. spicatum* was not recorded at any of the monitoring sites in RCE and was present with low abundance at three of the seven RCW sites (Table 3.3). At RCW5 (Kildallan Bridge), however, this species was the dominant submerged macrophyte and grew abundantly beneath dense trailing stands of *Sparganium emersum* (Unbranched Bur-reed).



Plate 3.12: Sections of the Royal Canal that were densely overgrown with grassy-leaved macrophytes (left – Sparganium emersum (Unbranched Bur-reed) at Hill of Down (RCE8) and right – Sagittaria sagittifolia (Arrowhead) at McNead's Bridge (RCE4)) during sampling in July 2025.

Six *Potamogeton* species were recorded from WFD sites on the Royal Canal in 2025. *Potamogeton crispus* (Curled Pondweed), *P. perfoliatus* (Perfoliate Pondweed) and *P. pectinatus* (Fennel Pondweed –named *Stuckenia pectinata* in Table 3.3) were recorded with low abundance at few monitoring sites in the Royal Canal (Table 3.3). The floating-leaved *P. natans* (Broad-leaved Pondweed) was most widespread and recorded, generally with low abundance, at ten of the monitoring sites. The robust and broad-leaved *P. lucens* (Shining Pondweed) was recorded at seven sites and was a dominant vegetative feature at three, with an abundance score of 4 (Table 3.3). Another broad-leaved *Potamogeton* species (*P. praelongus* – Long-stalked Pondweed), present at five sites in 2025, was among the dominant submerged species at RCW3 (Belmont Bridge).

Chara species were recorded at ten monitoring sites on the Royal Canal but none with a cover abundance value >3 (11-30%). *Chara hispida* (Bristly Stonewort) was the most widespread and vegetatively abundant species, being recorded at seven sites, and at six with a cover abundance score of 3. The plant generally formed discrete and robust cushions of bristly vegetation that grew adjacent to the variety of other submerged species present at these sites. At RCE22 (Castleknock), small filaments of the rare charophyte *Tolypella intricata* were recovered on one grapnel haul during sampling in July 2025. (This species was recorded as *Chara* sp. in Table 3.3 as it is not listed for WFD classification purposes.) This plant had been recorded at this site in 2021, 2022 and 2023 but no specimens were recorded in 2024.

The free-floating submerged plant *Utricularia vulgaris* (Greater Bladderwort) was recorded at just two sites during sampling on the Royal Canal and at both it was present with moderate abundance (Table 3.3). This species was recorded at five other monitoring sites in 2025, one on the Barrow Line at Athy (BL15) and four in GCW (Tables 3.1 and 3.2), but nowhere with a cover abundance score >2 (3-10%).

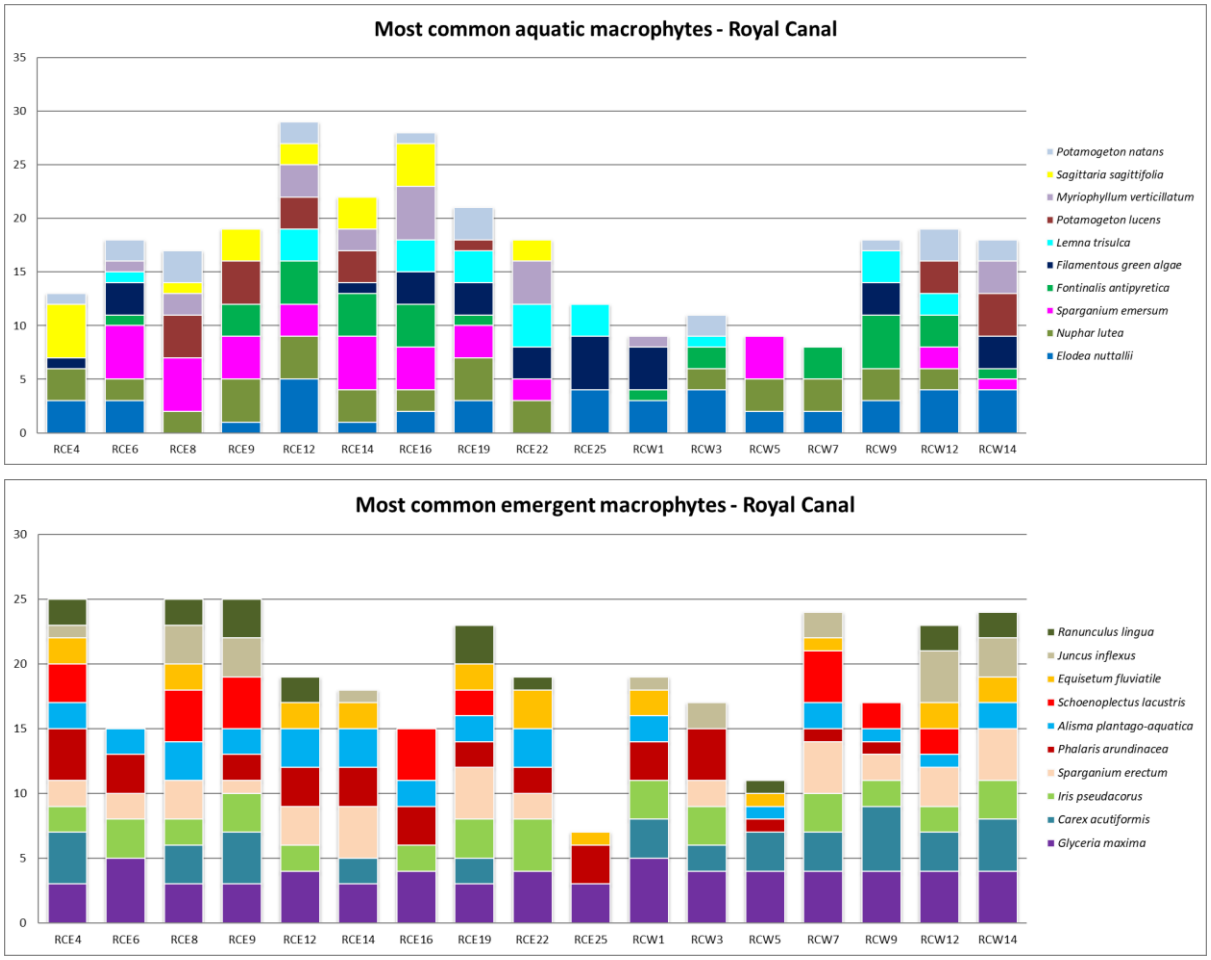


Figure 3.3 Relative representations, based on DAFOR abundance, of the ten most commonly recorded aquatic and emergent macrophytes at WFD sites in the Royal Canal in 2025. (The figures presented are those recorded on the date of sampling and do not take into account prior weed cutting operations at these sites.)

Glyceria maxima clearly dominated the emergent macrophyte flora at most monitoring sites on the Royal Canal in 2025. It was present with an abundance score of ≥4 (31-70%) at 11 of the 17 sites (Table 3.3 and Figure 3.3) and was recorded with an abundance ≥4 at all seven RCW sites. At most sites this species formed continuous, monodominant bands of tall, slightly bending, light green vegetation at the water's edge. This was occasionally interrupted by stands of other tall-growing species, such as *Iris pseudacorus* (Yellow Iris) or *Carex acutiformis* (Lesser Pond-sedge). The latter species was better represented at sites on the Royal Canal than elsewhere on the canals and presented a dominant display at a number of monitoring sites (e.g., RCE4 - McNead's Bridge, RCE9 – Moyvalley, RCW9 – Allard's Bridge, RCW14 – west of Ballydrum Bridge), where it commonly grew adjacent to or on drier ground than *G. maxima*.

Another emergent macrophyte species that prevailed in the wetted marginal zone at Royal Canal monitoring sites was *Alisma plantago-aquatica* (Water Plantain) which grew, often with relatively low abundance, at 15 of the 17 sites (Table 3.3 and Figure 3.3). This is also the habitat preferred by *Ranunculus lingua* (Greater Spearwort), present at nine monitoring sites. The fringing herb *Nasturtium officinale* (Water-cress – previously named *Rorippa nasturtium-aquaticum*) was recorded at only a single site (RCE25 – Croke Park) but with a cover abundance value of 4. In recent months, this site had been disturbed during Greenway construction activities and the dewatering associated with these works probably facilitated the expansion of this riparian species along the channel margins.



Plate 3.13: The Royal Canal at Cloncurry (RCE12) following weed cutting in July 2025.

Tall and robust stands of *Sparganium erectum* (Branched Bur-reed), commonly clumped in formation and always growing in the shallow margins of the channel, were recorded at 13 of the 17 monitoring sites, and grew with an abundance score of 4 at four of these sites (Table 3.3). Here, the plant was an obvious feature in the emergent plant community, sometimes growing in up to 0.5m depth of water. Also growing in the water or very close to the water's edge was *Schoenoplectus lacustris* (Common Club-rush), in its tall emergent form, which was recorded at eight sites, five in RCE and three in RCW. It grew abundantly (abundance score of 4) and formed continuous monodominant stands at four sites, but rarely forming mixed assemblage with other tall, emergent species. *Phalaris arundinacea* (Reed Canary-grass) was present at 14 monitoring sites, but mostly with a vegetative abundance score of $\leq$3 (11-30%). At two sites, RCE4 (McNead's Bridge) and RCW3 (Belmont Bridge), this grassy plant grew abundantly (abundance score of 4) and formed a dominant display on the drier banksides at these sites. *Phragmites australis* (Common Reed) remains very uncommon at Royal Canal monitoring sites and was only recorded at one site (RCW5 - Kildallan Bridge) during sampling in 2025.

3.1. Ecological Potential of WFD Monitoring Sites and AWBs

All of the 41 WFD monitoring sites on the Royal, Grand and Barrow Canals, including the Naas Line and Milltown Feeder, were assigned Maximum ecological potential based on results from macrophyte sampling conducted in summer 2025 (Table 3.4). This compared with 40, 41, 39 and 41 sites at Maximum potential in 2021, 2022, 2023 and 2024, respectively.

Table 3.4 Ecological potential and Ecological Quality Ratio (EQR) value awarded to each of the 41 WFD monitoring sites on the Grand and Royal Canals in 2025, based on the macrophyte quality element. (EQR scores: 1-0.8 = Maximum, 0.79-0.6 = Good, 0.59-0.4 = Moderate, 0.39-0.2 = Poor, 0.19–0 = Bad)

Canal	Site Code	Year	EQR	Macrophyte Potential - Site
Grand Canal	GCE4	2025	0.87	**Max**
	GCE6	2025	0.99	**Max**
	GCE8	2025	0.90	**Max**
	GCE10	2025	0.93	**Max**
	GCE12	2025	0.82	**Max**
	GCE14	2025	0.93	**Max**
	NL1	2025	0.94	**Max**
	MF1	2025	0.91	**Max**
	BL2	2025	0.96	**Max**
	BL6	2025	1.00	**Max**
	BL10	2025	1.00	**Max**
	BL15	2025	0.90	**Max**
	GCE1	2025	0.93	**Max**
	GCW1	2025	0.92	**Max**
	GCW8	2025	1.00	**Max**
	GCW12	2025	0.95	**Max**
	GCW4	2025	1.00	**Max**
	GCW6	2025	0.94	**Max**
	GCW16	2025	0.93	**Max**
	GCW18	2025	0.96	**Max**
	GCW20	2025	1.00	**Max**
	GCW22	2025	0.97	**Max**
	GCW24	2025	0.98	**Max**
	GCW27	2025	0.96	**Max**
Royal Canal	RCE4	2025	0.90	**Max**
	RCE6	2025	0.95	**Max**
	RCE8	2025	0.97	**Max**
	RCE9	2025	0.94	**Max**
	RCE12	2025	0.96	**Max**
	RCE14	2025	0.98	**Max**
	RCE16	2025	0.98	**Max**
	RCE19	2025	0.96	**Max**
	RCE22	2025	0.96	**Max**
	RCE25	2025	0.87	**Max**
	RCW1	2025	0.86	**Max**
	RCW3	2025	0.83	**Max**
	RCW5	2025	0.92	**Max**
	RCW7	2025	0.98	**Max**
	RCW9	2025	0.95	**Max**
	RCW12	2025	0.95	**Max**
	RCW14	2025	0.96	**Max**



Plate 3.14: Section of the Royal Canal at Castleknock (RCE22) in June 2025, where the number of permanently moored craft is rapidly increasing.

When the Equality Quality Ratios (EQR) for the macrophytes at monitoring sites sampled in each of the AWBs in 2025 were combined, all 14 AWBs were assigned Maximum ecological potential (Table 3.5).

Table 3.5 Ecological potential of the 14 WFD Artificial Water Bodies (AWB) on the Grand and Royal Canals in 2025, based on the macrophyte quality element.

Canal	AWB	EQR	Macrophyte Potential - AWB
Grand Canal	GCE_09	0.91	**Max**
	GCNL_09	0.94	**Max**
	GCMF_14	0.91	**Max**
	GCBL_14	0.96	**Max**
	GC_14E	0.93	**Max**
	GC_14W	0.97	**Max**
	GC_07	0.97	**Max**
	GC_25A	0.97	**Max**
Royal Canal	RC_07	0.95	**Max**
	RC_09	0.95	**Max**
	RC_25A	0.84	**Max**
	RC_26F	0.95	**Max**
	RC_26E	0.95	**Max**
	RC_26C	0.96	**Max**

4. Macroinvertebrate Monitoring

4.1. Introduction

Aquatic macroinvertebrate sampling at 14 of the 41 WFD monitoring sites on the Royal and Grand Canals, as agreed with Waterways Ireland (WI), was carried out between 18th April and 16th May 2025 for the purposes of assessing the ecological potential of these canal sites in respect of the macroinvertebrate quality element. This is the first sampling event in the current three-year cycle (2024 – 2026).

4.2. Materials and Methods

Sampling involves a 3-minute semi-continuous handnet sweep of the canal margin along a 10m stretch of channel. Macroinvertebrates are collected from emergent and aquatic plants, as well as from exposed sediments along the 10m stretch. Samples are stored in labelled plastic bags and preserved in 70% ethanol. Processing of macroinvertebrate samples involves washing each sample through a 0.5mm sieve and sorting by hand. Identification is carried out to family level using keys presented in Section 7.

A system for classifying British and Irish Canals (Willby, 2012) is used to assess the ecological potential of WFD sites based on their macroinvertebrate composition. Macroinvertebrates are recorded according to $\log_{10}$ abundance categories (0 = absent; 1–9 = 1; 10-99 = 2; 100-999 = 3). A number of macroinvertebrate metrics are calculated:

- Number of families (N_FAM)
- Average Score Per Taxon (ASPT) (based on BMWP scores for 81 families)
- Number of Ephemeroptera (mayfly), Plecoptera (stonefly) and Trichoptera (caddisfly) families (N_EPT)
- Number of Mollusc (snail, mussel and limpet) and Odonata (damselfly and dragonfly) families (N_MOLL+ODON)
- Number of Coleoptera (beetle) and Hemiptera (water bug) families (N_COL+BUGS).

The metrics ASPT and EPT are sensitive to water quality pressures, while N_FAM, N_MOLL+ODON and N_COL+BUGS reflect hydromorphological pressures, i.e., the quality and diversity of physical habitats in the canal. The classification involves calculating (for each site) an Ecological Quality Index (EQI) for each metric based on the ratio of 'observed value : expected value'. The expected value is based on reference conditions using alkalinity, boat traffic, channel type, particle size and altitude data for each site. For the purpose of standardisation, each EQI value is then converted to an Ecological Quality Ratio (EQR), ranging from 0 – 1, with class boundaries at intervals of 0.2: 0.8 – 1 = Maximum; 0.6 – 0.79 = Good; 0.4 – 0.59 = Moderate; 0.2 – 0.39 = Poor; 0 – 0.19 = Bad.

The overall EQR for a site is determined by the lowest of the water quality component (i.e., EQR_{ASPT} and EQR_{N_EPT}) and the hydromorphological component (i.e., EQR_{N_FAM}, $EQR_{N_COL+BUG}$ and

$EQR_{N_MOLL+ODON}$). To get the overall EQR for an artificial water body (AWB), EQR values are averaged across all sites in each AWB. Any site or AWB containing the invasive *Dreissena polymorpha* (Zebra mussel), or any other designated (listed) invasive macroinvertebrate species, cannot achieve Maximum Ecological Potential (MEP) and must be assigned, at best, Good Ecological Potential (GEP).

4.3. Results

4.3.1. *Macroinvertebrate Assemblages at WFD Monitoring Sites*

The 14 WFD sites sampled for macroinvertebrates in 2025 were – one on the Naas Line (NL1), eleven on the Grand Canal main line (GCE1, GCE4, GCE6, GCE8, GCE10, GCE12, GCE14, GCW1, GCW4, GCW6, GCW8) and two on the Royal Canal main line (RCW1, RCW3). These sites had previously been sampled in 2022.



Plate 4.1: The site at Naas (NL1) where macroinvertebrate sampling was conducted in May 2025.

Thirty-three aquatic macroinvertebrate families that are used to assess eco-potential were recorded from the 14 monitoring sites in 2025 (Table 4.1). Numbers of taxa ranged from 21 at GCE10 to 7 at NL1, with an average of 13 taxa across the sites. This is slightly lower than that recorded in 2022, the differences being within the range expected where sampling effort and exact location may differ, where habitats may shift or alter over time, and the rarer species may be missed or detected at random. The Mollusca (snails and mussels), followed by Coleoptera (beetles) and Hemiptera (bugs), had the highest number of families, followed by crustaceans, caddisflies, mayflies, trueflies, damselflies/dragonflies, alderflies, spiders, mites, moths and leeches. This is consistent with the samples from these same sites taken in 2022. In terms of numbers of individuals, Lymnaeidae (snails), Asellidae (crustaceans) and Coenagriidae (damselflies) were generally the most abundant (Table 4.1)

The macroinvertebrate species present in these canal sites are consistent with those present in high quality rivers and lakes, although different water types (especially lakes *versus* rivers) will differ in species composition due to their habitat requirements. For example, many crustaceans are missing in higher order streams of river systems due to lack of calcium for exoskeleton development. Further,

highest species richness often comes from "intermediate disturbance" regimes (e.g., where there is some artificial enrichment of water, movement of water due to boat traffic, cutting of reeds/weeds, and other disturbance). This is because low disturbance can lead to a proliferation of competitively dominant species and reduced species richness, while high disturbance can lead to local species extinction as the environment is too stressful. Hence, intermediate levels of disturbance can actually maintain high species richness - the "intermediate disturbance hypothesis". As canals will clearly vary in disturbance regimes, some research on the influence of this would help interpret species richness patterns that may often be independent of water quality.

Table 4.1 Abundance of aquatic macroinvertebrate families recorded from the 14 canal sites monitored in 2025.

Family	Common name	GCE1	GCE4	GCE6	GCE8	GCE10	GCE12	GCE14	NL1	GCW1	GCW4	GCW6	GCW8	RCW1	RCW3
Neritidae	Snails							3							
Lymnaeidae	Snails		549			26	323	157	12		24	8	57		4
Physidae	Snails					6		4						3	
Planorbidae	Snails	11	14			5	16	27	13	10	1	6	1	11	11
Bithyniidae	Snails	89								18		5		76	38
Unionidae	Mussels							4			2				
Sphaeriidae	Mussels	22	4			14	21	7		3				3	
Glossiphoniidae	Leeches	1	1	1		1					1	1			
Asellidae	Crustaceans	57	96	33	8	38	84	107	135	58	27	31	80	96	66
Corophiidae	Crustaceans													93	7
Gammaridae *	Crustaceans	121	16	5	3	15	2	33		28	10	2	27		
Baetidae	Mayflies											7	1		
Ephemerellidae	Mayflies						1								
Caenidae	Mayflies					1									
Coenagriidae	Damselflies	1				45	1	6	2	71	32	33	28	4	75
Aeshnidae	Dragonflies					1							2		5
Nepidae	Bugs			1								1	1		
Notonectidae	Bugs	2	36			19			6	1			18	2	1
Pleidae	Bugs	39		1		7	9			14		32		9	39
Corixidae	Bugs	16	12			3	12	15	39	2		1	1	4	
Haliplidae	Beetles	14									9				
Dytiscidae	Beetles										1	1	1		1
Gyrinidae	Beetles		1			4			2		4				3
Noteridae	Beetles					1						2			
Sialidae	Alderflies	1	4	1		1				1		1			1
Polycentropidae	Caddisflies					1						5	2		
Limnephilidae	Caddisflies	5			46	4				33			82	4	21
Leptoceridae	Caddisflies	9		8	6	40	1			55	5	12	17	12	6
Chironomidae	Trueflies	23	7	5	2	3				4	3	4		38	9
Ceratopogonidae	Trueflies				1		1						1	8	1
Cybaeidae	Spiders	2			1	3	2					1		6	7
Pyralidae	Moths	1			1					2	3	2			
Hydracarina	Mites	1	3							4	2				6

* Crangonyctidae are included with the Gammaridae

A very striking result from sampling in both 2022 and 2025 was the high abundance, and overall numerical predominance over other taxa, of *Asellus aquaticus* (Water Louse) and *Crangonyx pseudogracilis* (Northern River Crangonyctid), the latter listed under Gammaridae in Table 4.1. Also noteworthy, and related to this, was the absence of *Gammarus* (Water Shrimp) (Crustacea: Amphipoda) species. *Asellus aquaticus* is native to Ireland, whereas *C. pseudogracilis* is an American non-native species commonly found in harsh freshwater environments but excluded by *Gammarus* species where water quality is high and environmental conditions suitable (especially colder

temperatures and higher dissolved oxygen availability). *Asellus aquaticus* and *C. pseudogracilis*, in large numbers, are commonly associated with still or slow-moving water, organic enrichment and extremes of temperature and/or oxygen regime. A lack of *Gammarus* spp. will also follow from such conditions. Thus, while the overall quality of the water and habitat in the canals is good, the above pattern might suggest some issues that are chronic (e.g., sporadic organic pollution) or acute (such as dips in oxygen levels). On the other hand, the presence of a rich diversity of other organisms (e.g., insects), albeit at lower abundances, suggests the environmental conditions are not detrimental to healthy and diverse animal communities. Further, insects have more rapid re-colonisation and dispersal mechanisms, i.e., flight over distances, than crustaceans such as *Gammarus*, and hence re-colonisation after extreme, acute events is more likely by the former. The presence of molluscs is also a good sign, although their shells may offer some protection from acute events. We, thus, suggest that data loggers that capture chronic events, but also crucially acute events, could be employed to monitor long- and short-term environmental fluctuations at some of these monitoring sites.

Further, the range of feeding strategies represented by the macroinvertebrate species present in these canals is also encouraging, with most functional feeding groups, i.e., grazers, filterers, collector/gatherers and predators, present. In addition, the almost complete absence of invasive alien species is good, as this can skew species richness due to, for example predation (such as by Killer Shrimp, *Dikerogammarus villosus*). The only non-native species present in the sites monitored in 2025 (and in 2022) was *Crangonyx pseudogracilis* which, while not entirely benign, does not negatively affect any of the native species to the point of extinction (as can happen with other invaders, such as *Dikerogammarus villosus*). Hence, there are likely no detectable effects on other macroinvertebrates caused by *C. pseudogracilis* and, hence, no distortion of macroinvertebrate indices due to non-native species.

While the invasive *Dreissena polymorpha* (Zebra mussel) is known to be present throughout the Royal and Grand Canals, and *Dreissena bugensis* (Quagga Mussel) and *Corbicula fluminea* (Asian Clam) are present in Ireland, no specimens of these invasive alien species were recorded at any of the 14 monitoring sites in 2025. This may, however, reflect the fact that the sweepnet sampling technique used here is not amenable to the reliable collection of these species and, hence, future sampling might additionally use benthic samplers, such as the Ekman dredger/grab.

An invasive alien species alert was issued in September 2025 highlighting the discovery of Demon shrimp (*Dikerogammarus haemobaphes*) by the National Biodiversity Data Centre in partnership with Waterways Ireland, the National Parks and Wildlife Service and Dr. Dan Minchin of the Lough Derg Science Group. This species was predicted to arrive in Ireland following a horizon scan, based on a workshop in 2017 and published in 2020 (Lucy *et al.,* 2020). The demon shrimp is a voracious predator and is likely to have a significant impact on macroinvertebrate communities in Ireland. While it was not recorded during sampling in 2025, the canal network in Ireland may be vulnerable to invasion by the Demon shrimp. This species is likely to disperse rapidly based on records from the UK since its arrival there in 2012.

No vulnerable or red list macroinvertebrate species were recorded during the current sampling cycle.

4.3.2. *Ecological Potential of WFD Monitoring Sites and AWBs*

Of the 14 monitoring sites on the Grand Canal and Royal Canal examined in 2025, four were at Maximum, four were at Good, two were at Moderate and four were at Poor eco-potential, based on results from macroinvertebrate sampling in spring. No site was at Bad eco-potential in 2025 (Table 4.2). This compared with two at Maximum, eight at Good, two at Moderate and two at Poor when these sites were sampled in 2022.

In the intervening three years between 2022 and 2025, the eco-potential of two sites, GCE10 (Clondalkin) and GCW6 (Georges Bridge), improved from Good to Max, while the eco-potential remained at Maximum at two sites – GCW8 (Rhode Bridge) and RCW3 (Belmont Bridge). GCE1 (Robertstown), GCE12 (Blackhorse) and RCW1 (Mullingar) all remained at Good status, while GCW1 (Bond Bridge) improved from Moderate to Good (Table 4.2). GCE6 (Ponsonby Bridge) and GCW4 (Lock 20) both declined from Good to Moderate status in 2025. GCE4 (Sallins) and NL1 (Naas Line) both remained at Poor status and were joined by GCE8 (Hazelhatch) and GCE14 (Baggot Street).

This overall decline is driven almost entirely by the differences between years in the Grand Canal East scores, with the Grand Canal West and Royal Canal West scores remaining essentially unchanged between 2022 and 2025 and the NL1 site remaining at Poor status. The biological communities are similar in terms of invertebrate taxa present in both sampling periods, although three scoring taxa (snail Valvatidae; Beetle Hygrobiidae; mayfly Leptophilebiidae) are absent from all sites in 2025. These taxa were rare in the 2022 samples and may have been missed due to chance or any reduction in sampling effort in 2025 or another factor. There appears a need to identify the drivers of macroinvertebrate driven scoring for combined eco-potential to inform policy with regards to mitigation. Some of these measures may be relatively easy to address, such as point sources of pollution or anthropogenic impacts of barges, while others are much more insidious and irreversible, such as the proliferation of invasive alien species.



Plate 4.2: A barge turning at the abnormally wide section of the Grand Canal at the Naas Line confluence in October 2025, where macroinvertebrate sampling was conducted at GCE4 earlier in May.

Table 4.2 Ecological potential of the 13 WFD monitoring sites on the Grand and Royal Canals based on macroinvertebrate sampling conducted in 2025.

Canal	AWB	Site	Year	EQR	Macroinvetebrate Eco-potential
Grand Canal	GC_09	GCE4	2025	0.35	Poor
		GCE6	2025	0.44	Moderate
		GCE8	2025	0.21	Poor
		GCE10	2025	0.99	Max
		GCE12	2025	0.68	Good
		GCE14	2025	0.29	Poor
	GCNL_09	NL1	2025	0.25	Poor
	GCMF_14	MF1			
	GCBL_14	BL2			
		BL6	2024	0.51	Moderate
		BL10	2024	0.62	Good
		BL15	2024	0.58	Moderate
	GC_14E	GCE1	2025	0.69	Good
		GCW1	2025	0.71	Good
	GC_14W	GCW8	2025	0.84	Max
		GCW12	2024	0.87	Max
	GC_07	GCW4	2025	0.56	Moderate
		GCW6	2025	0.84	Max
	GC_25A	GCW16	2024	0.77	Good
		GCW18	2024	0.64	Good
		GCW20			
		GCW22			
		GCW24			
		GCW27			
Royal Canal	RC_07	RCE4			
		RCE6			
		RCE8	2024	0.96	Max
		RCE9	2024	0.90	Max
		RCE12	2024	0.78	Good
	RC_09	RCE14	2024	0.52	Moderate
		RCE16	2024	0.75	Good
		RCE19	2024	0.50	Moderate
		RCE22	2024	0.45	Moderate
		RCE25			
	RC_25A	RCW1	2025	0.76	Good
		RCW3	2025	0.82	Max
	RC_26F	RCW5			
		RCW7			
		RCW9			
	RC_26E	RCW12			
	RC_26C	RCW14			

A feature of these results that possibly warrants further investigation is the cluster of Moderate and Poor macroinvertebrate eco-potential results from GCE8 to GCE4, including NL1. There is little evidence to suggest that water quality issues or hydromorphological alterations are driving the decline in this section of the Grand Canal East, suggesting that this group of sites all immediately hydrologically linked and within the same geographic area may be experiencing an element of disruption that is not yet evident. It is documented in Section 3.3.2 that GCE6 had significant

accumulations of filamentous green algae and was dominated by two plants (invasive *Elodea nuttalii* and native *Nuphar lutea*). It is also worth noting that there has been a significant proliferation in stationary barges at both GCE4 and GCE8, indicating that local anthropogenic impacts may have a deleterious effect on macroinvertebrate scores (Figure 4.1). This may be a symptom of the current housing crisis being experienced in Ireland that has necessitated many people to utilise novel forms of accommodation that were not previously widespread in this country. The site at GCE4 also has the additional impacts of significant tree shading and housing development currently under construction at The Old Odlums Mill adjacent to the south bank of the canal. Indeed, it is documented that all of these contributory factors including plant species composition (especially invasive species), shading and boating activities with associated wave action can impact aquatic invertebrate communities (Kelly et al. 2015, Gabel et al. 2012).

Although the site at NL1 was also assigned Poor status in 2022, it should be acknowledged that at the time of sampling that routine weed cutting operations had taken place in the sample area and were ongoing in the area upstream towards Naas town. This disturbance may have contributed to the Poor macroinvertebrate eco-potential recorded for this site.

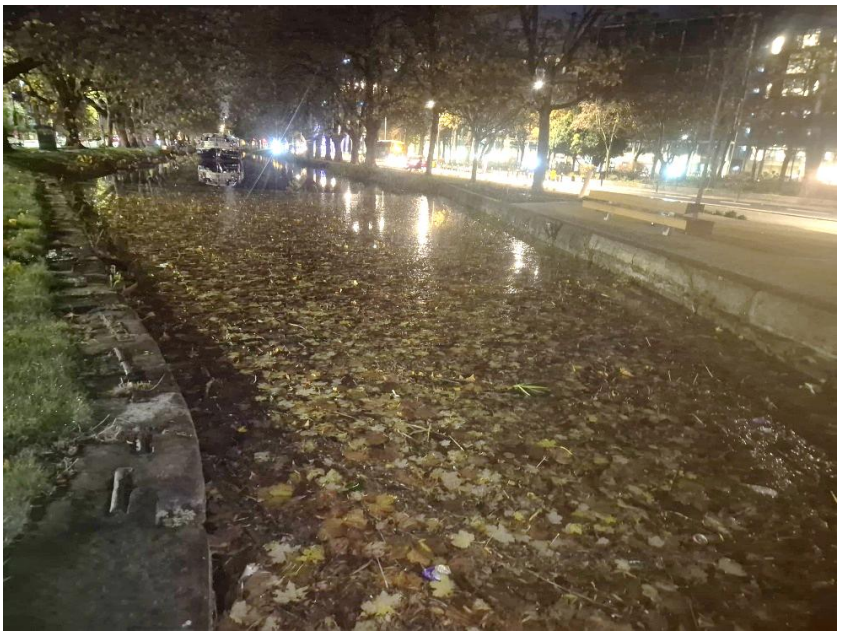


Plate 4. 3: Leaves dominate the water surface in late October at the Baggot Street (GCE14) site where macroinvertebrate sampling was conducted in May 2025.

As well as *Elodea nuttallii*, there has also been a significant increase in the presence of New Zealand pigmyweed (*Crassula helmsii*) throughout sections of the Grand Canal since 2019. This species is undoubtedly increasing its presence throughout the system particularly at GCW4 near Ticknevin (Plate 3.7) and to a lesser extent at GCE14. The dominance of this invasive alien species throughout the benthic and riparian habitat at this site is highly likely to be impacting upon macroinvertebrate communities *via* alterations to local trophic food webs. There is also significant shading at the Baggot Street site from lines of Sycamore trees on both banks (Plate 4.3).

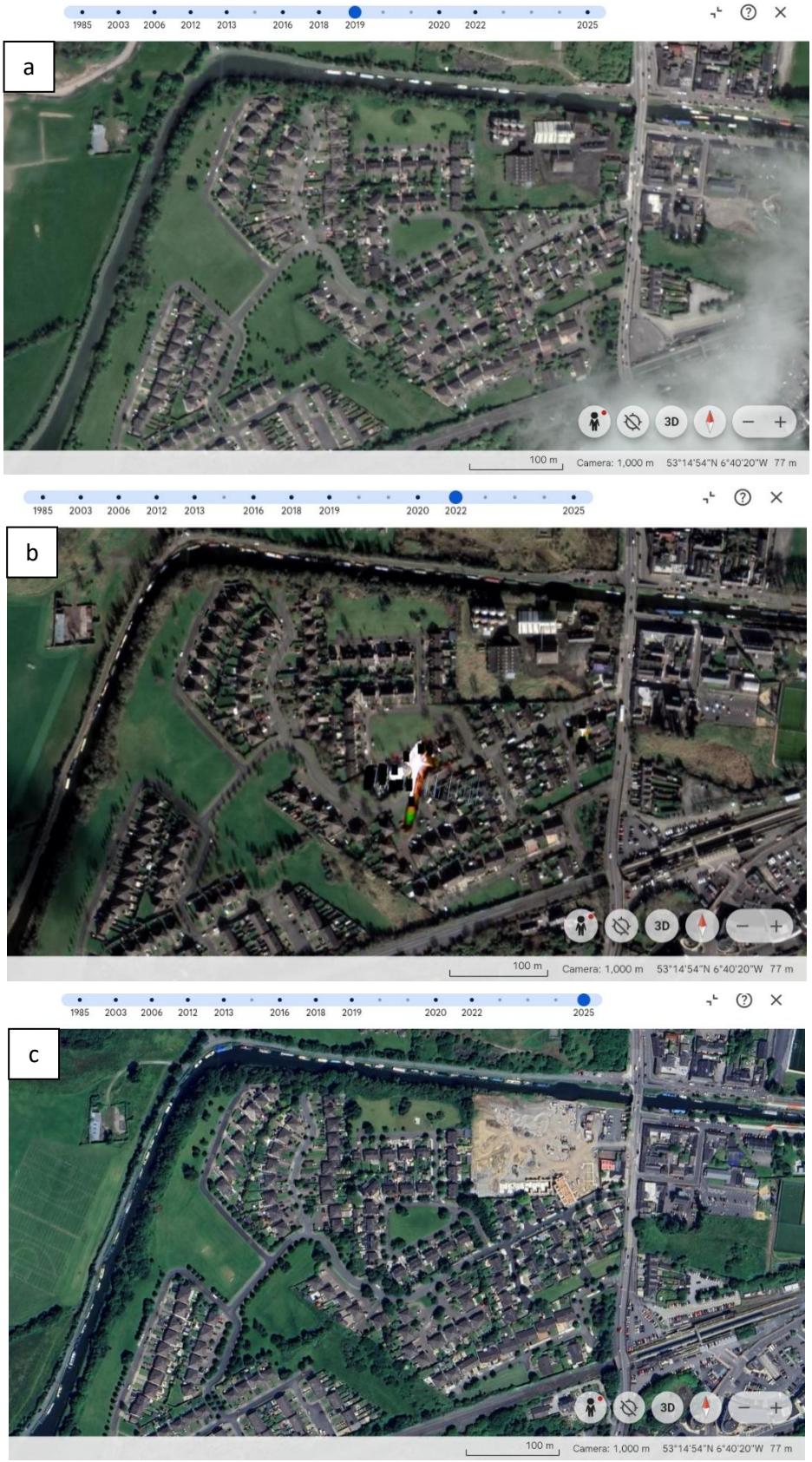


Figure 4.1 Historic satellite imagery from Google Earth (accessed January 2026) documenting the proliferation of permanently moored craft and the progression of a housing development at Sallins from 2019(a), 2022(b) and 2025(c).

Macroinvertebrate sampling took place from mid-April to mid-May within the suggested timings for this project. Following an analysis of data from Casement Aerodrome for April 2025, the mean monthly temperature was 10.2°C. The long-term average for this period is 8.3°C, almost 2°C degrees lower than that experienced in 2025. The Met Eireann report for April 2025 was "Warm and sunny with record high April daily temperatures. Dry first half, wet second half". For March 2025 it was described as "Mild, dry and sunny" and the February report was simply termed "Mild". With average temperatures increasing and hot spells of weather in spring, the timing of insect adult emergence may also be changing and may impact presence/absence scores based on taxa with larval stages that then emerge as adults. This would be most pronounced with fully emergent taxa such as mayflies and damselflies, although complete absence of such taxa in any year is unlikely as the nymphs of some species can take several years to develop into emergent adults. There will, conversely, likely be less of a phenological effect on more sedentary and non-emerging species, such as molluscs. If this trend in warm Spring periods is sustained, it will be important to consider the implications by incorporating emerging phenology and temperature effects on macroinvertebrate populations into sampling regimes.

A caveat to the above is that sampling effort, in terms of time spent sampling and patchiness of habitats, can lead to under-recording of taxa numbers, especially as some taxa are rare and can be missed easily. Thus, comparing the 2022 and 2025 data, we note that missing taxa in 2025 (e.g., mayflies (Baetidae)) were rare on the Grand Canal East in 2022 and could have been missed due to the above issues.

Table 4.3 Ecological potential of the 14 Artificial Water Bodies (AWB) on the Grand and Royal Canals, based on the macroinvertebrate quality element at 27 of the 41 monitoring sites. (The remaining 14 sites will be sampled in 2026.)

Canal	AWB	EQR	Macroinvetebrate Eco-potential
Grand Canal	GC_09	0.49	Moderate
	GCNL_09	0.25	Poor
	GCMF_14		
	GCBL_14		
	GC_14E	0.70	Good
	GC_14W	0.85	Max
	GC_07	0.70	Good
	GC_25A		
Royal Canal	RC_07		
	RC_09		
	RC_25A	0.79	Good
	RC_26F		
	RC_26E		
	RC_26C		

Between 2024 and 2025, the full complement of sites in six of the 14 AWBs has been sampled for the macroinvertebrate quality element. The remaining sites will be assessed in spring 2026, which will allow for the eco-potential of all 14 AWBs to be evaluated. Of the six AWBs that could be assessed, one was at Maximum eco-potential, three were at Good, one was at Moderate, and one was at Poor (Table 4.3).

At the level of macroinvertebrate taxa, at GCE (Grand Canal East) sites, there was a reduction in the number of taxa recorded between 2021 and 2024, from an average of 15.3 to 12.7 taxa. This is reflected in the decline of the GC_09 AWB from Good to Moderate status. The Naas Line seen a reduction from 9 to 7 taxa but remained in Poor status overall for the single site GCNL_09 AWB. The Grand Canal West sites seen an increase from 14 to 15.8 maintaining the Max status of the GC_14W AWB, while the Royal Canal West sites reduced from an average of 21 to 16.5 taxa but remained at Good status overall for the RC_25A AWB.

5. Invasive Species Monitoring

5.1. Introduction

Sampling for invasive species was conducted at the 41 WFD surveillance monitoring sites on the canals between 18th April and 16th May 2025, for macroinvertebrate species, and between 23rd June and 15th August 2025, for macrophyte species. Both sampling events were conducted in conjunction with sampling operations for native macroinvertebrate and macrophyte species.

For the ecological classification of WFD monitoring sites and AWBs, the presence of invasive macrophyte or macroinvertebrate species at a site will automatically result in a change of ecological potential for that quality element (e.g., from Maximum to Good or from Good to Moderate).

Until 2021, the submerged elodeid *Elodea nuttallii* (Nuttall's Pondweed) was categorised as an invasive species for WFD canal classification purposes. However, as this species is now both widespread and abundant in the Royal, Grand and Barrow Canals (currently present in 34 of the 41 sites monitored) and as no mitigation measures will bring about its effective control or eradication, it was agreed with EPA to remove it from the invasive species list for WFD classification of Irish canals. It remains a listed invasive species in Irish (S.I. 374/2024) and European (1143/2014) legislation.

5.2. Materials and Methods

For invasive macrophytes, the survey area at each WFD monitoring site consists of a 150m canal reach that is sampled, using an 8-pronged grapnel, at ten roughly equidistant locations. For invasive macroinvertebrate species, sampling involves a 3-minute semi-continuous hand net sweep of the canal margin along a 10m stretch of channel. Details of each sampling method are presented in Sections 3.2 and 4.2.

5.3. Results

Only one listed invasive plant species (*Crassula helmsii* – New Zealand Pigmyweed) and no listed invasive macroinvertebrate species were recorded during sampling at WFD monitoring sites on the canals in 2025.

Reynoutria japonica (Japanese Knotweed) and *Allium triquetrum* (Three-cornered Garlic) are two listed terrestrial invasive plant species that have been recorded on the canals in recent years, but neither at any of the 41 WFD monitoring sites. Following persistent herbicidal control by WI staff for several years, the presence of the former species is now very limited along these waterways. The management of Japanese knotweed using stem injected herbicide was carried out at several infested sites in 2025, including close to SE40 and RCE9. The latter species was first recorded on the Circular Line of the Grand Canal in 2018, and specimens remained present at this location each subsequent year, including 2025. There was, however, no evidence of significant spread of the invasive species at this location. No specimens of *A. triquetrum* have been recorded at any WFD monitoring site on the canal during sampling this year.

The increased occurrence of *Buddleja davidii* (Buddleja) along the canals has been observed during regular water and biological sampling on the canals in recent years. This non-native and potentially highly invasive species has an acknowledged capacity to adversely impact biodiversity and to compromise canal banksides and hard structures, such as the walls of lock chambers. It is, therefore, recommended that identified stands of this species on or adjacent to the canals should be removed.

In February 2024, live specimens of the highly invasive macroinvertebrate bivalve *Corbicula fluminea* (Asian Clam) were recorded along the canal margins, just west of the Armstrong Bridge (GCW24) WFD monitoring site. This was the first record of this species from any section of the Grand, Royal or Barrow Canals. It is understood that Waterways Ireland staff either have or propose to undertake a survey on the Grand Canal to determine the current status of this aggressive invasive invertebrate and consider mitigation measures.

In 2025, the non-native macroinvertebrate species *Crangonyx pseudogracilis* was recorded at 13 of the 14 canal sites monitored (see Table 4.1). The only site where no specimens were recovered was NL1 on the Naas Line. While this species is non-native, it is not a listed invasive species and is unlikely to influence resident macroinvertebrate communities.

5.3.1. Status of Aquatic Invasive Plant Species at WFD Monitoring Sites

In 2025, the invasive *Crassula helmsii* was recorded at the same seven WFD monitoring sites as it had been recorded each year since 2021. These included two sites on Grand Canal East (GCE1 - Robertstown and GCE14 - Baggot Street), four on Grand Canal West (GCW1 - Bond Bridge, GCW4 - Lock 20, GCW6 - George's Bridge and GCW8 - east of Rhode) and the MF1 (Milltown Feeder) (see Tables 3.1 to 3.3).

In 2023, a live specimen of this invasive species was recovered among the native flora during sampling on the Naas Line at NL1. A detailed examination of the site at that time, and again during macrophyte sampling in 2024 and 2025, failed to locate any further specimens. Also, while water sampling at Umeras (BL6) in August 2024, a fragment of live *C. helmsii* material was observed floating in the canal at this site. Subsequent surveys here in 2024 and 2025 did not record any further specimens of this unwanted macrophyte species, either floating or rooted. It will, however, be important to continue to monitor these sites and the adjacent canal habitats for the presence of this species during future water and biological sampling events.

The sites at which *C. helmsii* has been most abundant and where it has dominated the aquatic flora, in a manner typical of an aggressive invasive plant, are GCW4 (Lock 20) and MF1 on the Milltown Feeder (see Table 3.1). The former site lies immediately downstream of the Lullymore - Ticknevin section of the Grand Canal, on the 19th level, where this weed has posed problems for many years and where exhaustive control measures were implemented in the past in an effort to restrict its abundance and spread. This control intervention, however, failed to stop the rampant spread of the species in this section of canal. As a consequence of annual weed cutting operations in this infested level and the movement of boat traffic westward from Lowtown to the River Shannon, large volumes

of viable *C. helmsii* fragments are released and move westward with the flow of water. These fragments can settle in suitable canal habitats and have the capacity to produce new populations of this invasive species where they successfully establish. Thus, extensive stands of the weed are now present immediately west of Lock 20 and throughout GCW4. Consequent of this movement of viable plant fragments, established stands of the invasive species have been recorded farther west at GCW6 (George's Bridge) and GCW8 (east of Rhode). It is interesting that populations of this invasive plant have not been recorded at monitoring sites farther west than Rhode, but it is highly likely that stands of the weed are present at places in the canal between Rhode and the River Shannon.



Plate 5.1: Water users with a horse at GCE10 (Clondalkin) in May 2025.

In GCE *C. helmsii* continues to be recorded, with relatively low abundance, at GCE1 and GCE14, each at opposite ends of this long section of canal (see Table 3.1). No specimens of the invasive weed have been recorded at monitoring sites between these two sites, and no records have been reported by anglers or WI staff.

In an effort to eradicate this highly invasive species from the Milltown Feeder, and particularly at and adjacent to the WFD monitoring site (MF1) where it grew luxuriantly (cover abundance score of 5 - >70%) in 2023 and 2024, Waterways Ireland (WI) conducted a dredging program in July 2024. This dredging effort targeted and removed each identified *C. helmsii* stand from the channel and deposited it on the off-bank, which was subsequently closed to pedestrian users. Using the wheels of the excavator, the deposited spoil and invasive weed was compressed into the ground, and the bankside area was later sprayed with the herbicide Roundup Biactive. Further targeted dredging took place in October 2024 when, following a site survey, some regrowth of the invasive species was observed. Sampling at MF1 in summer 2025 recovered individual live plants in four of the ten grapnel hauls (for a cover abundance score of 1 - <3%). Close observation of the channel at this time revealed no stands of the invasive weed, although the presence of even individual live plants is a cause for concern. It is recommended that the site be closely monitored over the coming winter period and that the status of the weed is determined and documented. As *C. helmsii* is winter-green

and much of the native macrophyte vegetation will be dead at this time, it should be possible to identify and map any new stands of this invasive species that may appear.

No *C. helmsii* has yet been recorded from any WFD monitoring site on the Royal Canal.

5.3.2. Ecological Potential of WFD Monitoring Sites based on Invasive Species

The eco-potential of the seven WFD sites at which invasive species were recorded in 2025 had their eco-potential changed from Maximum to Good (Table 5.1) by virtue of the fact that a listed invasive species was recorded at these sites. The invasive plant species *C. helmsii* was the only invasive species recorded at any of the WFD monitoring sites in 2025.

Table 5.1 Ecological potential of the 41 WFD monitoring sites on the Grand and Royal Canals sampled in 2025, based on the invasive species quality element. (Maximum (Max) indicates that no invasive species were present.)

Site Code	Year	Ecological Potential - Site
GCE4	2025	Max
GCE6	2025	Max
GCE8	2025	Max
GCE10	2025	Max
GCE12	2025	Max
GCE14	2025	Good
NL1	2025	Max
MF1	2025	Good
BL2	2025	Max
BL6	2025	Max
BL10	2025	Max
BL15	2025	Max
GCE1	2025	Good
GCW1	2025	Good
GCW8	2025	Good
GCW12	2025	Max
GCW4	2025	Good
GCW6	2025	Good
GCW16	2025	Max
GCW18	2025	Max
GCW20	2025	Max
GCW22	2025	Max
GCW24	2025	Max
GCW27	2025	Max
RCE4	2025	Max
RCE6	2025	Max
RCE8	2025	Max
RCE9	2025	Max
RCE12	2025	Max
RCE14	2025	Max
RCE16	2025	Max
RCE19	2025	Max
RCE22	2025	Max
RCE25	2025	Max
RCW1	2025	Max
RCW3	2025	Max
RCW5	2025	Max
RCW7	2025	Max
RCW9	2025	Max
RCW12	2025	Max
RCW14	2025	Max

Because of the one-out-all-out rule, whereby the lowest eco-potential value determines the overall eco-potential for an AWB, five of the 14 AWBs were assigned Good rather than Maximum status (Table 5.2), based on the invasive species quality element.

Table 5.2 Ecological potential of the 14 Artificial Water Bodies on the Grand and Royal Canals in 2025, based on the invasive species quality element.

AWB	Year	Ecological Potential - AWB
GC_09	2025	Good
GCNL_09	2025	Max
GCMF_14	2025	Good
GCBL_14	2025	Max
GC_14E	2025	Good
GC_14W	2025	Good
GC_07	2025	Good
GC_25A	2025	Max
RC_07	2025	Max
RC_09	2025	Max
RC_25A	2025	Max
RC_26F	2025	Max
RC_26E	2025	Max
RC_26C	2025	Max

6. Combined Ecological Potential

In 2025, 22 of the 41 WFD surveillance monitoring sites on the canals were assigned Good ecological potential when physico-chemical, macrophyte, macroinvertebrate (13 sites in 2024 and 14 sites in 2025), invasive species and hydromorphological quality elements were assessed to determine their combined eco-potential (Table 6.1). (The Shannon-Erne Waterway and the Grand Canal Basin were assessed solely for the physico-chemical quality element.) This compared with 32 sites that were at Good eco-potential in 2024, 33 in 2023 and 33 in 2022. No sites were at Bad eco-potential following assessment in 2025 (Table 6.1).

Table 6.1 Ecological potential of the 41 WFD monitoring sites on the Grand Canal and Royal Canal based on the combined physico-chemistry, macrophyte, macroinvertebrate (13 sites in 2024 and 14 in 2025), invasive species and hydromorphology quality elements in 2025. The ecological potential of the sites on the Shannon-Erne Waterway and the Grand Canal Basin is based on physico-chemistry results alone.

Canal	Site	Macrophytes	Macro-invertebrates	Physico-Chemistry	Hydro-morphology	Invasive Species	ECOLOGICAL POTENTIAL - SITE
Grand Canal	GCE4	Max	Poor	Good	Max	Max	Poor
	GCE6	Max	Moderate	Good	Max	Max	Moderate
	GCE8	Max	Poor	Good	Max	Max	Poor
	GCE10	Max	Max	Good	Max	Max	Good
	GCE12	Max	Good	Good	Max	Max	Good
	GCE14	Max	Poor	Good	Max	Good	Poor
	NL1	Max	Poor	Good	Max	Max	Poor
	MF1	Max		Good	Max	Good	Good
	BL2	Max		Good	Max	Max	Good
	BL6	Max	Moderate	Good	Max	Max	Moderate
	BL10	Max	Good	Good	Max	Max	Good
	BL15	Max	Moderate	Good	Max	Max	Moderate
	GCE1	Max	Good	Good	Max	Good	Good
	GCW1	Max	Good	Good	Max	Good	Good
	GCW8	Max	Max	Good	Max	Good	Good
	GCW12	Max	Max	Good	Max	Max	Good
	GCW4	Max	Moderate	Good	Max	Good	Moderate
	GCW6	Max	Max	Good	Max	Good	Good
	GCW16	Max	Good	Moderate	Max	Max	Moderate
	GCW18	Max	Good	Moderate	Max	Max	Moderate
	GCW20	Max		Moderate	Max	Max	Moderate
	GCW22	Max		Good	Max	Max	Good
	GCW24	Max		Good	Max	Max	Good
	GCW27	Max		Good	Max	Max	Good
	GCB4	-	-	Good	-	-	Good
	GCB7	-	-	Good	-	-	Good
Royal Canal	RCE4	Max		Moderate	Max	Max	Moderate
	RCE6	Max		Good	Max	Max	Good
	RCE8	Max	Max	Good	Max	Max	Good
	RCE9	Max	Max	Moderate	Max	Max	Moderate
	RCE12	Max	Good	Moderate	Max	Max	Moderate
	RCE14	Max	Moderate	Moderate	Max	Max	Moderate
	RCE16	Max	Good	Good	Max	Max	Good
	RCE19	Max	Moderate	Moderate	Max	Max	Moderate
	RCE22	Max	Moderate	Good	Max	Max	Moderate
	RCE25	Max		Good	Max	Max	Good
	RCW1	Max	Good	Good	Max	Max	Good
	RCW3	Max	Max	Good	Max	Max	Good
	RCW5	Max		Good	Max	Max	Good
	RCW7	Max		Good	Max	Max	Good
	RCW9	Max		Moderate	Max	Max	Moderate
	RCW12	Max		Moderate	Max	Max	Moderate
	RCW14	Max		Good	Max	Max	Good
Shannon Erne	SE40	-	-	Moderate	-	-	Moderate
	SE42	-	-	Moderate	-	-	Moderate

*Grand Canal Basin is not a designated AWB

Of the 41 canal monitoring sites eight were at Moderate rather than Good eco-potential based on physico-chemical results alone. Five were at Moderate based on results from macroinvertebrate sampling alone, while two sites were at Moderate following physico-chemical and macroinvertebrate analysis (Table 6.1). The reasons for sites being at Moderate eco-potential based on results from physico-chemical analysis in 2025 is explained in Section 2.3.2, while it is considered that local issues that warrant further investigation are playing a role at sites that were assigned Moderate status based on macroinvertebrate sampling (see Section 4.3.2). Four sites were assigned a Poor rating based solely on the macroinvertebrate element. The potential causes of sites being at Poor eco-potential based on results from macroinvertebrate analysis alone in 2025 are discussed in Section 4.3.2

Both sites on the Shannon-Erne Waterway were assigned a Moderate indicative eco-potential following persistent BOD threshold breaches in 2025 (see Table 6.1 and Sections 2.3.1 and 2.3.3). Both sites on the Grand Canal Basin were assigned Good indicative eco-potential overall for 2025.

Table 6.2 Ecological potential of the 14 Artificial Water Bodies on the Grand Canal and Royal Canal based on the combined macrophyte, physico-chemistry, hydromorphology and invasive species quality elements in 2025. The ecological potential of the Shannon-Erne Waterway and the Grand Canal Basin is based on physico-chemistry results alone.

AWB	Macrophytes	Macro-invertebrates	Physico-Chemistry	Hydro-morphology	Invasive Species	ECOLOGICAL POTENTIAL - AWB
GC_09	Max	Moderate	Good	Max	Good	Moderate
GCNL_09	Max	Poor	Good	Max	Max	Poor
GCMF_14	Max		Good	Max	Good	Good
GCBL_14	Max		Good	Max	Max	Good
GC_14E	Max	Good	Good	Max	Good	Good
GC_14W	Max	Max	Good	Max	Good	Good
GC_07	Max	Good	Good	Max	Good	Good
GC_25A	Max		Good	Max	Max	Good
GCB	-	-	Good	-	-	Good
RC_07	Max		Moderate	Max	Max	Moderate
RC_09	Max		Good	Max	Max	Good
RC_25A	Max	Good	Good	Max	Max	Good
RC_26F	Max		Good	Max	Max	Good
RC_26E	Max		Moderate	Max	Max	Moderate
RC_26C	Max		Good	Max	Max	Good
SE_26A	-	-	Moderate	-	-	Moderate

*Grand Canal Basin is not a designated AWB

The eco-potentials for the 14 AWBs that are based on the combined physico-chemical, macrophyte, macroinvertebrate, invasive species and hydromorphological quality elements in 2025 are presented in Table 6.2. (Results from macroinvertebrate sampling is incomplete, as the there are still 14 sites to be sampled in 2026.) Also included in this Table are the eco-potential results for the Shannon-Erne AWB and the Grand Canal AWB (the latter is not a designated AWB for WFD classification purposes), based on the physico-chemical quality element alone. Three AWB's including the Shannon-Erne Waterway (RC_07, RC26E & SE_26A) were assigned Moderate eco-potential based on physico-chemistry analysis, for reasons explained in Section 2.3.2 (Table 6.2). One AWB (GC_09) was assigned Moderate status and one AWB (GCNL_09) was assigned Poor status based on the macroinvertebrate quality element alone, and are both discussed in Section 4.3.2.

7. References

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Appendices

Appendix I. Physico-chemical results and indicative ecological potential for the six classifying determinands on a site-by-site basis in the 15 Artificial Water Bodies (AWBs) on the Grand & Royal Canals and the Shannon-Erne Waterway for Q1, Q2, Q3 and Q4 in 2025. (Results for the Grand Canal Basin are included.)

AWB		Site Code	Quarter	Total P (mg/L P)	SRP (mg/L P)	TON (mg/L N)	*E.coli* (Count/100ml)	B.O.D. (mg/L O2)	Ammonia (mg/L N)	Indicative Physico-chemical Potential
GC_09	GCE4_Q1	GCE4	Q1	0.04	0.010	1.70	91	1.00	0.020	Good
	GCE4_Q2		Q2	0.01	0.010	1.00	27	2.00	0.030	Good
	GCE4_Q3		Q3	0.02	0.010	1.00	388	1.00	0.040	Good
	GCE4_Q4		Q4	0.03	0.010	1.80	10	1.00	0.050	Good
	GCE6_Q1	GCE6	Q1	0.03	0.01	1.50	0	1.00	0.020	Good
	GCE6_Q2		Q2	0.01	0.01	1.00	2	1.00	0.020	Good
	GCE6_Q3		Q3	0.02	0.01	1.00	41	1.00	0.040	Good
	GCE6_Q4		Q4	0.03	0.01	1.40	30	1.00	0.040	Good
	GCE8_Q1	GCE8	Q1	0.03	0.01	1.00	77	1.00	0.040	Good
	GCE8_Q2		Q2	0.01	0.01	1.00	125	2.00	0.020	Good
	GCE8_Q3		Q3	0.03	0.01	1.00	318	1.00	0.030	Good
	GCE8_Q4		Q4	0.03	0.01	1.40	733	1.00	0.090	Good
	GCE10_Q1	GCE10	Q1	0.02	0.01	1	0	2.00	0.020	Good
	GCE10_Q2		Q2	0.01	0.01	1	7	2.00	0.030	Good
	GCE10_Q3		Q3	0.01	0.01	1	63	1.00	0.050	Good
	GCE10_Q4		Q4	0.02	0.01	1	10	1.00	0.040	Good
	GCE12_Q1	GCE12	Q1	0.02	0.01	1.00	13	2.00	0.020	Good
	GCE12_Q2		Q2	0.01	0.01	1.00	76	2.00	0.020	Good
	GCE12_Q3		Q3	0.01	0.01	1.00	880	1.00	0.030	Good
	GCE12_Q4		Q4	0.02	0.01	1.00	10	1.00	0.040	Good
	GCE14_Q1	GCE14	Q1	0.02	0.01	1.00	7	2.00	0.020	Good
	GCE14_Q2		Q2	0.02	0.01	1.00	5	3.00	0.040	Moderate
	GCE14_Q3		Q3	0.02	0.01	1.00	285	1.00	0.040	Good
	GCE14_Q4		Q4	0.03	0.01	1.00	20	1.00	0.030	Good
GCNL_09	NL1_Q1	NL1	Q1	0.03	0.01	3.60	23	1.00	0.020	Good
	NL1_Q2		Q2	0.01	0.01	2.90	15	1.00	0.020	Good
	NL1_Q3		Q3	0.01	0.01	1.10	455	1.00	0.020	Good
	NL1_Q4		Q4	0.03	0.01	2.10	697	1.00	0.100	Good
GCMF_14	MF1_Q1	MF1	Q1	0.01	0.01	2.40	0	1.00	0.020	Good
	MF1_Q2		Q2	0.01	0.01	1.40	2	2.00	0.030	Good
	MF1_Q3		Q3	0.01	0.01	1.80	146	1.00	0.040	Good
	MF1_Q4		Q4	0.02	0.01	2.00	10	1.00	0.120	Moderate

GCBL_14	BL2_Q1	BL2	Q1	0.02	0.01	1.10	0	2.00	0.020	Good
	BL2_Q2		Q2	0.01	0.01	1.00	3	3.00	0.030	Moderate
	BL2_Q3		Q3	0.01	0.01	1.00	52	2.00	0.020	Good
	BL2_Q4		Q4	0.02	0.01	1.00	10	1.00	0.070	Good
	BL6_Q1	BL6	Q1	0.02	0.01	1.00	0	1.00	0.020	Good
	BL6_Q2		Q2	0.01	0.01	1.00	1	3.00	0.020	Moderate
	BL6_Q3		Q3	0.01	0.01	1.00	84	1.00	0.020	Good
	BL6_Q4		Q4	0.02	0.01	1.00	41	1.00	0.070	Good
	BL10_Q1	BL10	Q1	0.02	0.01	2.10	0	2.00	0.020	Good
	BL10_Q2		Q2	0.01	0.01	1.80	0	3.00	0.020	Moderate
	BL10_Q3		Q3	0.01	0.01	4.30	144	1.00	0.020	Moderate
	BL10_Q4		Q4	0.03	0.01	1.00	10	1.00	0.110	Good
	BL15_Q1	BL15	Q1	0.02	0.01	1.70	4	1.00	0.020	Good
	BL15_Q2		Q2	0.02	0.01	1.40	14	2.00	0.030	Good
	BL15_Q3		Q3	0.01	0.01	1.00	110	1.00	0.030	Good
	BL15_Q4		Q4	0.02	0.01	1.00	10	1.00	0.120	Moderate
GC_14E	GCE1_Q1	GCE1	Q1	0.020	0.010	1.00	0	1.00	0.070	Good
	GCE1_Q2		Q2	0.010	0.010	1.00	108	2.00	0.070	Good
	GCE1_Q3		Q3	0.010	0.010	1.00	52	1.00	0.040	Good
	GCE1_Q4		Q4	0.030	0.010	1.00	323	2.00	0.070	Good
	GCW1_Q1	GCW1	Q1	0.02	0.01	1.60	0	1.00	0.030	Good
	GCW1_Q2		Q2	0.01	0.01	1.00	4	2.00	0.030	Good
	GCW1_Q3		Q3	0.02	0.01	1.00	148	1.00	0.040	Good
	GCW1_Q4		Q4	0.02	0.01	1.20	10	1.00	0.050	Good
GC_14W	GCW8_Q1	GCW8	Q1	0.01	0.01	1.00	0	1.00	0.020	Good
	GCW8_Q2		Q2	0.02	0.01	0.50	122	1.00	0.040	Good
	GCW8_Q3		Q3	0.01	0.01	1.00	10	1.00	0.020	Good
	GCW8_Q4		Q4	0.02	0.01	1.00	10	2.00	0.040	Good
	GCW12_Q1	GCW12	Q1	0.02	0.01	1.00	23	1.00	0.040	Good
	GCW12_Q2		Q2	0.04	0.01	0.50	205	1.00	0.040	Good
	GCW12_Q3		Q3	0.07	0.01	1.00	10	2.00	0.040	Moderate
	GCW12_Q4		Q4	0.07	0.01	1.00	31	5.00	0.030	Moderate
GC_07	GCW4_Q1	GCW4	Q1	0.01	0.01	1.00	0	1.00	0.020	Good
	GCW4_Q2		Q2	0.02	0.01	0.50	345	3.00	0.050	Moderate
	GCW4_Q3		Q3	0.01	0.01	1.00	30	2.00	0.030	Good
	GCW4_Q4		Q4	0.02	0.01	1.00	10	1.00	0.030	Good
	GCW6_Q1	GCW6	Q1	0.01	0.01	1.00	0	1.00	0.020	Good
	GCW6_Q2		Q2	0.01	0.01	0.50	25	3.00	0.040	Moderate
	GCW6_Q3		Q3	0.01	0.01	1.00	288	2.00	0.030	Good
	GCW6_Q4		Q4	0.02	0.01	1.00	132	1.00	0.050	Good

GC_25A	GCW16_Q1	GCW16	Q1	0.01	0.01	1.00	5	**3.00**	0.020	**Moderate**
	GCW16_Q2		Q2	0.02	0.01	0.50	3	2.00	0.040	**Good**
	GCW16_Q3		Q3	0.03	0.01	1.00	238	2.00	0.030	**Good**
	GCW16_Q4		Q4	0.05	0.01	1.00	10	**6.00**	**0.130**	**Moderate**
	GCW18_Q1	GCW18	Q1	0.01	0.01	1.00	0	**4.00**	0.020	**Moderate**
	GCW18_Q2		Q2	0.02	0.01	0.50	345	**5.00**	0.050	**Moderate**
	GCW18_Q3		Q3	0.02	0.01	1.00	10	2.00	0.020	**Good**
	GCW18_Q4		Q4	0.03	0.01	1.00	10	1.00	0.050	**Good**
	GCW20_Q1	GCW20	Q1	0.01	0.01	1.00	0	**7.00**	0.020	**Moderate**
	GCW20_Q2		Q2	0.02	0.01	0.50	1	2.00	0.050	**Good**
	GCW20_Q3		Q3	0.01	0.01	2.50	10	2.00	0.030	**Good**
	GCW20_Q4		Q4	0.03	0.01	1.00	20	1.00	0.070	**Good**
	GCW22_Q1	GCW22	Q1	0.01	0.01	1.00	0	1.00	0.020	**Good**
	GCW22_Q2		Q2	0.01	0.01	0.54	0	1.00	0.040	**Good**
	GCW22_Q3		Q3	0.01	0.01	1.00	10	1.00	0.030	**Good**
	GCW22_Q4		Q4	0.02	0.01	1.00	10	1.00	0.070	**Good**
	GCW24_Q1	GCW24	Q1	0.01	0.01	1.00	0	2.00	0.020	**Good**
	GCW24_Q2		Q2	0.02	0.01	0.50	1	**4.00**	0.030	**Moderate**
	GCW24_Q3		Q3	0.02	0.01	1.00	10	2.00	0.020	**Good**
	GCW24_Q4		Q4	0.02	0.01	1.00	10	1.00	**0.130**	**Moderate**
	GCW27_Q1	GCW27	Q1	0.01	0.01	1.00	0	2.00	0.020	**Good**
	GCW27_Q2		Q2	0.02	0.01	0.50	9	1.00	0.040	**Good**
	GCW27_Q3		Q3	0.01	0.01	1.00	10	2.00	0.020	**Good**
	GCW27_Q4		Q4	0.02	0.01	1.00	30	1.00	0.100	**Good**
GCB*	GCB4*_Q1	GCB4*	Q1	0.06	0.01	1.00	20	2.00	0.070	**Good**
	GCB4*_Q2		Q2	0.02	0.01	1.00	138	2.00	0.030	**Good**
	GCB4*_Q3		Q3	0.04	0.01	1.00	75	2.00	0.070	**Good**
	GCB4*_Q4		Q4	**0.07**	0.01	1.00	95	2.00	0.050	**Moderate**
	GCB7*_Q1	GCB7*	Q1	0.06	0.01	1.00	29	1.00	0.050	**Good**
	GCB7*_Q2		Q2	0.01	0.01	1.00	140	1.00	0.020	**Good**
	GCB7*_Q3		Q3	0.06	0.01	1.00	86	2.00	**0.120**	**Moderate**
	GCB7*_Q4		Q4	**0.08**	0.02	1.00	63	1.00	0.060	**Moderate**

RC_07	RCE4_Q1	RCE4	Q1	0.02	0.01	1.00	37	**4.00**	0.020	**Moderate**
	RCE4_Q2		Q2	0.02	0.01	0.50	0	2.00	0.060	**Good**
	RCE4_Q3		Q3	0.02	0.01	1.00	20	2.00	0.020	**Good**
	RCE4_Q4		Q4	0.04	0.01	1.00	10	2.00	**0.120**	**Moderate**
	RCE6_Q1	RCE6	Q1	0.02	0.01	1.00	43	2.00	0.020	**Good**
	RCE6_Q2		Q2	0.02	0.01	0.88	248	2.00	0.070	**Good**
	RCE6_Q3		Q3	0.02	0.01	1.40	216	1.00	0.020	**Good**
	RCE6_Q4		Q4	0.03	0.01	1.00	10	1.00	0.070	**Good**
	RCE8_Q1	RCE8	Q1	0.01	0.01	1.00	10	1.00	0.020	**Good**
	RCE8_Q2		Q2	0.02	0.01	0.50	387	2.00	0.080	**Good**
	RCE8_Q3		Q3	0.04	0.01	1.00	10	2.00	0.020	**Good**
	RCE8_Q4		Q4	0.03	0.01	1.00	41	1.00	0.050	**Good**
	RCE9_Q1	RCE9	Q1	0.03	0.01	1.00	0	**3.00**	0.020	**Moderate**
	RCE9_Q2		Q2	0.01	0.01	1.00	29	**8.00**	0.020	**Moderate**
	RCE9_Q3		Q3	0.02	0.01	1.00	10	2.00	0.090	**Good**
	RCE9_Q4		Q4	0.03	0.01	1.00	10	2.00	**0.120**	**Moderate**
	RCE12_Q1	RCE12	Q1	0.02	0.01	1.00	2	2.00	0.020	**Good**
	RCE12_Q2		Q2	0.03	0.01	1.00	5	**9.00**	0.020	**Moderate**
	RCE12_Q3		Q3	0.05	0.01	1.00	20	**4.00**	0.050	**Moderate**
	RCE12_Q4		Q4	0.03	0.01	1.30	10	2.00	0.080	**Good**
RC_09	RCE14_Q1	RCE14	Q1	0.02	0.01	1.00	4	2.00	0.050	**Good**
	RCE14_Q2		Q2	0.02	0.01	1.00	10	**4.00**	0.030	**Moderate**
	RCE14_Q3		Q3	0.02	0.01	1.00	120	2.00	0.020	**Good**
	RCE14_Q4		Q4	0.02	0.01	1.00	10	2.00	0.110	**Good**
	RCE16_Q1	RCE16	Q1	0.02	0.01	1.00	3	2.00	0.020	**Good**
	RCE16_Q2		Q2	0.01	0.01	1.00	6	1.00	0.030	**Good**
	RCE16_Q3		Q3	0.01	0.01	1.00	10	2.00	0.060	**Good**
	RCE16_Q4		Q4	0.03	0.01	1.00	10	1.00	0.060	**Good**
	RCE19_Q1	RCE19	Q1	0.02	0.01	1.00	1	1.00	0.020	**Good**
	RCE19_Q2		Q2	0.02	0.01	1.00	10	**5.00**	0.020	**Moderate**
	RCE19_Q3		Q3	0.02	0.01	1.00	404	**4.00**	0.020	**Moderate**
	RCE19_Q4		Q4	0.03	0.01	1.00	10	1.00	0.110	**Good**
	RCE22_Q1	RCE22	Q1	0.03	0.01	1.00	99	1.00	0.040	**Good**
	RCE22_Q2		Q2	0.02	0.01	1.00	30	**3.00**	0.020	**Moderate**
	RCE22_Q3		Q3	0.02	0.01	1.00	30	**4.00**	0.060	**Moderate**
	RCE22_Q4		Q4	0.04	0.01	1.00	110	1.00	0.060	**Good**
	RCE25_Q1	RCE25	Q1	0.02	0.01	1.00	5	1.00	0.040	**Good**
	RCE25_Q2		Q2	0.02	0.01	1.00	7	**5.00**	0.020	**Moderate**
	RCE25_Q3		Q3	0.01	0.01	1.00	496	1.00	0.030	**Good**
	RCE25_Q4		Q4	0.03	0.01	1.00	181	1.00	0.040	**Good**

RC_25A	RCW1_Q1	RCW1	Q1	0.01	0.01	1.00	20	1.00	0.020	Good
	RCW1_Q2		Q2	0.02	0.01	0.50	25	2.00	0.080	Good
	RCW1_Q3		Q3	0.03	0.01	1.00	10	2.00	0.030	Good
	RCW1_Q4		Q4	0.03	0.01	1.00	52	1.00	0.040	Good
	RCW3_Q1	RCW3	Q1	0.01	0.01	1.00	0	1.00	0.020	Good
	RCW3_Q2		Q2	0.03	0.01	0.50	4	2.00	0.160	Moderate
	RCW3_Q3		Q3	0.02	0.01	1.00	10	2.00	0.030	Good
	RCW3_Q4		Q4	0.03	0.01	1.00	20	1.00	0.050	Good
RC_26F	RCW5_Q1	RCW5	Q1	0.01	0.01	1.00	0	1.00	0.020	Good
	RCW5_Q2		Q2	0.02	0.01	0.50	6	2.00	0.080	Good
	RCW5_Q3		Q3	0.02	0.01	2.90	120	2.00	0.020	Good
	RCW5_Q4		Q4	0.02	0.01	1.00	169	1.00	0.060	Good
	RCW7_Q1	RCW7	Q1	0.01	0.01	1.00	0	1.00	0.020	Good
	RCW7_Q2		Q2	0.01	0.01	0.50	9	1.00	0.060	Good
	RCW7_Q3		Q3	0.02	0.01	1.00	10	5.00	0.020	Moderate
	RCW7_Q4		Q4	0.02	0.01	1.00	10	1.00	0.050	Good
	RCW9_Q1	RCW9	Q1	0.02	0.01	1.00	0	2.00	0.020	Good
	RCW9_Q2		Q2	0.01	0.01	0.50	2	1.00	0.070	Good
	RCW9_Q3		Q3	0.03	0.01	1.30	10	5.00	0.020	Moderate
	RCW9_Q4		Q4	0.05	0.01	1.00	30	2.00	0.070	Good
RC_26E	RCW12_Q1	RCW12	Q1	0.01	0.01	1.00	0	2.00	0.020	Good
	RCW12_Q2		Q2	0.01	0.01	0.50	24	2.00	0.140	Moderate
	RCW12_Q3		Q3	0.01	0.01	1.30	52	5.00	0.020	Moderate
	RCW12_Q4		Q4	0.02	0.01	1.00	10	1.00	0.060	Good
RC_26C	RCW14_Q1	RCW14	Q1	0.01	0.01	1.00	0	1.00	0.020	Good
	RCW14_Q2		Q2	0.01	0.01	0.50	8	1.00	0.130	Moderate
	RCW14_Q3		Q3	0.02	0.01	1.00	10	5.00	0.020	Moderate
	RCW14_Q4		Q4	0.02	0.01	1.00	10	1.00	0.050	Good
SE_26A	SE40_Q1	SE40	Q1	0.05	0.01	1.00	7	3.00	0.020	Moderate
	SE40_Q2		Q2	0.06	0.01	0.50	130	3.00	0.140	Moderate
	SE40_Q3		Q3	0.05	0.01	1.00	10	4.00	0.080	Moderate
	SE40_Q4		Q4	0.06	0.01	1.00	148	4.00	0.090	Moderate
	SE42_Q1	SE42	Q1	0.06	0.01	1.00	28	2.00	0.020	Good
	SE42_Q2		Q2	0.04	0.01	0.50	19	3.00	0.070	Moderate
	SE42_Q3		Q3	0.05	0.01	1.00	41	5.00	0.050	Moderate
	SE42_Q4		Q4	0.09	0.01	1.00	189	3.00	0.090	Moderate

Appendix II. Physico-chemical results and indicative ecological potential for the six classifying determinands in the 15 Artificial Water Bodies (AWBs) on the Grand & Royal Canals and the Shannon-Erne Waterway for Q1, Q2, Q3 and Q4 in 2025. (Results for the Grand Canal Basin are included.)

	AWB	Quarter	Total P (mg/L P)	SRP (mg/L P)	TON (mg/L N)	*E.coli* (Count/100ml)	B.O.D. (mg/L O2)	Ammonia (mg/L N)	Indicative Physico-chemical Potential
Grand Canal	GC_09	Q1	0.027	0.010	1.20	31	1.50	0.023	Good
		Q2	0.012	0.010	1.00	40	2.00	0.027	Good
		Q3	0.018	0.010	1.00	329	1.00	0.038	Good
		Q4	0.027	0.010	1.27	136	1.00	0.048	Good
	GCNL_09	Q1	0.030	0.010	3.60	23	1.00	0.020	Good
		Q2	0.010	0.010	2.90	15	1.00	0.020	Good
		Q3	0.010	0.010	1.10	455	1.00	0.020	Good
		Q4	0.030	0.010	2.10	697	1.00	0.100	Good
	GCMF_14	Q1	0.010	0.010	2.40	0	1.00	0.020	Good
		Q2	0.010	0.010	1.40	2	2.00	0.030	Good
		Q3	0.010	0.010	1.80	146	1.00	0.040	Good
		Q4	0.020	0.010	2.00	10	1.00	0.120	Moderate
	GCBL_14	Q1	0.020	0.010	1.48	1	1.50	0.020	Good
		Q2	0.013	0.010	1.30	5	2.75	0.025	Moderate
		Q3	0.010	0.010	1.83	98	1.25	0.023	Good
		Q4	0.023	0.010	1.00	18	1.00	0.093	Good
	GC_14E	Q1	0.020	0.010	1.30	0	1.00	0.050	Good
		Q2	0.010	0.010	1.00	56	2.00	0.050	Good
		Q3	0.015	0.010	1.00	100	1.00	0.040	Good
		Q4	0.025	0.010	1.10	167	1.50	0.060	Good
	GC_14W	Q1	0.015	0.010	1.00	12	1.00	0.030	Good
		Q2	0.030	0.010	0.50	164	1.00	0.040	Good
		Q3	0.040	0.010	1.00	10	1.50	0.030	Good
		Q4	0.045	0.010	1.00	21	3.50	0.035	Moderate
	GC_07	Q1	0.010	0.010	1.00	0	1.00	0.020	Good
		Q2	0.015	0.010	0.50	185	3.00	0.045	Moderate
		Q3	0.010	0.010	1.00	159	2.00	0.030	Good
		Q4	0.020	0.010	1.00	71	1.00	0.040	Good
	GC_25A	Q1	0.010	0.010	1.00	1	3.17	0.020	Moderate
		Q2	0.018	0.010	0.51	60	2.50	0.042	Moderate
		Q3	0.017	0.010	1.25	48	1.83	0.025	Good
		Q4	0.028	0.010	1.00	63	1.50	0.075	Good
Royal Canal	GCB*	Q1	0.060	0.010	1.00	25	1.50	0.060	Good
		Q2	0.015	0.010	1.00	139	1.50	0.025	Good
		Q3	0.050	0.010	1.00	81	2.00	0.095	Good
		Q4	0.075	0.015	1.00	79	1.50	0.055	Moderate
	RC_07	Q1	0.020	0.010	1.00	18	2.40	0.020	Good
		Q2	0.020	0.010	0.78	134	4.60	0.050	Moderate
		Q3	0.030	0.010	1.08	55	2.20	0.040	Good
		Q4	0.032	0.010	1.06	16	1.60	0.088	Good
	RC_09	Q1	0.022	0.010	1.00	22	1.40	0.034	Good
		Q2	0.018	0.010	1.00	13	3.60	0.024	Moderate
		Q3	0.016	0.010	1.00	212	2.60	0.038	Moderate
		Q4	0.030	0.010	1.00	64	1.20	0.076	Good
	RC_25A	Q1	0.010	0.010	1.00	10	1.00	0.020	Good
		Q2	0.025	0.010	0.50	15	2.00	0.120	Moderate
		Q3	0.025	0.010	1.00	10	2.00	0.030	Good
		Q4	0.030	0.010	1.00	36	1.00	0.045	Good
	RC_26F	Q1	0.013	0.010	1.00	0	1.33	0.020	Good
		Q2	0.013	0.010	0.50	6	1.33	0.070	Good
		Q3	0.023	0.010	1.73	47	4.00	0.020	Moderate
		Q4	0.030	0.010	1.00	70	1.33	0.060	Good
	RC_26E	Q1	0.010	0.010	1.00	0	2.00	0.020	Good
		Q2	0.010	0.010	0.50	24	2.00	0.140	Moderate
		Q3	0.010	0.010	1.30	52	5.00	0.020	Moderate
		Q4	0.020	0.010	1.00	10	1.00	0.060	Good
Shannon Erne	RC_26C	Q1	0.010	0.010	1.00	0	1.00	0.020	Good
		Q2	0.010	0.010	0.50	8	1.00	0.130	Moderate
		Q3	0.020	0.010	1.00	10	5.00	0.020	Moderate
		Q4	0.020	0.010	1.00	10	1.00	0.050	Good
	SE_26A	Q1	0.055	0.010	1.00	18	2.50	0.020	Moderate
		Q2	0.050	0.010	0.50	75	3.00	0.105	Moderate
		Q3	0.050	0.010	1.00	26	4.50	0.065	Moderate
		Q4	0.075	0.010	1.00	169	3.50	0.090	Moderate

Appendix III. Physico-chemical results and indicative ecological potential for the six classifying determinands on the five canal feeders/drains for Q1 Q2, Q3 and Q4 in 2025.

Feeders		Site Code	Quarter	Total P (mg/L P)	SRP (mg/L P)	TON (mg/L N)	*E.coli* (Count/100ml)	B.O.D. (mg/L O2)	Ammonia (mg/L N)	Indicative Physico-chemical Potential
Monread Feeder	GCE5.1_Q1	GCE5.1	Q1	0.06	0.01	1.50	115	1.00	0.06	Good
	GCE5.1_Q2		Q2	0.02	0.01	1.60	1300	1.00	0.02	Moderate
	GCE5.1_Q3		Q3	0.06	0.01	2.10	2420	1.00	0.04	Moderate
	GCE5.1_Q4		Q4	0.04	0.01	1.90	213	1.00	0.04	Good
Ballymullen Feeder	GCW12.1_Q1	GCW12.1	Q1	0.06	0.01	1.00	122	1.00	0.02	Good
	GCW12.1_Q2		Q2	0.05	0.01	0.60	461	1.00	0.03	Good
	GCW12.1_Q3		Q3	0.23	0.04	1.00	657	5.00	0.19	Moderate
	GCW12.1_Q4		Q4	0.1	0.01	1.00	134	3.00	0.04	Moderate
Ballylennon Feeder	GCW13.1_Q1	GCW13.1	Q1	0.04	0.01	1.00	25	3.00	0.16	Moderate
	GCW13.1_Q2		Q2	0.06	0.01	0.50	2420	6.00	0.04	Moderate
	GCW13.1_Q3		Q3	0.04	0.01	1.00	63	5.00	0.07	Moderate
	GCW13.1_Q4		Q4	0.06	0.01	1.00	63	4.00	0.07	Moderate
Athy Drain	BL15.1_Q1	BL15.1	Q1	0.07	0.01	1.70	44	3.00	0.06	Moderate
	BL15.1_Q2		Q2	0.03	0.01	2.00	579	2.00	0.07	Good
	BL15.1_Q3		Q3	0.09	0.01	1.90	2420	1.00	0.07	Moderate
	BL15.1_Q4		Q4	0.06	0.01	2.60	670	1.00	0.14	Moderate
Kilcock Harbour	RCE16.1_Q1	RCE16.1	Q1	0.05	0.01	1.40	613	1.00	0.16	Moderate
	RCE16.1_Q2		Q2	0.03	0.01	1.00	2420	2.00	0.08	Moderate
	RCE16.1_Q3		Q3	0.02	0.01	1.00	504	1.00	0.05	Good
	RCE16.1_Q4		Q4	0.04	0.01	1.50	1670	1.00	0.05	Moderate

Appendix IV

Water Framework Directive Compliance Report

Physico-Chemistry

First Quarter 2025

Water Framework Directive Compliance Report

Physico-chemistry

First Quarter 2025



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Front Cover: A barge moored in Leitrim Village (SE42) in February 2025.

1. Introduction

Water Framework Directive (WFD) surveillance monitoring of the Royal and Grand Canals and the canalised section of the Shannon-Erne Waterway for Q1 2025 was carried out on 26th of February and 6th of March 2025.

A canal is identified as an Artificial Water Body (AWB) in the WFD and is defined as 'a body of water created by human activity'. In recognition of their navigational role, AWBs must achieve good ecological potential as opposed to good ecological status, the latter which applies to natural water bodies, such as rivers and lakes. Ecological potential is assessed using a combination of biological (native and invasive macroinvertebrate and macrophyte), physico-chemical and hydromorphological quality elements. For classification purposes, the ecological potential of a site or AWB can be Maximum, Good, Moderate, Poor or Bad. Where physico-chemistry alone is being assessed, as in this report, sites and AWBs can achieve either Good or Moderate potential only. In assigning ecological potential, the one-out-all-out rule applies, whereby the lowest value quality element determines the overall classification of the AWB. A system for classifying British and Irish canals based on macroinvertebrate, macrophyte, invasive species, physico-chemical and hydromorphological quality elements is used to assess the ecological potential of AWBs. In the current reporting period (Q1 2025), the canals are classified based on the physico-chemistry of the water during this period.

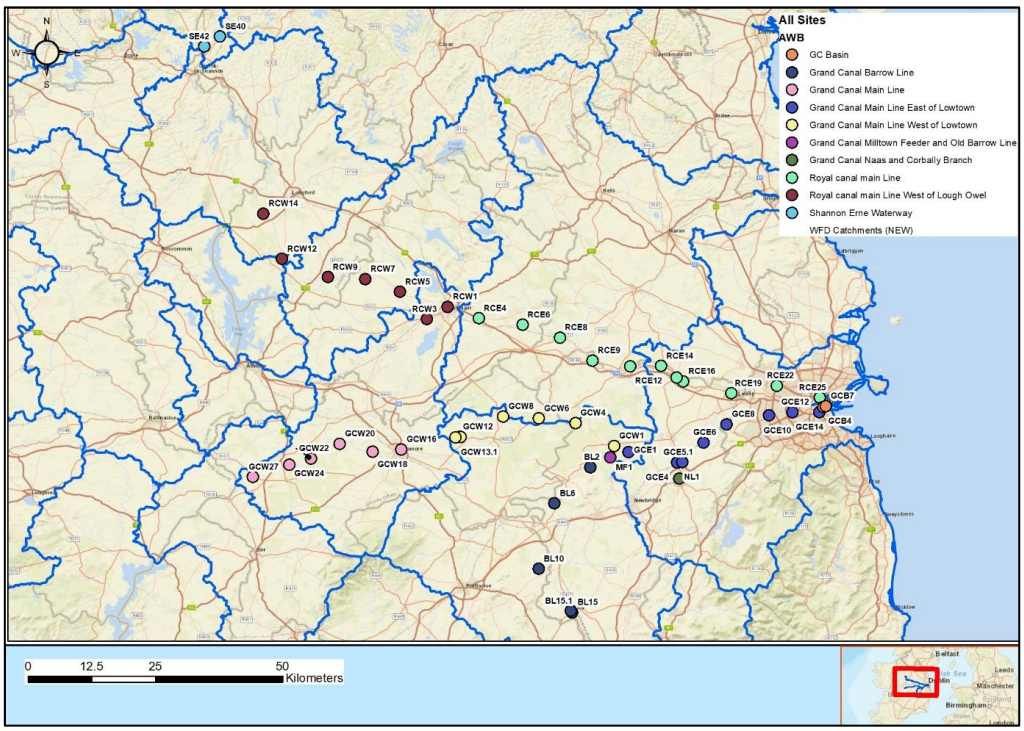


Figure 1.1: Artificial Water Bodies (AWBs), sites and monitored feeder streams on the Royal and Grand Canals, and the Shannon-Erne Waterway. The AWBs are grouped based on associated river catchments.

The canals are currently divided into 15 AWBs based on their locations within river catchments (Table 1.1). The Grand Canal supports eight AWBs (this does not include the Grand Canal Basin), the Royal Canal has six AWBs and there is just a single AWB on the Shannon-Erne Waterway. Four of the AWBs have only a single canal sampling site (Table 1.1), which can be potentially problematic when ecological potential for individual AWBs is being assigned. This reflects the fact that a breach in any biological or abiotic parameter can result in the AWB being changed from Good to Moderate.

For reporting purposes, a simple code has been assigned, whereby AWBs are labelled according to the river catchment in which they occur (Table 1.1).

Table 1.1: Artificial Water Bodies (AWBs) included in the WFD Monitoring Programme.

Artificial Water Body (AWB)	Catchment No	New ID Code	New Report Code	Length (km)	No of Sites
GRAND CANAL					
Grand Canal Main Line - Liffey and Dublin Bay	9	IE_09_AWB_GCMLE	GC_09	41.4	6
Grand Canal Main Line East - Barrow	14	IE_14_AWB_GCMLE	GC_14E	15.7	2
Grand Canal Main Line West - Barrow	14	IE_14_AWB_GCMLW	GC_14W	12.9	2
Grand Canal Main Line - Boyne	7	IE_07_AWB_GCMLW	GC_07	14.5	2
Grand Canal Main Line - Lower Shannon	25A	IE_25A_AWB_GCMLW	GC_25A	47.0	6
Grand Canal Naas Line - Liffey and Dublin Bay	9	IE_09_AWB_GCNL	GCNL_09	11.9	1
Grand Canal Milltown Feeder - Barrow	14	IE_14_AWB_GCMF	GCMF_14	10.5	1
Grand Canal Barrow Line - Barrow	14	IE_14_AWB_GCBL	GCBL_14	50.8	4
Grand Canal Basin - Liffey and Dublin Bay	9	IE_09_AWB_GCB	GCB		2
ROYAL CANAL					
Royal Canal Main Line - Boyne Catchment	7	IE_07_AWB_RCMLE	RC_07	42.6	5
Royal Canal Main Line - Liffey and Dublin Bay	9	IE_09_AWB_RCMLE	RC_09	39.4	5
Royal Canal Main Line - Lower Shannon	25A	IE_25A_AWB_RCMLW	RC_25A	13.3	2
Royal Canal Main Line - Upper Shannon	26F	IE_26F_AWB_RCMLW	RC_26F	33.8	3
Royal Canal Main Line - Upper Shannon	26E	IE_26E_AWB_RCMLW	RC_26E	3.7	1
Royal Canal Main Line - Upper Shannon	26C	IE_26C_AWB_RCMLW	RC_26C	14.2	1
SHANNON ERNE WATERWAY					
Shannon Erne Waterway - Upper Shannon	26A	IE_26A_AWB_SEW	SE_26A	25.5	2

During 2020 a second site (SE42) was included on the Shannon-Erne Waterway to better represent the water quality status of this Waterway and AWB (Table 1.1). This site is located adjacent to the marina in Leitrim village, close to where the Shannon-Erne Waterway discharges to the River Shannon (Figure 1.2).



Figure 1.2. Location of the two WFD monitoring sites (SE40 and 42) on the Shannon-Erne Waterway.



Plate 1.1: *Water sampling at Belmont Bridge (RCW3) in February 2025.*

2. Materials and Methods

2.1. *Sampling locations*

Physico-chemical sampling is conducted on a quarterly basis at 50 monitoring sites – 41 on the Royal, Grand and Barrow Canals, two on the Grand Canal Basin, two on the Shannon-Erne Waterway, and five on selected canal feeder streams/drains (see Figures 1.1, 1.2 and 2.1). The canal feeders/drains have been a source of elevated nutrient and coliform inputs in the past. They include the Monread drain (GCE5.1) and Ballymullen (GCW12.1) and Ballylennon (GCW13.1) feeder streams on the Grand Canal, the Athy drain (BL15.1) on the Barrow Line, and the Kilcock harbour drain (RCE16.1) on the Royal Canal.

Since early summer 2023 to Q1 2025, the water level at the Croke Park monitoring site (RCE25) has been artificially lowered and access to the canal has been blocked, to facilitate Greenway construction activities. From personal communication with an operative at the site, it is expected that water levels will be returned to normal in late spring or early summer 2025. It was, therefore, necessary to take water samples at the nearest accessible upstream site, which has been at Binn's Bridge, Drumcondra, throughout 2024 and in Q1 2025.

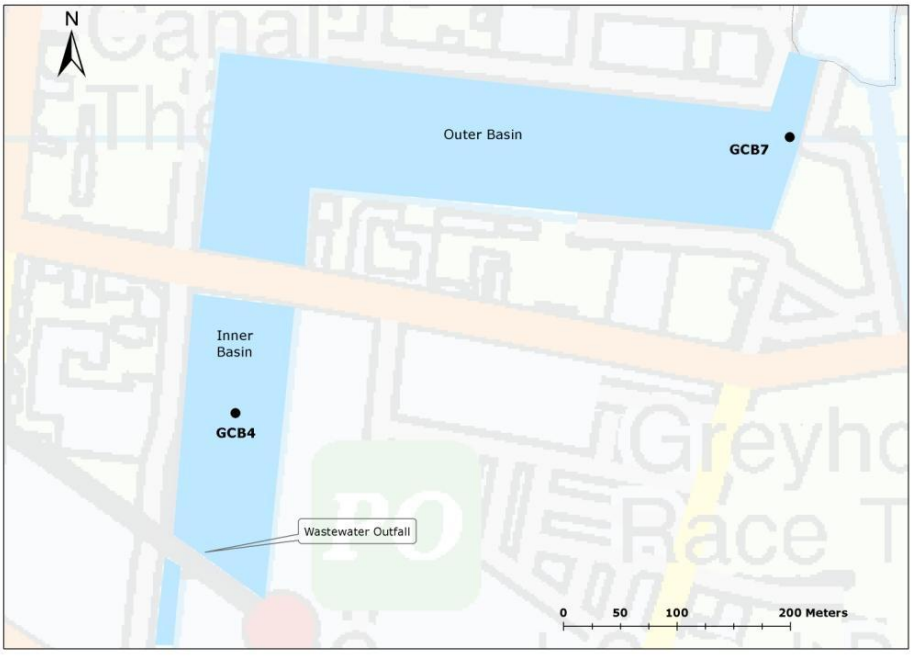


Figure 2.1. Grand Canal Basin (Dublin) showing the two monitoring sites (GCB4 and GCB7).

In addition to the quarterly water samples taken by INVAS at two sites in the Grand Canal Basin (GCB4 – inner and GCB7 - outer), as part of the annual WFD Canals Surveillance Monitoring Programme, Waterways Ireland (WI) and Dublin City Council (DCC) have, in recent years, conducted regular bacteriological sampling for *E. coli* and *Enterococci* at up to 11 sites in the basin (three in the inner,

eight in the outer) and two in the adjacent Grand Canal (Figure 2.2). No results from this sampling programme, however, have been received by INVAS since mid-May 2023.

During 2023 and 2024, persistent water quality issues at have been highlighted at Athy drain, Naas harbour and Leitrim Marina. It is believed that residential pressures such as missed connections, or undocumented drains may be responsible for the issues in each of the areas. Offaly County Council highlighted a complaint from a member of the Public in relation to an 'oil/fuel film contaminant visible in the Tullamore Canal near Canal Court Housing Development' on Sunday the 2nd of March 2025. This is adjacent to the Tullamore site (GCW16). No oily layer was noted at the site during sampling on the 26th of February 2025 (Plate 3.3). A further water quality issue where oil/bilge was dealt with by WI staff using floating booms was reported on the 3rd of March at the 12th lock on the Royal Canal. An apparent slurry release was also detected in the area downstream of Deey Bridge at Lock 13 on the Royal Canal entering the canal at a drain culvert around the same date.

2.2. *Physico-Chemical Monitoring*

Water sampling involves the deployment of a YSI water logger at each site to measure temperature, conductivity, pH and dissolved oxygen (DO). Water samples are collected from canal sites and returned to the Independent Analytical Supplies (IAS) laboratory in Bagenalstown for analysis of a range of determinands (Table 2.1). A subset of these is used to assess indicative ecological potential - Total Phosphorus (TP), Soluble Reactive Phosphorus (SRP), Total Oxidised Nitrogen (TON), Ammonia, Biological Oxygen Demand (BOD) and Faecal Coliforms.

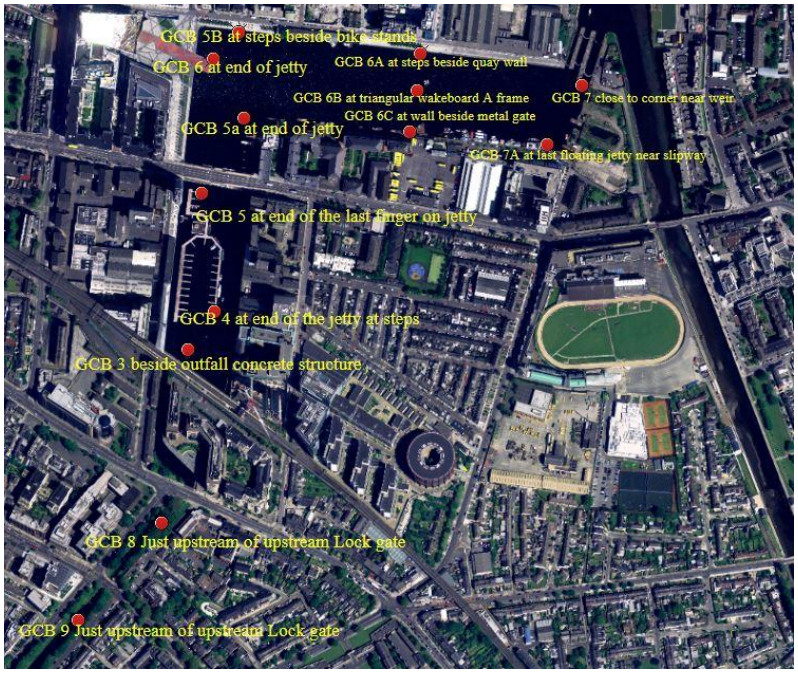


Figure 2.2: Grand Canal Basin (Dublin) showing the 13 sites that have been sampled in the past by Waterways Ireland and Dublin City Council for bacteriology.

Table 2.1: Physico-chemical determinands measured as part of WFD monitoring. (Chlorophyll monitoring has been discontinued since 2021.)

Determinand	Limit	Determinand	Limit
Total Phosphorus (TP) (mg/l P)*	0.063 mg/l P	Dissolved Oxygen (DO) (mg/l and % saturation)	>5.0 mg/l O_2
Molybdate Reactive Phosphorus (MRP) (mg/l P)	0.025 mg/l P	pH	
Soluble Reactive Phosphorus (SRP) (mg/l P)*	0.025 mg/l P	Conductivity (µS)	
Total Oxidised Nitrogen (TON) (mg/l N)*	4.1 mg/l N	Alkalinity (meq/l)	
Nitrite (mg/l)		Chlorophyll (µg/l)	
Nitrate (mg/l)		Biological Oxygen Demand (BOD) (mg/l O_2)*	<2.5 mg/l O_2
Ammonia (mg/l N)*	0.12 mg/l N	Total Coliforms (TC) (counts/100ml)	5000/100 ml
Temperature (°C)		Faecal Coliforms (counts/100ml)*	1000/100 ml

* Determinands used to assign ecological potential to the Artificial Water Bodies (AWBs)

3. Results

The full set of results from physico-chemical analysis of the water samples taken from the 50 canal, feeder/drain and Grand Canal Basin sites surveyed in Q1 2025 is presented in Appendices I and II.

3.1. *Physico-chemistry at Canal Sites*

Water sampling in Q1 2025 was conducted over two days – 26th of February and 6th of March 2025. There was notable rainfall in the week leading up to the sampling on the 26th of February with a relatively dry week prior to the 6th of March sample collection. This led to water levels in most canal sections being close to normal, with the exception of Athy (BL15) on the 6th of March where the water level was circa 30cm below normal (Plate 3.1). There was a low flow of water in most of the feeders and drains following the dry period at the start of March. The water clarity was generally good at most sites with a few outliers, including the site 1km east of Armstrong Bridge on the Grand Canal (GCW24). The Royal Canal east was relatively turbid with the most notable site being Ferns Lock (RCE14) where a significant buildup of loose weed was also observed (Plate 3.2). Water temperature over the sampling period varied from 7 to 12°C and ranged from 7 to 10°C on 26th of February and from 10 to 12°C on the 6th of March 2025 (see Appendix I). The lowest temperature in Q1 of 7°C was recorded at RCE8 (Hill of Down) on the 26th of February.



Plate 3.1. Lower than normal water levels at Lock 28 in Athy (BL15) in March 2025.



Plate 3.2. A buildup of loose weed and turbid water at Ferns Lock in March 2025.

The water quality conditions in Q1 2025 at all seven of the Grand Canal East (GCE) sites were good with no sites in this section breaching any of the six key determinand thresholds or exceeding the acceptable limits of the other parameters. Three sites recorded a BOD reading of 2mg/l O_2 and the remaining four sites were at the low level of 1mg/l O_2. This continues a trend of good water quality seen in 2024 despite the accumulation of permanently moored craft at some of these sites. There were slightly elevated levels for Coliforms and *E. coli* recorded at GCE4 (Sallins) and GCE8 (Hazelhatch), however these results were well within the acceptable limits. The water at Hazelhatch was slightly turbid and a thin film of oil was evident on the water surface at the time of sampling, but there was no indication of any direct discharge in the area.

For all 11 sites on Grand Canal West (GCW) the readings for five of the six key determinands (TP, SRP, TON, Ammonia, and Faecal Coliforms) were consistently well below the classification standards (see Appendix I). However, a cluster of unacceptably high BOD readings were recorded from the water quality sampling on the 26th of February. The sites exhibiting elevated BOD's were Tullamore (GCW16)(3mg/l O_2), Ballycowan (GCW18)(4mg/l O_2), and Cornalaur (GCW20)(7mg/l O_2). Although an oil/film layer was reported from the location of the Tullamore site in early March 2025, the reason(s) for the elevated BOD levels throughout this long section of the Grand Canal is not apparent and there was no evidence of organic pollution or excessive nutrient input to much of this section of canal during sampling. A similar pattern was recorded during Q1 water quality sampling in 2023 where the same cluster of sites exhibited elevated BOD values at GCW16 (2mg/l O_2), GCW18 (4mg/l O_2), and GCW20 (6mg/l O_2). It is unlikely that the contributions from the Ballymullen (GC12.1) and Ballylennon

(GC13.1) feeders could have contributed to these levels at these sites west (downstream) of the feeders. It may be possible that the decay of aquatic vegetation in the channel following weed cutting or winter decline may have contributed to the elevated BOD levels recorded. It will be important to remain vigilant during sampling on this section of canal in Q2 2025 to determine if there are any external sources of organic pollution to the waterway.



Plate 3.3. The site at Tullamore (GCW16) adjacent to the Canal Court Housing Development during water quality sampling on the 26th of February 2025.

The water in the Naas Line at NL1 in Q1 2025 was relatively clear, although the persistent opaqueness that is synonymous with this site remained. Although none of the classification standards were breached on this sampling occasion, Phosphorus levels were slightly raised, while TON (3.6mg/l N) and Nitrate (3.0mg/l N) readings were high and indicate that nitrogen-rich water continues to enter the canal, probably *via* runoff from Naas town that discharges into the . TON and Nitrate levels have been consistently elevated at this site since 2022, and Waterways Ireland should provide this information to Kildare County highlighting the persistent influx of nutrients into the canal.

Water quality conditions in the Milltown Feeder (MF1) exhibited low values reported for all of the physico-chemical parameters measured in Q1 2025, with the exception of TON (see Appendix I). This slightly elevated reading may be related to benthic disturbance at this section where management works to control the infestations of New Zealand Pigmyweed (*Crassula helmsii*) were undertaken in 2024.

On the Barrow Line, the levels recorded for TP, MRP, SRP, *E. coli* and Ammonia were all low in Q1 2025 and well within acceptable limits (see Appendix I). The levels for TON and Nitrate were elevated for both Vicarstown (BL10) and Athy (BL15). The raised TON and Nitrate values at BL10 and BL15

(see Appendix II) are likely to arise as a result of nutrient inputs from the Annonock Stream and Athy Drain, respectively. The record for total Coliforms for Q1 at Athy was raised in comparison to the other sites and may have been related to the low water levels at the site as well as local inputs. The records of continued nutrient input should be notified to Kildare County Council with a focus on the long-term protection of water quality on these sections of the Barrow Line.

As seen in Q1 2024, the water at the ten Royal Canal East (RCE) sites was quite turbid. Water quality conditions were generally good and the only sites throughout the entire Royal Canal system with an Ammonia level above 0.02 mg/lN were RCE14 (Fern's Lock)(0.05 mg/lN), RCE22 (Castleknock)(0.04 mg/lN) and RCE25 (Croke Park) (0.04 mg/lN). Within the RCE system there were slightly elevated readings for Total Phosphorous across most sites, while the highest recorded values for Total Coliforms (488) and *E. coli* (99) were both at RCE22 (Castleknock)(both below the threshold limits). However, there were breaches in BOD recorded at both RCE4 (McNead's Bridge) and RCE9 (Moyvalley) in Q1 2025. This appears to highlight somewhat of a trend in BOD breaches for these two sites where the limit was also exceeded twice each across the four water quality sampling events in 2024. There were no breaches in BOD at these sites in 2023, but if the issue persists throughout sampling in 2025, it may indicate an underlying problem that will need to be raised with Westmeath (RCE4) and Kildare (RCE9) County Councils.

Water quality conditions at the seven sites on RCW were again excellent in Q1 2025, as in 2024. The value for total Coliforms was 0 at all sites except for RCW1 (Mullingar)(308) and RCW7 (Kelly's Bridge)(20), while BOD values were 1mg/lO_2 for all sites but RCW9 (Allard's Bridge) and RCW12 (Island Bridge)(both 2mg/lO_2).

An unacceptably high BOD reading of 3mg/l O_2 was recorded at SE40 in Q1 2025 and represents a sustained high reading with three breaches recorded at this site since Q2 2024. A BOD of 2mg/l O_2 was recorded at Leitrim Village (SE42) and did not exceed the parameter limit. While high levels of Phosphorous were reported at both SE40 and SE42, the levels for all other parameters measured at both monitoring sites on the Shannon-Erne Waterway in Q1 2025 were low and indicative of good water quality conditions (see Appendix I).

3.2. *Indicative Ecological Potential of Canal Sites and Artificial Water Bodies*

The only determinand that was breached in Q1 2025 was BOD at six of the 43 canal and Shannon-Erne sites examined. This resulted in each being assigned Moderate rather than Good indicative eco-potential (Table 3.1 and Figure 3.1) compared to 12 sites that were at Moderate status in Q4 2024. Three of the sites, RCE4 (McNead's Bridge), RCE9 (Moyvalley) and SE40, were downgraded based on their BOD reading alone during consecutive sampling events in both Q1 2025 and Q4 2024. The site at Cornalaur (GCW20) recorded the highest BOD value of the Q1 2025 sampling event at 7mg/l O_2.

Table 3.1: Classification of the 43 canal sites in the 15 Artificial Water Bodies (AWBs), and the Grand Canal Basin, based on results for the six physico-chemical determinands for Q1 2025.

AWB	Site Code	Year	Total P (mg/L P)	SRP (mg/L P)	TON (mg/L N)	*E. coli* (Count/100ml)	B.O.D. (mg/L O2)	Ammonia (mg/L N)	Indicative Physico-chemical Potential
GCE_09	GCE4	2025	0.040	0.010	1.700	91.000	1.000	0.020	Good
	GCE6	2025	0.030	0.010	1.500	0.000	1.000	0.020	Good
	GCE8	2025	0.030	0.010	1.000	77.000	1.000	0.040	Good
	GCE10	2025	0.020	0.010	1.000	0.000	2.000	0.020	Good
	GCE12	2025	0.020	0.010	1.000	13.000	2.000	0.020	Good
	GCE14	2025	0.020	0.010	1.000	7.000	2.000	0.020	Good
GCNL_09	NL1	2025	0.030	0.010	3.600	23.000	1.000	0.020	Good
GCMF_14	MF1	2025	0.010	0.010	2.400	0.000	1.000	0.020	Good
GCBL_14	BL2	2025	0.020	0.010	1.100	0.000	2.000	0.020	Good
	BL6	2025	0.020	0.010	1.000	0.000	1.000	0.020	Good
	BL10	2025	0.020	0.010	2.100	0.000	2.000	0.020	Good
	BL15	2025	0.020	0.010	1.700	4.000	1.000	0.020	Good
GC_14E	GCE1	2025	0.020	0.010	1.000	0.000	1.000	0.070	Good
	GCW1	2025	0.020	0.010	1.600	0.000	1.000	0.030	Good
GC_14W	GCW8	2025	0.010	0.010	1.000	0.000	1.000	0.020	Good
	GCW12	2025	0.020	0.010	1.000	23.000	1.000	0.040	Good
GC_07	GCW4	2025	0.010	0.010	1.000	0.000	1.000	0.020	Good
	GCW6	2025	0.010	0.010	1.000	0.000	1.000	0.020	Good
GC_25A	GCW16	2025	0.010	0.010	1.000	5.000	3.000	0.020	Moderate
	GCW18	2025	0.010	0.010	1.000	0.000	4.000	0.020	Moderate
	GCW20	2025	0.010	0.010	1.000	0.000	7.000	0.020	Moderate
	GCW22	2025	0.010	0.010	1.000	0.000	1.000	0.020	Good
	GCW24	2025	0.010	0.010	1.000	0.000	2.000	0.020	Good
	GCW27	2025	0.010	0.010	1.000	0.000	2.000	0.020	Good
GCB*	GCB4	2025	0.060	0.010	1.000	20.000	2.000	0.070	Good
	GCB7	2025	0.060	0.010	1.000	29.000	1.000	0.050	Good
RC_07	RCE4	2025	0.020	0.010	1.000	37.000	4.000	0.020	Moderate
	RCE6	2025	0.020	0.010	1.000	43.000	2.000	0.020	Good
	RCE8	2025	0.010	0.010	1.000	10.000	1.000	0.020	Good
	RCE9	2025	0.030	0.010	1.000	0.000	3.000	0.020	Moderate
	RCE12	2025	0.020	0.010	1.000	2.000	2.000	0.020	Good
RC_09	RCE14	2025	0.020	0.010	1.000	4.000	2.000	0.050	Good
	RCE16	2025	0.020	0.010	1.000	3.000	2.000	0.020	Good
	RCE19	2025	0.020	0.010	1.000	1.000	1.000	0.020	Good
	RCE22	2025	0.030	0.010	1.000	99.000	1.000	0.040	Good
	RCE25	2025	0.020	0.010	1.000	5.000	1.000	0.040	Good
RC_25A	RCW1	2025	0.010	0.010	1.000	20.000	1.000	0.020	Good
	RCW3	2025	0.010	0.010	1.000	0.000	1.000	0.020	Good
RC_26F	RCW5	2025	0.010	0.010	1.000	0.000	1.000	0.020	Good
	RCW7	2025	0.010	0.010	1.000	0.000	1.000	0.020	Good
	RCW9	2025	0.020	0.010	1.000	0.000	2.000	0.020	Good
RC_26E	RCW12	2025	0.010	0.010	1.000	0.000	2.000	0.020	Good
RC_26C	RCW14	2025	0.010	0.010	1.000	0.000	1.000	0.020	Good
SE_26A	SE40	2025	0.050	0.010	1.000	7.000	3.000	0.020	Moderate
	SE42	2025	0.060	0.010	1.000	28.000	2.000	0.020	Good

* The Grand Canal Basin is not a designated AWB.

Thirteen of the 15 AWBs were assigned Good indicative eco-potential based on the physico-chemical parameters analysed in Q1 2025 (Table 3.2) and all of the AWBs that breached threshold limits were for BOD (Table 3.2). Within each of the AWB's one of the two sites in SE_26A and three of the six sites in GC_25A were downgraded to Moderate indicative eco-potential based on the BOD threshold breaches.

Table 3.2. Indicative ecological potential for the 15 Artificial Water Bodies (AWBs), and the Grand Canal Basin, based on results for the six physico-chemical determinands in Q1 2025.

AWB	Year	Total P (mg/L P)	SRP (mg/L P)	TON (mg/L N)	*E. coli* (Count/100ml)	B.O.D. (mg/L O2)	Ammonia (mg/L N)	Indicative Physico-chemical Potential
GCE_09	2025	0.027	0.010	1.200	31.333	1.500	0.023	Good
GCNL_09	2025	0.030	0.010	3.600	23.000	1.000	0.020	Good
GCMF_14	2025	0.010	0.010	2.400	0.000	1.000	0.020	Good
GCBL_14	2025	0.020	0.010	1.475	1.000	1.500	0.020	Good
GC_14E	2025	0.020	0.010	1.300	0.000	1.000	0.050	Good
GC_14W	2025	0.015	0.010	1.000	11.500	1.000	0.030	Good
GC_07	2025	0.010	0.010	1.000	0.000	1.000	0.020	Good
GC_25A	2025	0.010	0.010	1.000	0.833	3.167	0.020	Moderate
GCB*	2025	0.060	0.010	1.000	24.500	1.500	0.060	Good
RC_07	2025	0.020	0.010	1.000	18.400	2.400	0.020	Good
RC_09	2025	0.022	0.010	1.000	22.400	1.400	0.034	Good
RC_25A	2025	0.010	0.010	1.000	10.000	1.000	0.020	Good
RC_26F	2025	0.013	0.010	1.000	0.000	1.333	0.020	Good
RC_26E	2025	0.010	0.010	1.000	0.000	2.000	0.020	Good
RC_26C	2025	0.010	0.010	1.000	0.000	1.000	0.020	Good
SE_26A	2025	0.055	0.010	1.000	17.500	2.500	0.020	Moderate

* The Grand Canal Basin is not a designated AWB.

3.3. *Physico-chemistry and Indicative Ecological Potential of Canal Feeders/Drains*

Just two of the five feeders/drains were assigned Good indicative eco-potential based on physico-chemical sampling in Q1 2025 (see Appendix II and Figure 4.1). These are the same two feeders/drains that were Good in Q4 2024.

The Monread drain (GCE5.1) was sampled on the 6th of March 2025 and had a moderate flow entering the canal. The water quality exhibited high Phosphorous (0.6mg/l P) and slightly elevated Nitrate, Ammonia, Total Coliforms and *E.coli* in Q1 2025, but since none of the classification standards were exceeded at this site, water quality at this site was assigned a Good indicative eco-potential rating. The site was assigned Moderate status in just one of the four quarters during 2024 when very high levels of Total Coliforms and *E. coli* were recorded in Q3.

Table 3.3. Indicative ecological potential for the five canal feeders/drains based on results for the six physico-chemical determinands in Q1 2025.

AWB	Site Code	Year	Total P (mg/L P)	SRP (mg/L P)	TON (mg/L N)	*E. coli* (Count/100ml)	B.O.D. (mg/L O2)	Ammonia (mg/L N)	Indicative Physico-chemical Potential
Monread	GCE5.1	2025	0.060	0.010	1.500	115	1.000	0.060	Good
Ballymullen	GCW12.1	2025	0.060	0.010	1.000	122	1.000	0.020	Good
Ballylennon	GCW13.1	2025	0.040	0.010	1.000	25	3.000	0.160	Moderate
Athy	BL15.1	2025	0.070	0.010	1.700	44	3.000	0.060	Moderate
Kilcock Harbour	RCE16.1	2025	0.050	0.010	1.400	613	1.000	0.160	Moderate

On the 26th of February 2025 there was a low to moderate flow of clear water emerging from both the Ballymullen (GCW12.1) and the Ballylennon (GCW13.1) feeders. On this occasion the Ballymullen feeder was assigned a Good indicative physico-chemical eco-potential with the only notable high value being Phosphorous at 0.6mg/l P (see Appendix II). The levels for all the other parameters examined were relatively low and indicative of Good water quality conditions giving the site its third consecutive Good status in a row.

While the bacteriological counts from the Ballylennon feeder (GCW13.1) were relatively low, high readings for BOD (5mg/l O_2) and Ammonia (0.16 mg/l N) in the water from the Ballylennon feeder breached the threshold limits (Table 3.3). This feeder has persistently breached the determinand limits, being assigned Moderate water quality status 7 out of nine times since Q1 2023. To protect this section of the Grand Canal Offaly County Council should be made aware of the low water quality entering the system *via*. the Ballylennon feeder, in close proximity to the GCW12 sample site west Pollagh.



Plate 3.4. The outflow of the Athy drain (BL15.1) on the 6th of March 2025.

The Athy drain (BL15.1) was discharging a small volume of water to the Barrow Canal when sampled on the 6th of March 2025 (Plate 3.4). There were high values recorded for Total phosphorus (0.07 mg/l P) and BOD (3.0 mg/l O_2) resulting in breaches in determinand threshold limits, with an elevated reading for Nitrate (3.49mg/l N) also detected. This drain has continued to be a source of low water quality inputs into the Barrow Canal in Athy having only achieved assigned a Good indicative physico-chemical eco-potential once out of nine samples since Q1 2023. This highlights another sustained water quality issue that should be directed towards Kildare County Council to identify the possible source(s) of pollution being discharged to the Barrow Canal and ultimately the Barrow River at Athy.

There was a very slow flow of water from the Kilcock drain (RCE16.1) when sampled on the 6th of March 2025. The water in Kilcock and throughout the RCE system was quite turbid on this date. There were high values recorded for phosphorous, Total coliforms and *E.coli*, however the only determinand threshold that was breached on this occasion was Ammonia (0.16 mg/l N). The water quality at the Kilcock drain was assigned Moderate indicative eco-potential based on physico-chemical results (see Appendix II and Table 3.3) for the third time in a row since Q3 2024, necessitating intervention by Kildare County Council to protect water quality at Kilcock amenity area.

3.4. *Grand Canal Basin*

A Dublin City Council urban wastewater outfall is located in the inner Grand Canal Basin (see Figure 3). This outfall is used to carry storm water overflow but, on occasions, sewage contamination is discharged to the Basin *via* this outfall.

On the occasion of sampling, in early March 2025, the water level in the basin was normal and the water was clear. Results from physico-chemical analysis of water samples taken by INVAS from the inner (GCB4) and outer basins (GCB7)(see Appendix I) showed elevated levels of Total phosphorous and Ammonia with no breaches in any of the classification standards. Both sites were assigned Good physico-chemical eco-potential for Q1 2025. The outer basin was assigned four Good ratings in 2024 while the inner basin was only assigned one Good rating out of four in 2024. The opposite was recorded in 2023 with the inner basin receiving four Good ratings and the outer, just one. While there is little consistency in these results it does highlight the necessity for vigilance during sampling in the Grand Canal basin for any potential point sources of pollution.

When the data for the two sites in Grand Canal Basin were assessed, this artificial waterbody was assigned Good status (Table 3.2).

No data from bacteriological sampling of the basin by WI and DCC was available for this period.

4. Issues for Waterways Ireland Resulting from Sampling in Q1 2025

The high BOD values recorded at the cluster of sites from Tullamore (GCW16)(3mg/l O_2) Ballycowan (GCW18)(4mg/l O_2) to Cornalaur (GCW20)(7mg/l O_2) should be closely monitored in Q2 to determine if these were a coincidental series of breaches or if there is an underlying problematic factor in the area.

During water sampling in Q1 2025, although the threshold limits were not breached, a high TON reading of 3.6mg/l N and high Nitrate reading of 3 mg/l N were recorded at NL1. Further elevated TON and Nitrate levels were detected at BL10 (upstream of Vicarstown) and BL15 (Athy), most likely attributable to the Annonock feeder and Athy drain, respectively. Yet again, Kildare County Council should be notified that there appears to be a source of nitrogen entering the water on the Naas Line at Naas and lower Barrow Line at Vicarstown and Athy.

The Ballylennon feeder continues to discharge water of an unsatisfactory standard into the Grand Canal west of Daingean. Unacceptably high levels of BOD and Ammonia were reported from the site. Offaly County Council should be notified of the results from physico-chemical analyses and engaged in a discussion regarding potential action that may be taken to safeguard water quality within the canal system in this area.

The Athy drain has achieved Good indicative eco-potential in just one quarter since Q1 2023. The site was downgraded based on breaches in Total phosphorous and BOD in Q1 2025. Although there has been some engagement between Kildare County Council with WI on the issue it is clear that poor quality water continues to be discharged into the Barrow canal in Athy from this point.

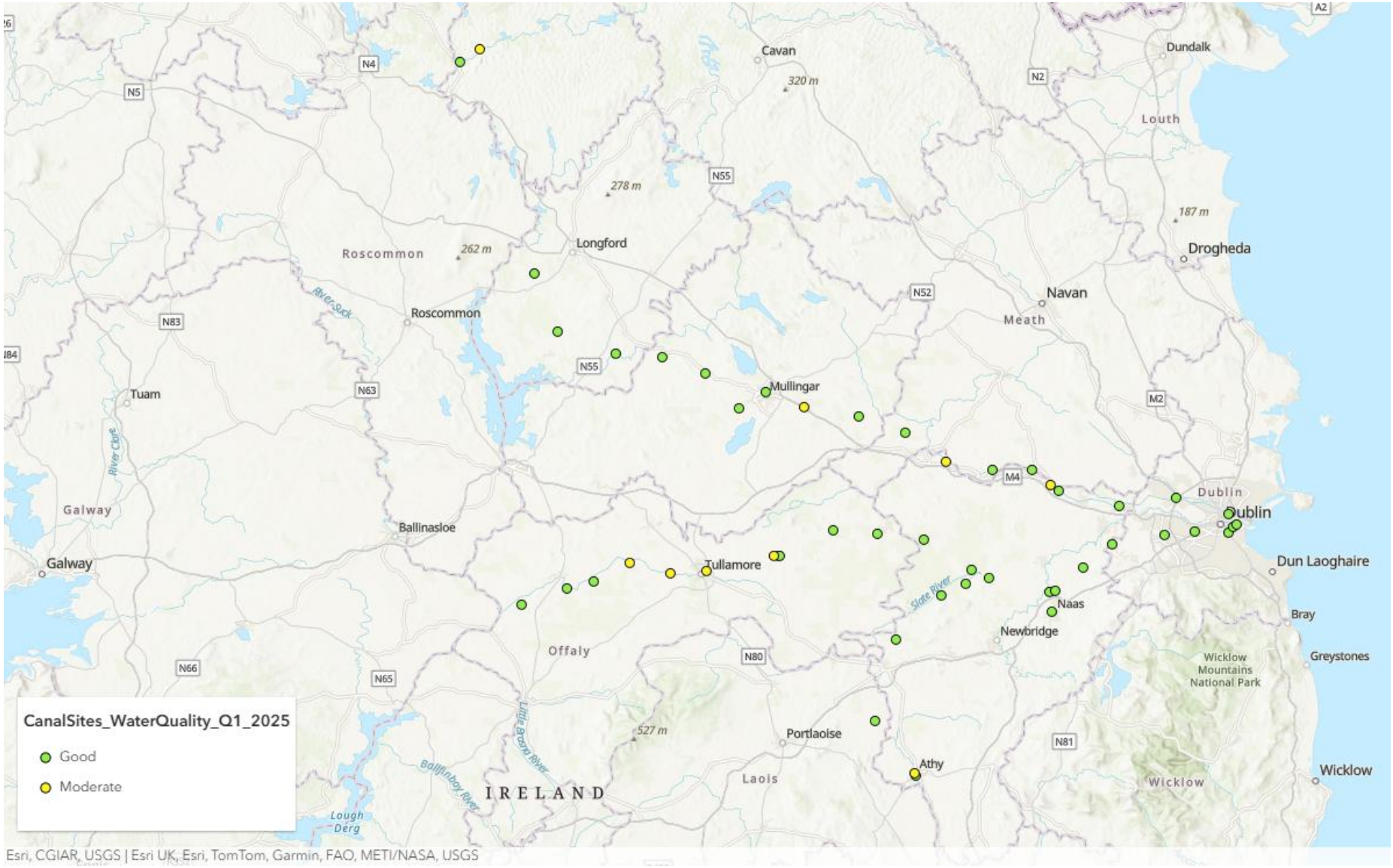


Figure 4.1: Indicative ecological potential based on physico-chemical data for the 50 canal, Shannon-Erne Waterway and feeder/drain sites monitored in Q1 2025 (Green = Good, Yellow = Moderate).

Appendix I. Physico-chemical results and indicative ecological potential for canal (41), Shannon-Erne Waterway (2) and Grand Canal Basin (2) sites sampled in Q1 2025.

Canal	Site Code	AWB	Quarter	Date	Total P (mg/L P)	MRP (mg/L P)	SRP (mg/L P)	TON (mg/L N)	Temperature	Conductivity (µS)	pH	DO %	DO (mg/L O_2)	Total Coliform (Count/100ml)	*E.coli* (Count/100ml)	B.O.D. (mg/L O2)	Ammonia (mg/L N)	Nitrite (mg/L N)	Nitrate (mg/L N)	Alkalinity (meq/L)	Alkalinity (mg/L $CaCO_3$)	Indicative Physico-chemical Potential
Grand Canal	GCE1	GC_14E	Q1	06/03/2025	0.020	0.010	0.010	1.000	11.0	426	8.60	92.3	10.40	79	0	1.00	0.070	0.030	1.700	2.675	133.90	Good
Grand Canal	GCE4	GC_09	Q1	06/03/2025	0.040	0.010	0.010	1.700	10.0	438	8.67	89.2	10.65	365	91	1.00	0.020	0.030	2.300	2.382	119.20	Good
Grand Canal	GCE6	GC_09	Q1	06/03/2025	0.030	0.010	0.010	1.500	11.0	444	8.63	92.4	9.35	1	0	1.00	0.020	0.030	2.200	2.757	138.00	Good
Grand Canal	GCE8	GC_09	Q1	06/03/2025	0.030	0.010	0.010	1.000	12.0	440	8.62	94.7	8.68	980	77	1.00	0.040	0.030	1.700	2.398	120.00	Good
Grand Canal	GCE10	GC_09	Q1	06/03/2025	0.020	0.010	0.010	1.000	12.0	414	8.70	99.2	10.20	5	0	2.00	0.020	0.030	1.700	2.583	129.30	Good
Grand Canal	GCE12	GC_09	Q1	06/03/2025	0.020	0.010	0.010	1.000	10.0	377	8.82	94.0	10.64	42	13	2.00	0.020	0.030	1.400	2.256	112.90	Good
Grand Canal	GCE14	GC_09	Q1	06/03/2025	0.020	0.010	0.010	1.000	12.0	375	8.84	90.3	9.75	28	7	2.00	0.020	0.030	1.200	2.194	109.80	Good
Grand Canal	GCW1	GC_14E	Q1	06/03/2025	0.020	0.010	0.010	1.600	11.0	450	8.51	95.3	10.65	214	0	1.00	0.030	0.030	1.790	2.739	137.10	Good
Grand Canal	GCW4	GC_07	Q1	26/02/2025	0.010	0.010	0.010	1.000	9.0	409	8.65	95.5	11.54	0	0	1.00	0.020	0.030	1.000	2.046	102.40	Good
Grand Canal	GCW6	GC_07	Q1	26/02/2025	0.010	0.010	0.010	1.000	8.0	384	8.64	98.5	10.13	0	0	1.00	0.020	0.030	1.000	1.958	98	Good
Grand Canal	GCW8	GC_14W	Q1	26/02/2025	0.010	0.010	0.010	1.000	9.0	370	8.74	94.6	10.74	19	0	1.00	0.020	0.030	1.000	2.755	137.90	Good
Grand Canal	GCW12	GC_14W	Q1	26/02/2025	0.020	0.010	0.010	1.000	8.0	515	8.35	87.4	9.18	236	23	1.00	0.040	0.030	1.290	3.215	160.90	Good
Grand Canal	GCW16	GC_25A	Q1	26/02/2025	0.010	0.010	0.010	1.000	9.0	422	8.73	88.8	10.63	43	5	3.00	0.020	0.030	1.000	3.536	177.00	Moderate
Grand Canal	GCW18	GC_25A	Q1	26/02/2025	0.010	0.010	0.010	1.000	9.0	445	8.90	91.7	10.89	10	0	4.00	0.020	0.030	1.000	2.889	144.60	Moderate
Grand Canal	GCW20	GC_25A	Q1	26/02/2025	0.010	0.010	0.010	1.000	10.0	376	8.74	97.3	10.33	0	0	7.00	0.020	0.030	1.000	2.448	122.50	Moderate
Grand Canal	GCW22	GC_25A	Q1	26/02/2025	0.010	0.010	0.010	1.000	9.0	390	8.73	90.5	9.39	0	0	1.00	0.020	0.030	1.000	2.599	130.10	Good
Grand Canal	GCW24	GC_25A	Q1	26/02/2025	0.010	0.010	0.010	1.000	8.0	376	8.57	85.3	8.54	5	0	2.00	0.020	0.030	1.000	2.843	142.30	Good
Grand Canal	GCW27	GC_25A	Q1	26/02/2025	0.010	0.010	0.010	1.000	9.0	312	8.67	93.8	9.66	0	0	2.00	0.020	0.030	1.000	2.322	116.20	Good
Grand Canal	NL1	GCNL_09	Q1	06/03/2025	0.030	0.010	0.010	3.600	11.0	458	8.57	90.6	11.25	225	23	1.00	0.020	0.030	3.000	2.390	119.60	Good
Grand Canal	MF1	GCMF_14	Q1	06/03/2025	0.010	0.010	0.010	2.400	11.0	482	8.41	86.2	10.41	0	0	1.00	0.020	0.030	1.400	2.645	132.40	Good
Grand Canal	BL2	GCBL_14	Q1	06/03/2025	0.020	0.010	0.010	1.100	10.0	388	8.64	93.7	11.10	2	0	2.00	0.020	0.030	1.000	2.492	124.70	Good
Grand Canal	BL6	GCBL_14	Q1	06/03/2025	0.020	0.010	0.010	1.000	11.0	489	8.64	96.3	11.22	4	0	1.00	0.020	0.030	2.200	3.077	154.00	Good
Grand Canal	BL10	GCBL_14	Q1	06/03/2025	0.020	0.010	0.010	2.100	11.0	433	8.47	87.2	9.96	0	0	2.00	0.020	0.030	1.900	3.261	163.20	Good
Grand Canal	BL15	GCBL_14	Q1	06/03/2025	0.020	0.010	0.010	1.700	12.0	449	8.73	92.8	11.21	365	4	1.00	0.020	0.030	2.090	2.709	135.60	Good
Grand Canal	GCB4	GCB*	Q1	06/03/2025	0.060	0.010	0.010	1.000	12.0	402	8.76	93.3	10.04	219	20	2.00	0.070	0.030	1.580	2.783	139.30	Good
Grand Canal	GCB7	GCB*	Q1	06/03/2025	0.060	0.010	0.010	1.000	12.0	399	8.99	91.8	12.03	58	29	1.00	0.050	0.030	1.790	2.230	111.60	Good
Royal Canal	RCE4	RC_07	Q1	26/02/2025	0.020	0.010	0.010	1.000	8.0	434	8.17	82.6	8.42	126	37	4.00	0.020	0.030	1.000	3.419	171.10	Moderate
Royal Canal	RCE6	RC_07	Q1	26/02/2025	0.020	0.010	0.010	1.000	9.0	453	8.07	79.6	8.52	214	43	2.00	0.020	0.030	1.390	3.688	184.60	Good
Royal Canal	RCE8	RC_07	Q1	26/02/2025	0.010	0.010	0.010	1.000	7.0	425	8.70	86.8	9.93	59	10	1.00	0.020	0.030	1.000	2.599	130.10	Good
Royal Canal	RCE9	RC_07	Q1	26/02/2025	0.030	0.010	0.010	1.000	9.0	317	8.70	89.2	9.55	0	0	3.00	0.020	0.030	1.000	2.282	114.20	Moderate
Royal Canal	RCE12	RC_07	Q1	06/03/2025	0.020	0.010	0.010	1.000	12.0	505	8.23	79.8	9.87	29	2	2.00	0.020	0.030	1.800	3.299	165.10	Good
Royal Canal	RCE14	RC_09	Q1	06/03/2025	0.020	0.010	0.010	1.000	12.0	462	8.40	84.3	10.07	12	4	2.00	0.050	0.030	1.000	2.827	141.50	Good
Royal Canal	RCE16	RC_09	Q1	06/03/2025	0.020	0.010	0.010	1.000	10.0	463	8.75	91.3	12.09	23	3	2.00	0.020	0.030	1.700	2.939	147.10	Good
Royal Canal	RCE19	RC_09	Q1	06/03/2025	0.020	0.010	0.010	1.000	12.0	443	8.65	91.3	10.23	3	1	1.00	0.020	0.030	1.200	2.797	140.00	Good
Royal Canal	RCE22	RC_09	Q1	06/03/2025	0.030	0.010	0.010	1.000	11.0	472	8.30	95.8	8.48	488	99	1.00	0.040	0.030	1.490	2.388	119.50	Good
Royal Canal	RCE25	RC_09	Q1	06/03/2025	0.020	0.010	0.010	1.000	12.0	418	8.84	104.5	10.39	17	5	1.00	0.040	0.030	1.000	2.306	115.40	Good
Royal Canal	RCW1	RC_25A	Q1	26/02/2025	0.010	0.010	0.010	1.000	8.0	278	8.35	86.4	9.93	308	20	1.00	0.020	0.030	1.000	2.521	126.20	Good
Royal Canal	RCW3	RC_25A	Q1	26/02/2025	0.010	0.010	0.010	1.000	9.0	316	8.61	83.2	9.98	0	0	1.00	0.020	0.030	1.000	2.999	150.10	Good
Royal Canal	RCW5	RC_26F	Q1	26/02/2025	0.010	0.010	0.010	1.000	9.0	396	8.37	82.8	9.43	0	0	1.00	0.020	0.030	1.000	3.153	157.80	Good
Royal Canal	RCW7	RC_26F	Q1	26/02/2025	0.010	0.010	0.010	1.000	9.0	420	8.62	89.3	11.22	20	0	1.00	0.020	0.030	1.000	3.005	150.40	Good
Royal Canal	RCW9	RC_26F	Q1	26/02/2025	0.020	0.010	0.010	1.000	9.0	402	8.67	85.8	11.84	0	0	2.00	0.020	0.030	1.000	2.595	129.90	Good
Royal Canal	RCW12	RC_26E	Q1	26/02/2025	0.010	0.010	0.010	1.000	9.0	320	8.49	80.6	8.84	0	0	2.00	0.020	0.030	1.000	2.320	116.10	Good
Royal Canal	RCW14	RC_26C	Q1	26/02/2025	0.010	0.010	0.010	1.000	10.0	331	8.84	86.0	12.21	0	0	1.00	0.020	0.030	1.000	2.971	148.70	Good
Shannon Erne	SE40	SE_26A	Q1	26/02/2025	0.050	0.010	0.010	1.000	9.0	213	8.43	89.9	11.65	16	7	3.00	0.020	0.030	1.000	1.626	81.40	Moderate
Shannon Erne	SE42	SE_26A	Q1	26/02/2025	0.060	0.010	0.010	1.000	9.0	541	8.18	86.2	11.89	613	28	2.00	0.020	0.030	1.000	1.740	87.10	Good

Appendix II. Physico-chemical results and indicative ecological potential for canal feeder/drain sites sampled in Q1 2025.

Canal	Site	Location	AWB_Code	Quarter	Date	Total P (mg/L P)	MRP (mg/L P)	SRP (mg/L P)	TON (mg/L N)	Temperature (degree C)	Conductivity (µS)	pH	DO %	DO (mg/L O_2)	Total Coliform (Count/100ml)	*E.coli* (Count/100ml)	B.O.D. (mg/L O2)	Ammonia (mg/L N)	Nitrite (mg/L N)	Nitrate (mg/L N)	Alkalinity (meq/L)	Alkalinity (mg/L $CaCO_3$)	Indicative Physico-chemical Potential
Grand Canal	GCE5.1	Monread Feeder	GC_09	Q1	06/03/2025	0.060	0.010	0.010	1.500	12.00	489	8.45	87.7	9.94	980	115	1.00	0.060	0.030	2.400	2.681	134.20	Good
Grand Canal	GCW12.1	Ballymullen Feeder	GC_14	Q1	26/02/2025	0.060	0.010	0.010	1.000	9.00	510	8.41	91.2	10.26	365	122	1.00	0.020	0.030	1.490	3.165	158.40	Good
Grand Canal	GCW13.1	Ballylennon Feeder	GC_14	Q1	26/02/2025	0.040	0.010	0.010	1.000	8.00	428	8.03	76.2	8.84	276	25	**3.00**	**0.160**	0.030	1.580	2.645	132.40	Moderate
Grand Canal Barrow Line	BL15.1	Athy Drain	GCBL_14	Q1	06/03/2025	**0.070**	0.010	0.010	1.700	12.00	394	8.49	91.8	9.67	326	44	**3.00**	0.060	0.030	3.490	2.967	148.50	Moderate
Royal Canal	RCE16.1	Kilcock Harbour Drain	RC_09	Q1	06/03/2025	0.050	0.010	0.010	1.400	10.00	477	8.52	84.4	9.42	2,420	613	1.00	**0.160**	0.030	2.390	2.779	139.10	Moderate



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Appendix V

Water Framework Directive Compliance Report

Physico-Chemistry

Second Quarter 2025

Water Framework Directive Compliance Report

Physico-chemistry

Second Quarter 2025



June 2025

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Front Cover: A waterhen by the canal at Granard Bridge (RCE22) in May 2025.

1. Introduction

Water Framework Directive (WFD) surveillance monitoring of the Royal and Grand Canals and the canalised section of the Shannon-Erne Waterway for Q2 2025 was carried out on 21st and 28th May 2025.

A canal is identified as an Artificial Water Body (AWB) in the WFD and is defined as 'a body of water created by human activity'. In recognition of their navigational role, AWBs must achieve good ecological potential as opposed to good ecological status, the latter which applies to natural water bodies, such as rivers and lakes. Ecological potential is assessed using a combination of biological (native and invasive macroinvertebrate and macrophyte), physico-chemical and hydromorphological quality elements. For classification purposes, the ecological potential of a site or AWB can be Maximum, Good, Moderate, Poor or Bad. Where physico-chemistry alone is being assessed, as in this report, sites and AWBs can achieve either Good or Moderate potential only. In assigning ecological potential, the one-out-all-out rule applies, whereby the lowest value quality element determines the overall classification of the AWB. A system for classifying British and Irish canals based on macroinvertebrate, macrophyte, invasive species, physico-chemical and hydromorphological quality elements is used to assess the ecological potential of AWBs. In the current reporting period (Q2 2025), the canals are classified based on the physico-chemistry of the water during this period.

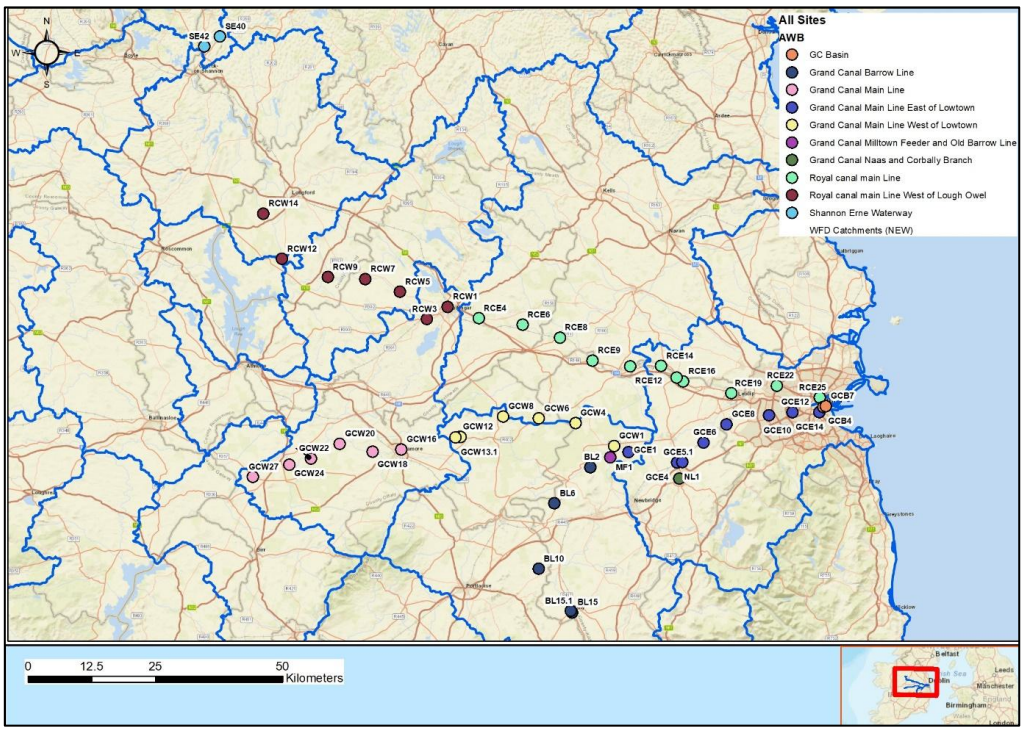


Figure 1.1: Artificial Water Bodies (AWBs), sites and monitored feeder streams on the Royal and Grand Canals, and the Shannon-Erne Waterway. The AWBs are grouped based on associated river catchments.

The canals are currently divided into 15 AWBs based on their locations within river catchments (Table 1.1). The Grand Canal supports eight AWBs (this does not include the Grand Canal Basin), the Royal Canal has six AWBs and there is just a single AWB on the Shannon-Erne Waterway. Four of the AWBs have only a single canal sampling site (Table 1.1), which can be potentially problematic when ecological potential for individual AWBs is being assigned. This reflects the fact that a breach in any biological or abiotic parameter can result in the AWB being changed from Good to Moderate.

For reporting purposes, a simple code has been assigned, whereby AWBs are labelled according to the river catchment in which they occur (Table 1.1).

Table 1.1: Artificial Water Bodies (AWBs) included in the WFD Monitoring Programme.

Artificial Water Body (AWB)	Catchment No	New ID Code	New Report Code	Length (km)	No of Sites
GRAND CANAL					
Grand Canal Main Line - Liffey and Dublin Bay	9	IE_09_AWB_GCMLE	GC_09	41.4	6
Grand Canal Main Line East - Barrow	14	IE_14_AWB_GCMLE	GC_14E	15.7	2
Grand Canal Main Line West - Barrow	14	IE_14_AWB_GCMLW	GC_14W	12.9	2
Grand Canal Main Line - Boyne	7	IE_07_AWB_GCMLW	GC_07	14.5	2
Grand Canal Main Line - Lower Shannon	25A	IE_25A_AWB_GCMLW	GC_25A	47.0	6
Grand Canal Naas Line - Liffey and Dublin Bay	9	IE_09_AWB_GCNL	GCNL_09	11.9	1
Grand Canal Milltown Feeder - Barrow	14	IE_14_AWB_GCMF	GCMF_14	10.5	1
Grand Canal Barrow Line - Barrow	14	IE_14_AWB_GCBL	GCBL_14	50.8	4
Grand Canal Basin - Liffey and Dublin Bay	9	IE_09_AWB_GCB	GCB		2
ROYAL CANAL					
Royal Canal Main Line - Boyne Catchment	7	IE_07_AWB_RCMLE	RC_07	42.6	5
Royal Canal Main Line - Liffey and Dublin Bay	9	IE_09_AWB_RCMLE	RC_09	39.4	5
Royal Canal Main Line - Lower Shannon	25A	IE_25A_AWB_RCMLW	RC_25A	13.3	2
Royal Canal Main Line - Upper Shannon	26F	IE_26F_AWB_RCMLW	RC_26F	33.8	3
Royal Canal Main Line - Upper Shannon	26E	IE_26E_AWB_RCMLW	RC_26E	3.7	1
Royal Canal Main Line - Upper Shannon	26C	IE_26C_AWB_RCMLW	RC_26C	14.2	1
SHANNON ERNE WATERWAY					
Shannon Erne Waterway - Upper Shannon	26A	IE_26A_AWB_SEW	SE_26A	25.5	2

During 2020 a second site (SE42) was included on the Shannon-Erne Waterway to better represent the water quality status of this Waterway and AWB (Table 1.1). This site is located adjacent to the marina in Leitrim village, close to where the Shannon-Erne Waterway discharges to the River Shannon (Figure 1.2).



Figure 1.2: Location of the two WFD monitoring sites (SE40 and 42) on the Shannon-Erne Waterway.



Plate 1.1: Water being pumped from the Clodiagh River into the Grand Canal near Cornalur (GCW20) on 28th May 2025.

2. Materials and Methods

2.1. *Sampling locations*

Physico-chemical sampling is conducted on a quarterly basis at 50 monitoring sites – 41 on the Royal, Grand and Barrow Canals, two on the Grand Canal Basin, two on the Shannon-Erne Waterway, and five on selected canal feeder streams/drains (see Figures 1.1, 1.2 and 2.1). The canal feeders/drains have been a source of elevated nutrient and coliform inputs in the past. They include the Monread drain (GCE5.1) and Ballymullen (GCW12.1) and Ballylennon (GCW13.1) feeder streams on the Grand Canal, the Athy drain (BL15.1) on the Barrow Line, and the Kilcock Harbour drain (RCE16.1) on the Royal Canal. In addition to the quarterly water samples taken by INVAS at two sites in the Grand Canal Basin as part of the WFD Canals Surveillance Programme, Waterways Ireland (WI) and Dublin City Council (DCC) conduct regular water sampling for bacteriological (*E. coli* and *Enterococci*) analysis at up to 11 sites in the Basin (three in the Inner, eight in the Outer) and two in the adjacent Grand Canal (Figure 4). In 2022 and 2025, just five samples for bacteriology have been collected and analysed on a fortnightly basis. The sampling sites were 1st level of the Grand Canal (1), the inner basin (2 – sites 4 and 5 in Figure 2.2) and the outer basin (2 – sites 6 and 7 in Figure 2.2).

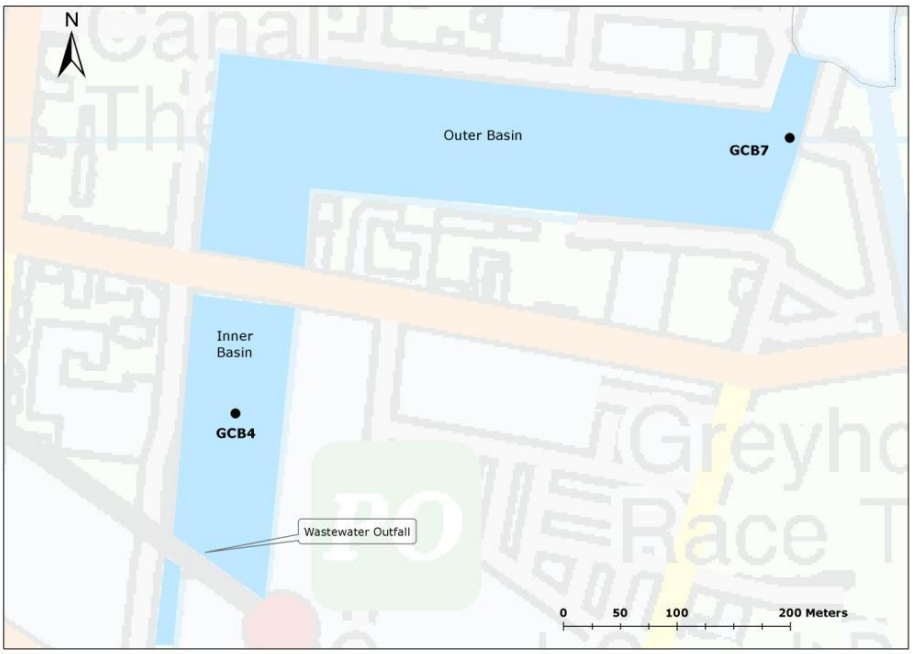


Figure 2.1: Grand Canal Basin (Dublin) showing the two monitoring sites (GCB4 and GCB7).

2.2. *Physico-Chemical Monitoring*

Water sampling involves the deployment of a YSI water logger at each site to measure temperature, conductivity, pH and dissolved oxygen (DO). Water samples are collected from canal sites and returned to the Independent Analytical Supplies (IAS) laboratory in Bagenalstown for analysis of a range of

determinands (Table 2.1). A subset of these is used to assess indicative ecological potential - Total Phosphorus (TP), Soluble Reactive Phosphorus (SRP), Total Oxidised Nitrogen (TON), Ammonia, Biological Oxygen Demand (BOD) and Faecal Coliforms.

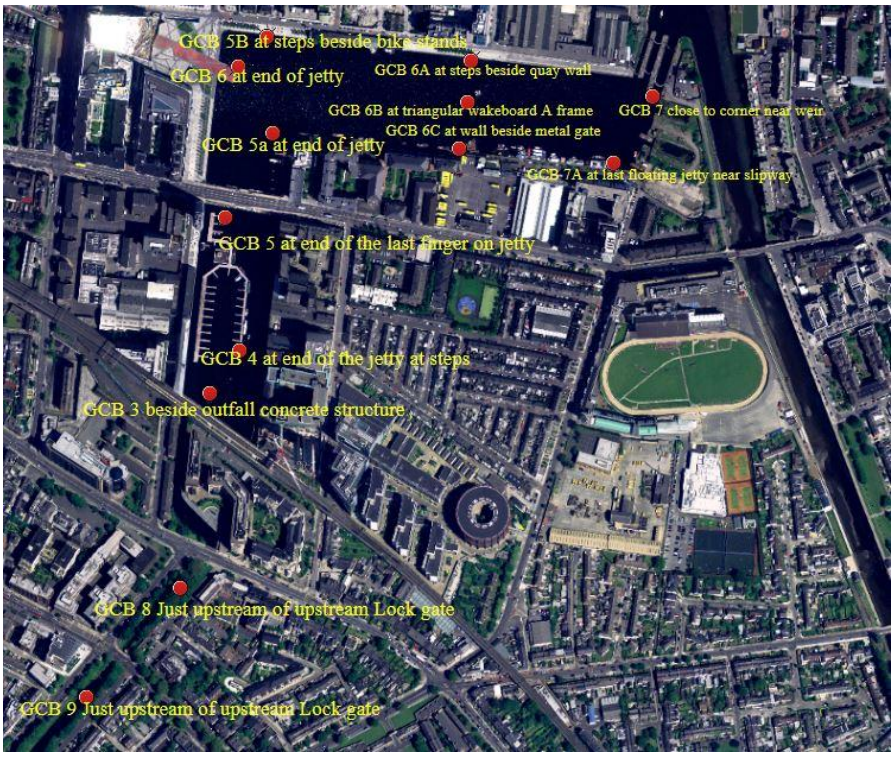


Figure 2.2: Grand Canal Basin (Dublin) showing the 13 sites that have been sampled in the past by Waterways Ireland and Dublin City Council for bacteriology.

Table 2.1: Physico-chemical determinands measured as part of WFD monitoring. (Chlorophyll monitoring has been discontinued since 2021.)

Determinand	Limit	Determinand	Limit
Total Phosphorus (TP) (mg/l P)*	0.063 mg/l P	Dissolved Oxygen (DO) (mg/l and % saturation)	>5.0 mg/l O_2
Molybdate Reactive Phosphorus (MRP) (mg/l P)	0.025 mg/l P	pH	
Soluble Reactive Phosphorus (SRP) (mg/l P)*	0.025 mg/l P	Conductivity (µS)	
Total Oxidised Nitrogen (TON) (mg/l N)*	4.1 mg/l N	Alkalinity (meq/l)	
Nitrite (mg/l)		Chlorophyll (µg/l)	
Nitrate (mg/l)		Biological Oxygen Demand (BOD) (mg/l O_2)*	<2.5 mg/l O_2
Ammonia (mg/l N)*	0.12 mg/l N	Total Coliforms (TC) (counts/100ml)	5000/100 ml
Temperature (°C)		Faecal Coliforms (counts/100ml)*	1000/100 ml

* Determinands used to assign ecological potential to the Artificial Water Bodies (AWBs)

3. Results

The full set of results from physico-chemical analysis of the water samples taken from the 50 canal, feeder/drain and Grand Canal Basin sites surveyed in Q2 2025 is presented in Appendices I and II.

3.1. *Physico-chemistry at Canal Sites*

Water sampling in Q2 2025 was conducted over two days –21st and 28th May 2025. The weather throughout May was very dry, with no rain from late April to late May prior to water sampling. The water levels were slightly below normal at many sites with levels being supplemented in some areas through the addition of water from local watercourses (Plate 1.1). This was taking place up to at least the 28th of May despite some rainfall in previous days. The lack of rain in in May also contributed to low flows at most of the feeders/drains. There were significant infrastructural works taking place on tow paths and adjacent sites at several sites including Croke Park (RCE25), Baggot Street (GCE14), East of Armstrong Bridge (GCW24)(Plate 3.1) and Sallins (GCE4). Water temperature over the sampling period varied from 14.2 to 20.2°C and ranged from 14.2 to 20.2°C on 21st and from 16.6 to 19.3°C on 28th May 2025 (see Appendix I). The highest temperature in Q2 of 20.2°C was recorded at BL10 (Vicarstown).



Plate 3.1: Infrastructural development taking place adjacent to the Grand Canal at Baggot Street on the 21st of May 2025.

The water quality conditions were generally good throughout all seven Grand Canal East (GCE) in Q2 2025, except for one breach at GCE14 (Baggot Street) with an elevated BOD reading of 3.0mg/l O_2. There was no obvious source of pollution at the time of sampling, but there were ongoing towpath and seating works observed along the north bank. The site had a slightly elevated BOD value of 2.0mg/l O_2

in Q1, but it did not breach the determinand limit at that time. Although the determinand threshold was not breached, Hazelhatch (GCE8) exhibited very high bacteriological counts for both Total coliforms and *E.coli.* These values are once again causing concern in relation to the possible adverse impact of high numbers of moored craft at this site.

In Q2 2025, Lock 20 (GCW4)(3.0mg/l O_2), Georges Bridge (GCW6)(3.0mg/l O_2), Ballycowan (GCW18)(5.0mg/l O_2) and Armstrong Bridge (GCW24)(4.0mg/l O_2) exhibited unacceptably high BOD values out of the 11 sites on the Grand Canal West (GCW). The site at Ballycowan was the only repeat offender from Q1 2025 where a cluster of three sites including Tullamore (GCW16), Ballycowan , and Cornalaur (GCW20) were all downgraded. As has been suggested in previous reports, raised BOD levels may be related to the decay of aquatic vegetation in the channel following weed cutting. Although BOD were the only recorded breaches in determinand limits throughout this section in Q1 and Q2 2025, there were some other water quality issues in Q2 with elevated Total P (West of Daingean (GCW12) (0.04mg/l P)), Total coliforms (Lock 20 (866) and West of Daingean (1,986)) and *E.coli* (Lock 20 (345), West of Daingean (205) and Ballycowan(345)) being recorded. The raised Total P, Total coliforms and *E.coli* at GCW12 appear to be attributable to the inputs from both the Ballymullen (GCW12.1) and Ballylennon Feeders (GCW13.1) (see Appendix II), with no obvious factors identified for the other sites. Waterways Ireland have reported that Offaly County Council intend to engage this year on the persistent water quality issues detected at both of these feeders near Daingean.

Despite none of the classification standards being breached on this sampling occasion, TON (2.9 mg/l N) and Nitrate (2.88 mg/l N) levels were again high on the Naas Line (NL1), continuing the trend that has been observed at this site since 2022. This was coupled with a raised value for Total coliforms (579), highlighting nutrient influxes that may be related to runoff from Naas town discharging into the area. It appears that any past efforts by Kildare County Council (KCC) to identify and eliminate the source or sources of nutrient enrichment have yet to manage the persistent problems in Naas.

The water levels in the Milltown Feeder appeared normal with a slow flow on the 21st of May 2025. The water quality was good with slight elevations in BOD (2.0mg/l O_2), TON (1.4 mg/l N) and Nitrate (1.39 mg/l N).

On the Barrow Line, three out of the four sampling sites were downgraded as a result of high BOD values. East of Lock 22 (BL2), Umeras (BL6) and Vicarstown (BL10) all returned a BOD value of 3.0mg/l O_2. The other water quality issues for each site on the Barrow Line were similar to those recorded in Q1 2025. Both Vicarstown (BL10) and Athy (BL15) exhibited raised values for TON and Nitrate, while very high Total coliforms were detected in Athy. As highlighted in Q1 2025 and previous years, these are likely to arise because of factors associated with the Annonock Stream and Athy Drain (see Appendix II), respectively.

The recurring issue of BOD threshold breaches in Q2 2025 is most apparent on the Royal Canal East (RCE) where six out of the ten sample sites failed on this determinand alone. The sites that were downgraded included Moy valley (RCE9), Cloncurry (RCE12)(Plate 3.2), Ferns Lock (RCE14), Louisa Bridge (RCE19), Castleknock (RCE22) and Croke Park (RCE25). While raised BOD values may sometimes be explained by natural fluctuations and weed cutting, the most significant breaches of BOD limits recorded at RCE9 (8.0mg/l O_2), RCE12 (9.0mg/l O_2), RCE19 (5.0mg/l O_2) and RCE25 (5.0mg/l O_2) may indicate direct nutrient inputs from urban, industrial or agricultural sources. In Q1 2025 RCE4 (Mc Neads Bridge) and RCE 9 were the only two sites in the Royal canal east to be downgraded due to excessive BOD readings. The recorded values for Total P, MRP, SRP, TON, Nitrate and Ammonia values were generally good on the Royal canal east, but there were several sites showing high Total coliform (RCE6, RCE8, RCE14, RCE22) and *E. coli* (RCE6 and RCE8) readings.



Plate 3.2: The Royal Canal at Cloncurry (RCE12) where the highest Q2 BOD value of 9.0mg/lO_2 was recorded on the 21st of May 2025.

High Ammonia levels ($\geq$ 0.13mg/l N) resulted in the downgrading of three sites on the Royal Canal West at RCW3 (Belmont Bridge), RCW12 (Island Bridge) and RCW14 (west of Ballydrum). There were no breaches of the BOD threshold limit, however high total coliform values were recorded for RCW1 and RCW14. The levels for all other parameters recorded in samples from sites throughout the western section of the Royal canal in Q2 2025 were generally low and well within acceptable limits.

The two sites in the Shannon-Erne Waterway were assigned Moderate Indicative Physico-chemical potential in Q2 2025. Both sites were downgraded as a result of elevated BOD results while the site at Lisconnor Bridge (SE40) also breached the Ammonia threshold limit. Following rainfall after a prolonged dry spell there was significant visible evidence of an oily slick on the water surface in Leitrim village (SE42)(Plate 3.3) at the time of sampling on the 28th of May 2025. Both sites also had raised values for Total P with Lisconnor Bridge also returning a high value for Total coliforms.



Plate 3.3: The Shannon Erne in Leitrim village (SE42) where an oily slick was observed on the water surface at the time of sampling on the 28th of May 2025.

3.2. *Indicative Ecological Potential of Canal Sites and Artificial Water Bodies*

Breaches of determinand threshold limits were recorded at fifteen of the 43 canal and Shannon-Erne Waterway sites examined when readings for Q1 and Q2 2025 were assessed, resulting in each being assigned Moderate rather than Good indicative eco-potential (Table 3.1 and Figure 4.1). On the combined assessment all fifteen sites recorded breaches for just a single determinand, with BOD being responsible at all of the sites (GCE14, BL2, BL10, GCW16, GCW18, GCW20, GCW24, RCE4, RCE9, RCE12, RCE14, RCE19, RCE25, SE40 and SE42). This represents a significant increase in the number of Moderate sites from just six in Q1 2025.

When analysing the results for water quality sampling in Q2 2025 a total of 19 sites were assigned Moderate status. The breakdown of threshold breaches in Q2 was 15 BOD, 3 Ammonia and 1 site for both BOD and Ammonia.

Eleven of the 15 AWBs were assigned Good indicative eco-potential when results from physico-chemical analyses in Q1 and Q2 2025 were combined (Table 3.2). All four of the AWBs that breached threshold limits were for BOD (Table 3.2). The increase in Moderate AWBs from two in Q1 to four in Q2 is as a direct result of the high number of BOD threshold breaches recorded in the Royal canal east.

Table 3.1: Classification of the 43 canal sites in the 15 Artificial Water Bodies (AWBs), and the Grand Canal Basin, based on results for the six physico-chemical determinands for Q1 and Q2 combined in 2025.

AWB	Site Code	Year	Total P (mg/L P)	SRP (mg/L P)	TON (mg/L N)	*E. coli* (Count/100ml)	B.O.D. (mg/L O2)	Ammonia (mg/L N)	Indicative Physico-chemical Potential
GCE_09	GCE4	2025	0.025	0.010	1.350	59.000	1.500	0.025	Good
	GCE6	2025	0.020	0.010	1.250	1.000	1.000	0.020	Good
	GCE8	2025	0.020	0.010	1.000	101.000	1.500	0.030	Good
	GCE10	2025	0.015	0.010	1.000	3.500	2.000	0.025	Good
	GCE12	2025	0.015	0.010	1.000	44.500	2.000	0.020	Good
	GCE14	2025	0.020	0.010	1.000	6.000	2.500	0.030	Moderate
GCNL_09	NL1	2025	0.020	0.010	3.250	19.000	1.000	0.020	Good
GCMF_14	MF1	2025	0.010	0.010	1.900	1.000	1.500	0.025	Good
GCBL_14	BL2	2025	0.015	0.010	1.050	1.500	2.500	0.025	Moderate
	BL6	2025	0.015	0.010	1.000	0.500	2.000	0.020	Good
	BL10	2025	0.015	0.010	1.950	0.000	2.500	0.020	Moderate
	BL15	2025	0.020	0.010	1.550	9.000	1.500	0.025	Good
GC_14E	GCE1	2025	0.015	0.010	1.000	54.000	1.500	0.070	Good
	GCW1	2025	0.015	0.010	1.300	2.000	1.500	0.030	Good
GC_14W	GCW8	2025	0.015	0.010	0.750	61.000	1.000	0.030	Good
	GCW12	2025	0.030	0.010	0.750	114.000	1.000	0.040	Good
GC_07	GCW4	2025	0.015	0.010	0.750	172.500	2.000	0.035	Good
	GCW6	2025	0.010	0.010	0.750	12.500	2.000	0.030	Good
GC_25A	GCW16	2025	0.015	0.010	0.750	4.000	2.500	0.030	Moderate
	GCW18	2025	0.015	0.010	0.750	172.500	4.500	0.035	Moderate
	GCW20	2025	0.015	0.010	0.750	0.500	4.500	0.035	Moderate
	GCW22	2025	0.010	0.010	0.770	0.000	1.000	0.030	Good
	GCW24	2025	0.015	0.010	0.750	0.500	3.000	0.025	Moderate
	GCW27	2025	0.015	0.010	0.750	4.500	1.500	0.030	Good
GCB*	GCB4	2025	0.040	0.010	1.000	79.000	2.000	0.050	Good
	GCB7	2025	0.035	0.010	1.000	84.500	1.000	0.035	Good
RC_07	RCE4	2025	0.020	0.010	0.750	18.500	3.000	0.040	Moderate
	RCE6	2025	0.020	0.010	0.940	145.500	2.000	0.045	Good
	RCE8	2025	0.015	0.010	0.750	198.500	1.500	0.050	Good
	RCE9	2025	0.020	0.010	1.000	14.500	5.500	0.020	Moderate
	RCE12	2025	0.025	0.010	1.000	3.500	5.500	0.020	Moderate
RC_09	RCE14	2025	0.020	0.010	1.000	7.000	3.000	0.040	Moderate
	RCE16	2025	0.015	0.010	1.000	4.500	1.500	0.025	Good
	RCE19	2025	0.020	0.010	1.000	5.500	3.000	0.020	Moderate
	RCE22	2025	0.025	0.010	1.000	64.500	2.000	0.030	Good
	RCE25	2025	0.020	0.010	1.000	6.000	3.000	0.030	Moderate
RC_25A	RCW1	2025	0.015	0.010	0.750	22.500	1.500	0.050	Good
	RCW3	2025	0.020	0.010	0.750	2.000	1.500	0.090	Good
RC_26F	RCW5	2025	0.015	0.010	0.750	3.000	1.500	0.050	Good
	RCW7	2025	0.010	0.010	0.750	4.500	1.000	0.040	Good
	RCW9	2025	0.015	0.010	0.750	1.000	1.500	0.045	Good
RC_26E	RCW12	2025	0.010	0.010	0.750	12.000	2.000	0.080	Good
RC_26C	RCW14	2025	0.010	0.010	0.750	4.000	1.000	0.075	Good
SE_26A	SE40	2025	0.055	0.010	0.750	68.500	3.000	0.080	Moderate
	SE42	2025	0.050	0.010	0.750	23.500	2.500	0.045	Moderate

* The Grand Canal Basin is not a designated AWB.

Table 3.2: Indicative ecological potential for the 15 Artificial Water Bodies (AWBs), and the Grand Canal Basin, based on results for the six physico-chemical determinands in Q1 and Q2 combined in 2025.

AWB	Year	Total P (mg/L P)	SRP (mg/L P)	TON (mg/L N)	*E. coli* (Count/100ml)	B.O.D. (mg/L O2)	Ammonia (mg/L N)	Indicative Physico-chemical Potential
GCE_09	2025	0.019	0.010	1.100	35.833	1.750	0.025	Good
GCNL_09	2025	0.020	0.010	3.250	19.000	1.000	0.020	Good
GCMF_14	2025	0.010	0.010	1.900	1.000	1.500	0.025	Good
GCBL_14	2025	0.016	0.010	1.388	2.750	2.125	0.023	Good
GC_14E	2025	0.015	0.010	1.150	28.000	1.500	0.050	Good
GC_14W	2025	0.023	0.010	0.750	87.500	1.000	0.035	Good
GC_07	2025	0.013	0.010	0.750	92.500	2.000	0.033	Good
GC_25A	2025	0.014	0.010	0.753	30.333	2.833	0.031	Moderate
GCB*	2025	0.038	0.010	1.000	81.750	1.500	0.043	Good
RC_07	2025	0.020	0.010	0.888	76.100	3.500	0.035	Moderate
RC_09	2025	0.020	0.010	1.000	17.500	2.500	0.029	Moderate
RC_25A	2025	0.018	0.010	0.750	12.250	1.500	0.070	Good
RC_26F	2025	0.013	0.010	0.750	2.833	1.333	0.045	Good
RC_26E	2025	0.010	0.010	0.750	12.000	2.000	0.080	Good
RC_26C	2025	0.010	0.010	0.750	4.000	1.000	0.075	Good
SE_26A	2025	0.053	0.010	0.750	46.000	2.750	0.063	Moderate

* The Grand Canal Basin is not a designated AWB.

3.3. *Physico-chemistry and Indicative Ecological Potential of Canal Feeders/Drains*

Three of the five feeders/drains sampled in Q2 2025 were assigned Moderate indicative eco-potential following physico-chemical analysis and included the Monread drain (GCE5.1), Ballylennon feeder (GCW13.1) and Kilcock drain (RCE16.1)(see Appendix II). The Athy drain (BL15.1) was upgraded from Moderate in Q1 to Good in Q2, while the Monread drain was downgraded from Good in Q1 to Moderate in Q2. The Ballymullen feeder (GCW12.1) was the only site allocated a Good eco-potential in both Q1 and Q2. Total coliform results were high for all five feeders/drains during the Q2 sampling.

When sampled on 21st of May 2025, there was a low flow of clear water discharging from the Monread drain. The *E. coli* count was high and in breach of the threshold limit for that parameter, at 1,300 counts per 100ml. Because of this breach, the drain was assigned Moderate indicative eco-potential on this occasion (see Appendix II).

On 28th of May 2025 there was a slow but steady flow from both the Ballymullen and Ballylennon feeders. Levels for most of the physico-chemical parameters analysed were low and well within acceptable limits (see Appendix II). The total P for both sites was high but did not exceed the determinand limits. The BOD value (6.0mg/l O_2) and *E. coli* count (>2,420), however, were both high

for the Ballylennon feeder and in breach of the acceptable threshold limits. Although the Ballymullen feeder did have a high *E. coli* reading it was less than half of the determinand limit.

A good flow of clear water was observed at the Athy drain on the 21st of May 2025, even following the recent dry period in the area. Despite the elevated readings for BOD, *E. coli,* Nitrate, Total P and TON (see Appendix II) there were no threshold breaches recorded for the water discharging from the drain on this occasion. The reductions observed in the Total P and BOD were enough to upgrade the site from Moderate in Q1 to Good in Q2 2025.

When sampled on the 21st of May 2025 there was a very low flow emerging from the Kilcock drain into Kilcock harbour. The water quality parameters for all physico-chemical determinands were low except for Total coliforms and *E. coli*. The *E. coli* levels presented a breach of the acceptable limits and resulted in the downgrade of the sampling site from Good to Moderate in Q2 2025.

Table 3.3. Indicative ecological potential for the five canal feeders/drains based on results for the six physico-chemical determinands in Q1 and Q2 combined in 2025.

AWB	Site Code	Year	Total P (mg/L P)	SRP (mg/L P)	TON (mg/L N)	*E. coli* (Count/100ml)	B.O.D. (mg/L O2)	Ammonia (mg/L N)	Indicative Physico-chemical Potential
Monread	GCE5.1	2025	0.040	0.010	1.550	708	1.000	0.040	Good
Ballymullen	GCW12.1	2025	0.055	0.010	0.800	292	1.000	0.025	Good
Ballylennon	GCW13.1	2025	0.050	0.010	0.750	1,223	4.500	0.100	Moderate
Athy	BL15.1	2025	0.050	0.010	1.850	312	2.500	0.065	Moderate
Kilcock Harbour	RCE16.1	2025	0.040	0.010	1.200	1,517	1.500	0.120	Moderate

When physico-chemical results from Q1 and Q2 2025 were combined for the feeder/drain systems, only two were assigned Good indicative eco-potential (Table 3.3). The Ballymullen feeder was the only site with no recorded breaches in 2025. The Athy drain breached for Total P and BOD, both in Q1, and was assigned a combined eco-potential of Moderate for 2025 despite no determinand breaches in Q2. Although a breach of *E. coli* was recorded in Q2, the Monread drain was assigned Good combined status following Q1 and Q2. The Ballylennon feeder and the Kilcock Harbour drain each breached two determinand parameters in the combined assessment of eco-potential for 2025 to date.

3.4. *Grand Canal Basin*

A Dublin City Council urban wastewater outfall is located in the inner Grand Canal Basin (see Figure 2.2). This outfall is used to carry storm water overflow but, on occasions, sewage contamination is discharged to the Basin *via* this outfall.

When sampled in May 2025, the water level in the basin was normal and very clear. A floating containment boom was noted along the overflow into the River Liffey but there was no visible evidence of any floating petrochemical layer on the water at either sampling site (Plate 3.4). As on the previous

sampling occasion in February 2025, results from physico-chemical analysis of water from both the inner basin (GCB4) and outer basin (GCB7) were good, with levels for all parameters being well within acceptable limits (see Appendix I and Table 3.1). The Total coliforms and *E. coli* levels were elevated at both sample sites (GCB4 - 1,553 and 138 respectively, GCB7 - 2,420 and 140 respectively) but were not in breach of the physico-chemical determinands measured as part of WFD monitoring. This indicates some bacterial contamination in the basin at the time of sampling. However, this artificial waterbody was assigned Good indicative eco-potential when the data for both sites in the Grand Canal Basin was assessed (Table 4).

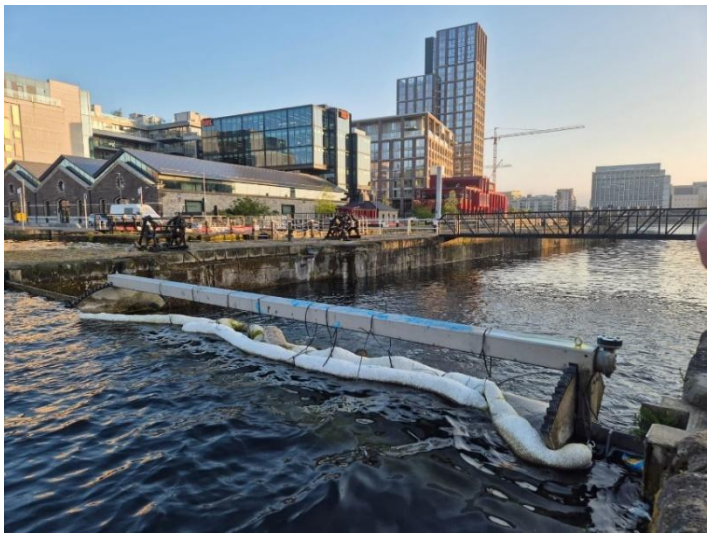


Plate 3.4: A floating containment boom at the time of sampling on the 21st of May 2025.

Thirty-six sets of samples for bacteriological analysis (*E. coli* and *Enterococci*) were taken by WI/DCC in and immediately upstream of the Grand Canal Basin between the January and July 2025 (Table 3.4). DCC sampling took places at sites 4, 5, 6, 7 and 8 with one site on the Grand Canal, two in the inner basin and two in the outer basin. WI sampling took place at 3, 5, 6, 6B, 7 and 8 (Figure 2.2) with one site on the Grand Canal, two in the inner basin and three in the outer basin.

Across all sampling by DCC and WI, a total of 32 breach events involving *E. coli* and *Enterococci* were reported from the water samples taken between January and July 2025 (Table 3.4). Of the 32, seventeen of these breaches occurred in samples tested between the 28th of January to the 25th of February. A further 11 of the breaches were recorded on samples taken between the 28th of May and the 16th of June.

Three breaches were recorded in the Grand Canal before it entered the basin, one for *E. coli* and two for *Enterococci* counts. In the inner basin, twenty-three breaches were reported, with twelve for *E. coli* and eleven for *Enterococci*. The highest bacteriological counts detected were from the 3rd of June 2025, at 17,329 and 19,863 *E,coli* per 100ml and >2,000 and >2,000 *Enterococci* per 100ml. It is notable that

following a relatively dry May there was 27mm of rainfall recorded at Phoenix Park for the week prior to this sampling event. In the outer basin, of the six breaches reported, with three each for *E. coli* and *Enterococci*. Five of the six breaches were recorded in January and June when both sites in the inner basin failed on counts for both parameters (Table 3.4).

E. coli counts reported by WI/DCC on the 20th of May and by INVAS on 21st of May for sites in the inner and outer basins were very similar and all well below acceptable threshold limits.

Table 3.4. Number of sites that breached acceptable limits for *E. coli* (>900 counts per 100ml) and *Enterococci* (>250 counts per 100ml) in water samples taken by Waterways Ireland and Dublin City Council with third party testing in Level 1 of the Grand Canal (1 site) and in the inner (2 sites) and outer (2 or 3 sites) Grand Canal Basins between January and July 2025.

Date	Canal *E. coli*	Canal Enterococci	Inner *E. coli*	Inner Enterococci	Outer *E. coli*	Outer Enterococci
14/01/2025	0	0	0	0	0	0
28/01/2025	0	1	2	2	2	2
11/02/2025	0	0	2	2	0	0
25/02/2025	0	0	2	2	0	0
11/03/2025	0	0	0	0	0	0
25/03/2025	0	0	0	0	0	0
07/04/2025	0	0	0	0	0	0
08/04/2025	0	1	0	0	0	0
14/04/2025	0	0	0	0	0	0
16/04/2025	0	0	2	1	0	0
22/04/2025	0	0	0	0	0	0
23/04/2025	0	0	0	0	0	0
28/04/2025	0	0	0	0	0	0
30/04/2025	0	0	0	0	0	0
06/05/2025	0	0	0	0	0	0
07/05/2025	0	0	0	0	0	0
12/05/2025	0	0	0	0	0	0
14/05/2025	0	0	0	0	0	0
19/05/2025	0	0	0	0	0	0
26/05/2025	0	0	0	0	0	0
28/05/2025	0	0	0	0	1	0
03/06/2025	0	0	2	2	0	1
04/06/2025	0	0	0	0	0	0
09/06/2025	0	0	0	0	0	0
11/06/2025	1	0	0	0	0	0
16/06/2025	0	0	2	2	0	0
17/06/2025	0	0	0	0	0	0
23/06/2025	0	0	0	0	0	0
25/06/2025	0	0	0	0	0	0
30/06/2025	0	0	0	0	0	0
01/07/2025	0	0	0	0	0	0
07/07/2025	0	0	0	0	0	0
09/07/2024	0	0	0	0	0	0
14/07/2024	0	0	0	0	0	0
15/07/2025	0	0	0	0	0	0

4. Issues for Waterways Ireland Resulting from Sampling in Q2 2025

A total of 19 sites of the 43 canal and Shannon-Erne Waterway sites were downgraded from Good to Moderate indicative physico-chemical status in Q2 2025. The high number of breaches in threshold limits attributed to just two determinands, BOD and Ammonia. Of the sites that were downgraded due to excessive readings, fifteen of these resulted from BOD alone, three from Ammonia alone and one site from both BOD and Ammonia. High BOD values can be caused by drought periods and accumulations in decaying organic matter, however, excessively high readings such as 9.0mg/l O_2 at Cloncurry (RCE12) and 8.0mg/l O_2 at Moy valley (RCE9) may indicate further underlying issues. While all sites that experienced a breach in BOD should be closely monitored for any subsequent breaches in Q3 2025, sites that breached in both Q1 and Q2 2025 including Moy valley and Ballycowan (GCW18) may warrant further investigation if the problem persists.

During the Q2 sampling in May 2025, elevated levels of Total coliforms were recorded at several sites, while breaches in *E. coli* levels were recorded at two of the Feeder sites (GCW13.1 and RCE 16.1). Since then, throughout June and early July, elevated Total coliforms and *E. coli* results have been a significant feature of the internal water quality sampling regimes of Waterways Ireland. Several excessively high results have been recorded at a wide range of sites throughout the canal network including some those covered in this report such as Athy, Croke Park, Grand canal basin, Hazelhatch, Kilcock, Leitrim village, Lock 12 and Nass Harbour. This has resulted in Waterways Ireland staff and contractors as well as recreational users being advised to make alternative arrangements for any activities planned at these locations. The high readings in some cases may be coming as a result of direct discharges or from runoff following generally dry periods seen in early May, mid-June and early July. In advance of the Q3 water quality sampling, Waterways Ireland should continue with their in-house monitoring of areas that they have identified as problematic or recreational sites for sustained breaches in acceptable threshold limits.

Ammonia levels were breached at four sites in Royal canal west, for reasons that are not apparent. It has been suggested as part of this reporting in the past that it possible this Ammonia threshold limit of 0.12mg/l N is too low for Irish canals and has recently been reviewed by the Environmental Protection Agency and Waterways Ireland, with the outcome pending. All four breaches in Q2 2025 were within the proposed increased threshold limit of 0.165mg/l N suggested as part of the review meeting.

The Monread drain, Ballylennon feeder and Kilcock drain were assigned Moderate indicative eco-potential reflecting a high *E. coli* count at all three sites, with a breach in BOD also recorded at Ballylennon. Both the Ballymullen feeder and Athy drain were assigned Good indicative eco-potential on this sampling occasion.

The presence of a significant oily layer was at Leitrim village (SE42) on the Shannon-Erne Waterway was reported to WI on the day of sampling. This also follows on from a site investigation with INVAS and WI staff on the 22nd of May to identify possible sources of pollution in the vicinity of SE42. It will be important for WI to maintain communication with Leitrim County Council regarding the persistent water quality issues and work towards the identification of contamination risks at this site.

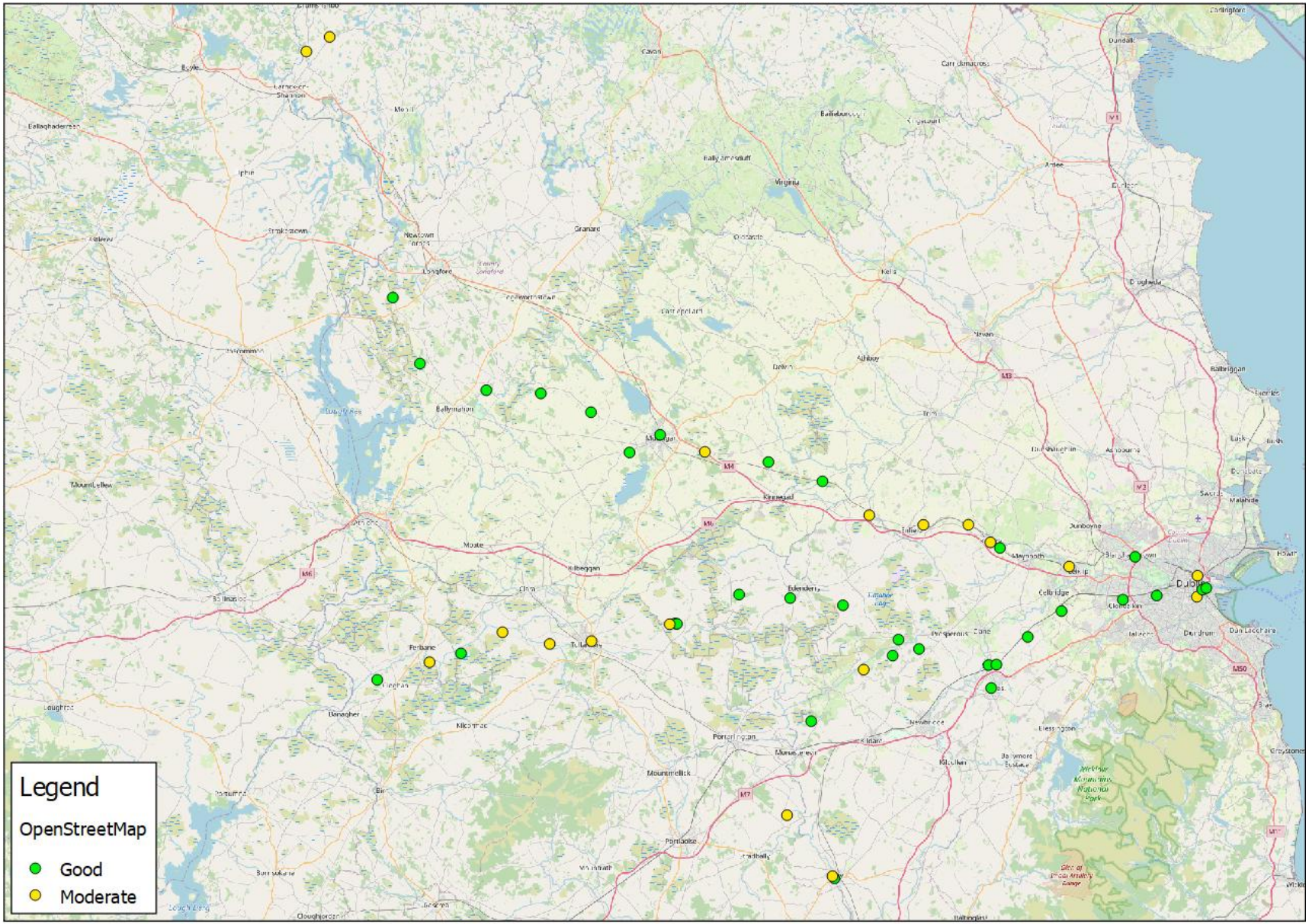


Figure 4.1. Indicative ecological potential based on physico-chemical data for the 50 canal, Shannon-Erne Waterway and feeder/drain sites monitored in Q2 2025 (Green = Good, Yellow = Moderate).

Appendix I. Physico-chemical results and indicative ecological potential for canal (41), Shannon-Erne Waterway (2) and Grand Canal Basin (2) sites sampled in Q2 2025.

	Canal	Site Code	AWB	Quarter	Date	Total P (mg/L P)	MRP (mg/L P)	SRP (mg/L P)	TON (mg/L N)	Temperature	Conductivity (µS)	pH	DO %	DO (mg/L O_2)	Total Coliform (Count/100ml)	*E.coli* (Count/100ml)	B.O.D. (mg/L O2)	Ammonia (mg/L N)	Nitrite (mg/L N)	Nitrate (mg/L N)	Alkalinity (meq/L)	Alkalinity (mg/L $CaCO_3$)	Indicative Physico-chemical Potential
GCE1_Q2	Grand Canal	GCE1	GC_14E	Q2	21/05/2025	0.010	0.010	0.010	1.000	18.6	416	7.42	89.3	8.40	345	108	2.00	0.070	0.030	1.000	2.965	148.40	Good
GCE4_Q2	Grand Canal	GCE4	GC_09	Q2	21/05/2025	0.010	0.010	0.010	1.000	16.2	486	7.54	81.8	8.03	204	27	2.00	0.030	0.030	1.000	3.057	153.00	Good
GCE6_Q2	Grand Canal	GCE6	GC_09	Q2	21/05/2025	0.010	0.010	0.010	1.000	17.2	477	7.42	69.0	6.84	19	2	1.00	0.020	0.030	1.000	3.395	169.90	Good
GCE8_Q2	Grand Canal	GCE8	GC_09	Q2	21/05/2025	0.010	0.010	0.010	1.000	16.8	432	7.43	70.1	6.89	2,420	125	2.00	0.020	0.030	1.000	2.348	117.50	Good
GCE10_Q2	Grand Canal	GCE10	GC_09	Q2	21/05/2025	0.010	0.010	0.010	1.000	18.2	405	7.35	64.1	6.18	147	7	2.00	0.030	0.030	1.000	1.830	91.60	Good
GCE12_Q2	Grand Canal	GCE12	GC_09	Q2	21/05/2025	0.010	0.010	0.010	1.000	17.6	382	7.43	61.3	5.92	387	76	2.00	0.020	0.030	1.000	1.752	87.70	Good
GCE14_Q2	Grand Canal	GCE14	GC_09	Q2	21/05/2025	0.020	0.010	0.010	1.000	17.4	364	7.29	63.6	5.18	68	5	3.00	0.040	0.030	1.000	3.163	158.30	Moderate
GCW1_Q2	Grand Canal	GCW1	GC_14E	Q2	21/05/2025	0.010	0.010	0.010	1.000	19.1	449	7.67	118.5	10.58	166	4	2.00	0.030	0.030	1.000	3.313	165.80	Good
GCW4_Q2	Grand Canal	GCW4	GC_07	Q2	28/05/2025	0.020	0.010	0.010	0.500	18.7	370	7.44	80.2	6.74	866	345	3.00	0.050	0.010	0.500	1.976	98.89	Moderate
GCW6_Q2	Grand Canal	GCW6	GC_07	Q2	28/05/2025	0.010	0.010	0.010	0.500	19.3	353	7.66	84.0	8.38	461	25	3.00	0.040	0.010	0.500	1.969	98.54	Moderate
GCW8_Q2	Grand Canal	GCW8	GC_14W	Q2	28/05/2025	0.020	0.010	0.010	0.500	19.0	344	7.61	68.7	6.76	228	122	1.00	0.040	0.010	0.500	2.068	103.49	Good
GCW12_Q2	Grand Canal	GCW12	GC_14W	Q2	28/05/2025	0.040	0.010	0.010	0.500	18.4	372	7.57	68.0	6.97	1,986	205	1.00	0.040	0.010	0.500	2.175	108.85	Good
GCW16_Q2	Grand Canal	GCW16	GC_25A	Q2	28/05/2025	0.020	0.010	0.010	0.500	17.8	481	7.63	75.2	7.16	387	3	2.00	0.040	0.010	0.500	2.721	136.18	Good
GCW18_Q2	Grand Canal	GCW18	GC_25A	Q2	28/05/2025	0.020	0.010	0.010	0.500	18.2	381	7.74	85.3	8.33	345	345	5.00	0.050	0.010	0.500	1.996	99.88	Moderate
GCW20_Q2	Grand Canal	GCW20	GC_25A	Q2	28/05/2025	0.020	0.010	0.010	0.500	18.3	365	7.59	90.8	8.83	99	1	2.00	0.050	0.010	0.500	1.774	88.77	Good
GCW22_Q2	Grand Canal	GCW22	GC_25A	Q2	28/05/2025	0.010	0.010	0.010	0.540	18.5	454	7.26	72.3	7.01	116	0	1.00	0.040	0.010	0.530	2.563	128.29	Good
GCW24_Q2	Grand Canal	GCW24	GC_25A	Q2	28/05/2025	0.020	0.010	0.010	0.500	17.2	435	7.41	66.8	6.46	52	1	4.00	0.030	0.010	0.500	2.725	136.41	Moderate
GCW27_Q2	Grand Canal	GCW27	GC_25A	Q2	28/05/2025	0.020	0.010	0.010	0.500	17.6	347	7.65	83.2	8.23	138	9	1.00	0.040	0.010	0.500	1.791	89.65	Good
NL1_Q2	Grand Canal	NL1	GCNL_09	Q2	21/05/2025	0.010	0.010	0.010	2.900	14.2	526	7.51	103.6	10.90	579	15	1.00	0.020	0.030	2.880	2.935	146.90	Good
MF1_Q2	Grand Canal	MF1	GCMF_14	Q2	21/05/2025	0.010	0.010	0.010	1.400	18.1	551	7.48	96.7	9.23	70	2	2.00	0.030	0.030	1.390	3.073	153.80	Good
BL2_Q2	Grand Canal	BL2	GCBL_14	Q2	21/05/2025	0.010	0.010	0.010	1.000	20.1	418	7.67	108.9	10.11	68	3	3.00	0.030	0.030	1.000	2.056	102.90	Moderate
BL6_Q2	Grand Canal	BL6	GCBL_14	Q2	21/05/2025	0.010	0.010	0.010	1.000	19.4	434	7.44	87.2	7.49	345	1	3.00	0.020	0.030	1.000	1.652	82.70	Moderate
BL10_Q2	Grand Canal	BL10	GCBL_14	Q2	21/05/2025	0.010	0.010	0.010	1.800	20.2	525	7.55	93.6	9.16	150	0	3.00	0.020	0.030	1.800	2.781	139.20	Moderate
BL15_Q2	Grand Canal	BL15	GCBL_14	Q2	21/05/2025	0.020	0.010	0.010	1.400	19.3	524	7.76	98.5	8.51	2,420	14	2.00	0.030	0.030	1.390	1.552	77.70	Good
GCB4_Q2	Grand Canal	GCB4	GCB*	Q2	21/05/2025	0.020	0.010	0.010	1.000	17.8	368	7.54	82.4	7.86	1,553	138	2.00	0.030	0.030	1.000	2.114	105.80	Good
GCB7_Q2	Grand Canal	GCB7	GCB*	Q2	21/05/2025	0.010	0.010	0.010	1.000	17.9	387	7.85	99.0	9.48	2,420	140	1.00	0.020	0.030	1.000	2.464	123.30	Good
RCE4_Q2	Royal Canal	RCE4	RC_07	Q2	28/05/2025	0.020	0.010	0.010	0.500	18.4	505	7.40	53.0	5.63	43	0	2.00	0.060	0.010	0.500	2.810	140.66	Good
RCE6_Q2	Royal Canal	RCE6	RC_07	Q2	28/05/2025	0.020	0.010	0.010	0.880	18.2	474	7.30	81.6	8.61	517	248	2.00	0.070	0.010	0.870	2.617	130.96	Good
RCE8_Q2	Royal Canal	RCE8	RC_07	Q2	28/05/2025	0.020	0.010	0.010	0.500	17.6	434	7.47	61.4	6.11	2,420	387	2.00	0.080	0.010	0.500	2.960	148.13	Good
RCE9_Q2	Royal Canal	RCE9	RC_07	Q2	21/05/2025	0.010	0.010	0.010	1.000	17.7	545	7.32	62.6	6.08	159	29	8.00	0.020	0.030	1.000	2.178	109.00	Moderate
RCE12_Q2	Royal Canal	RCE12	RC_07	Q2	21/05/2025	0.030	0.010	0.010	1.000	15.2	404	7.23	80.2	8.08	88	5	9.00	0.020	0.030	1.000	3.037	152.00	Moderate
RCE14_Q2	Royal Canal	RCE14	RC_09	Q2	21/05/2025	0.020	0.010	0.010	1.000	16.1	474	7.42	56.8	5.52	980	10	4.00	0.030	0.030	1.000	2.338	117.00	Moderate
RCE16_Q2	Royal Canal	RCE16	RC_09	Q2	21/05/2025	0.010	0.010	0.010	1.000	16.4	490	7.36	75.8	7.29	179	6	1.00	0.030	0.030	1.000	2.424	121.30	Good
RCE19_Q2	Royal Canal	RCE19	RC_09	Q2	21/05/2025	0.020	0.010	0.010	1.000	16.3	433	7.16	51.7	5.07	135	10	5.00	0.020	0.030	1.000	2.188	109.50	Moderate
RCE22_Q2	Royal Canal	RCE22	RC_09	Q2	21/05/2025	0.020	0.010	0.010	1.000	18.3	453	7.02	49.7	4.89	1,732	30	3.00	0.020	0.030	1.000	2.567	128.50	Moderate
RCE25_Q2	Royal Canal	RCE25	RC_09	Q2	21/05/2025	0.020	0.010	0.010	1.000	17.4	436	7.43	85.3	8.23	21	7	5.00	0.020	0.030	1.000	1.946	97.40	Moderate
RCW1_Q2	Royal Canal	RCW1	RC_25A	Q2	28/05/2025	0.020	0.010	0.010	0.500	18.2	277	7.27	81.0	8.32	2,420	25	2.00	0.080	0.010	0.500	2.014	100.82	Good
RCW3_Q2	Royal Canal	RCW3	RC_25A	Q2	28/05/2025	0.030	0.010	0.010	0.500	18.6	279	7.34	53.4	5.37	179	4	2.00	0.160	0.010	0.500	1.605	80.33	Moderate
RCW5_Q2	Royal Canal	RCW5	RC_26F	Q2	28/05/2025	0.020	0.010	0.010	0.500	17.8	356	7.26	75.1	7.46	131	6	2.00	0.080	0.010	0.500	1.971	98.67	Good
RCW7_Q2	Royal Canal	RCW7	RC_26F	Q2	28/05/2025	0.010	0.010	0.010	0.500	17.9	371	7.46	70.6	7.53	80	9	1.00	0.060	0.010	0.500	2.433	121.79	Good
RCW9_Q2	Royal Canal	RCW9	RC_26F	Q2	28/05/2025	0.010	0.010	0.010	0.500	17.4	374	7.31	92.2	8.15	135	2	1.00	0.070	0.010	0.500	2.296	114.91	Good
RCW12_Q2	Royal Canal	RCW12	RC_26E	Q2	28/05/2025	0.010	0.010	0.010	0.500	16.6	352	6.84	61.7	5.08	157	24	2.00	0.140	0.010	0.500	2.539	127.10	Moderate
RCW14_Q2	Royal Canal	RCW14	RC_26C	Q2	28/05/2025	0.010	0.010	0.010	0.500	17.5	303	7.30	68.3	6.65	291	8	1.00	0.130	0.010	0.500	2.004	100.32	Moderate
SE40_Q2	Shannon Erne	SE40	SE_26A	Q2	28/05/2025	0.060	0.010	0.010	0.500	16.8	176	7.04	71.8	7.08	2,420	130	3.00	0.140	0.010	0.500	1.459	73.02	Moderate
SE42_Q2	Shannon Erne	SE42	SE_26A	Q2	28/05/2025	0.040	0.010	0.010	0.500	17.3	224	7.17	81.0	8.07	248	19	3.00	0.070	0.010	0.500	1.868	93.51	Moderate

Appendix II. Physico-chemical results and indicative ecological potential for canal feeder/drain sites sampled in Q2 2025.

Canal	Site	Location	AWB_Code	Quarter	Date	Total P (mg/L P)	MRP (mg/L P)	SRP (mg/L P)	TON (mg/L N)	Temperature (degree C)	Conductivity (µS)	pH	DO %	DO (mg/L O_2)	Total Coliform (Count/100ml)	*E.coli* (Count/100ml)	B.O.D. (mg/L O2)	Ammonia (mg/L N)	Nitrite (mg/L N)	Nitrate (mg/L N)	Alkalinity (meq/L)	Alkalinity (mg/L $CaCO_3$)	Indicative Physico-chemical Potential
Grand Canal	GCE5.1	Monread Feeder	GC_09	Q1	06/03/2025	0.060	0.010	0.010	1.500	12.00	489	8.45	87.7	9.94	980	115	1.00	0.060	0.030	2.400	2.681	134.20	Good
Grand Canal	GCW12.1	Ballymullen Feeder	GC_14	Q1	26/02/2025	0.060	0.010	0.010	1.000	9.00	510	8.41	91.2	10.26	365	122	1.00	0.020	0.030	1.490	3.165	158.40	Good
Grand Canal	GCW13.1	Ballylennon Feeder	GC_14	Q1	26/02/2025	0.040	0.010	0.010	1.000	8.00	428	8.03	76.2	8.84	276	25	3.00	0.160	0.030	1.580	2.645	132.40	Moderate
Grand Canal Barrow Line	BL15.1	Athy Drain	GCBL_14	Q1	06/03/2025	0.070	0.010	0.010	1.700	12.00	394	8.49	91.8	9.67	326	44	3.00	0.060	0.030	3.490	2.967	148.50	Moderate
Royal Canal	RCE16.1	Kilcock Harbour Drain	RC_09	Q1	06/03/2025	0.050	0.010	0.010	1.400	10.00	477	8.52	84.4	9.42	2,420	613	1.00	0.160	0.030	2.390	2.779	139.10	Moderate
Grand Canal	GCE5.1	Monread Feeder	GC_09	Q2	21/05/2025	0.020	0.010	0.010	1.600	13.00	541	7.66	81.2	8.71	2,420	1,300	1.00	0.020	0.030	1.580	2.412	120.70	Moderate
Grand Canal	GCW12.1	Ballymullen Feeder	GC_14	Q2	28/05/2025	0.050	0.010	0.010	0.600	16.00	561	7.36	51.0	5.60	2,420	461	1.00	0.030	0.010	0.590	2.939	147.12	Good
Grand Canal	GCW13.1	Ballylennon Feeder	GC_14	Q2	28/05/2025	0.060	0.010	0.010	0.500	16.00	573	7.24	54.2	5.76	2,420	2,420	6.00	0.040	0.020	0.500	3.400	170.18	Moderate
Grand Canal Barrow Line	BL15.1	Athy Drain	GCBL_14	Q2	21/05/2025	0.030	0.010	0.010	2.000	16.00	511	7.66	86.3	7.78	2,420	579	2.00	0.070	0.030	1.990	2.458	123.00	Good
Royal Canal	RCE16.1	Kilcock Harbour Drain	RC_09	Q2	21/05/2025	0.030	0.010	0.010	1.000	15.00	495	7.52	86.2	8.32	2,420	2,420	2.00	0.080	0.030	1.000	3.089	154.60	Moderate



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Appendix VI

Water Framework Directive Compliance Report

Physico-Chemistry

Third Quarter 2025

Water Framework Directive Compliance Report

Physico-chemistry

Third Quarter 2025



September 2025

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Front Cover: Water being pumped between levels at Cornalaur (GCW20) in August 2025.

1. Introduction

Water Framework Directive (WFD) surveillance monitoring of the Royal and Grand Canals and the canalised section of the Shannon-Erne Waterway for Q3 2025 was carried out on 20th and 28th of August 2025.

A canal is identified as an Artificial Water Body (AWB) in the WFD and is defined as 'a body of water created by human activity'. In recognition of their navigational role, AWBs must achieve good ecological potential as opposed to good ecological status, the latter which applies to natural water bodies, such as rivers and lakes. Ecological potential is assessed using a combination of biological (native and invasive macroinvertebrate and macrophyte), physico-chemical and hydromorphological quality elements. For classification purposes, the ecological potential of a site or AWB can be Maximum, Good, Moderate, Poor or Bad. Where physico-chemistry alone is being assessed, as in this report, sites and AWBs can achieve either Good or Moderate potential only. In assigning ecological potential, the one-out-all-out rule applies, whereby the lowest value quality element determines the overall classification of the AWB. A system for classifying British and Irish canals based on macroinvertebrate, macrophyte, invasive species, physico-chemical and hydromorphological quality elements is used to assess the ecological potential of AWBs. In the current reporting period (Q3 2025), the canals are classified based on the physico-chemistry of the water during this period.

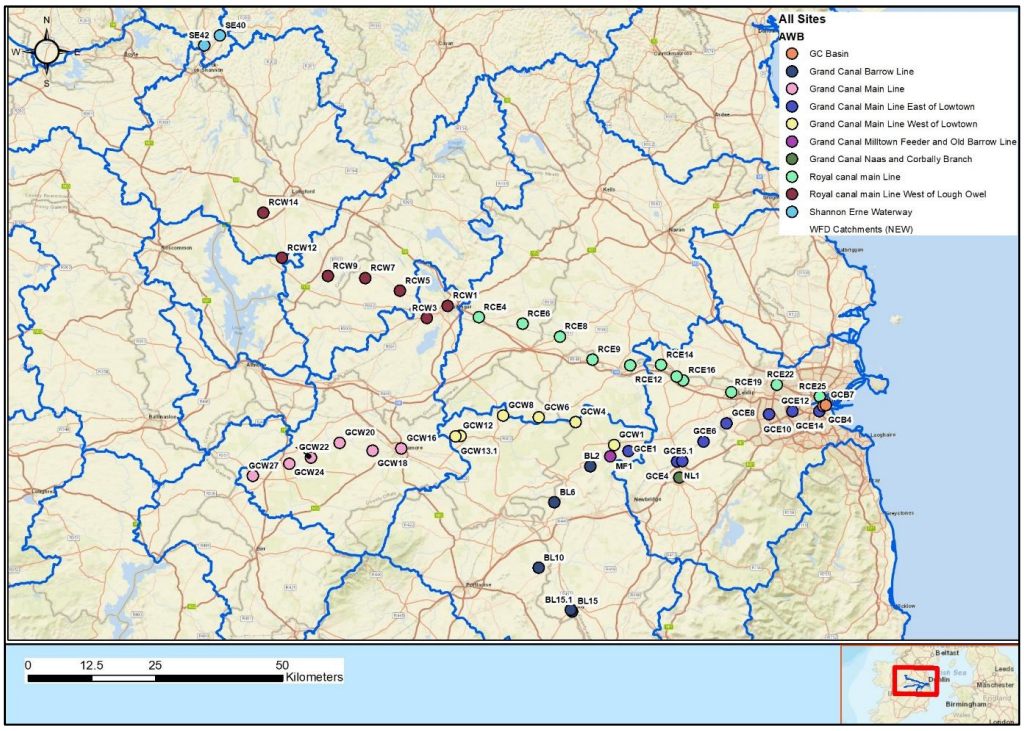


Figure 1.1: Artificial Water Bodies (AWBs), sites and monitored feeder streams on the Royal and Grand Canals, and the Shannon-Erne Waterway. The AWBs are grouped based on associated river catchments.

The canals are currently divided into 15 AWBs based on their locations within river catchments (Table 1.1). The Grand Canal supports eight AWBs (this does not include the Grand Canal Basin), the Royal Canal has six AWBs and there is just a single AWB on the Shannon-Erne Waterway. Four of the AWBs have only a single canal sampling site (Table 1.1), which can be potentially problematic when ecological potential for individual AWBs is being assigned. This reflects the fact that a breach in any biological or abiotic parameter can result in the AWB being changed from Good to Moderate.

For reporting purposes, a simple code has been assigned, whereby AWBs are labelled according to the river catchment in which they occur (Table 1.1).

Table 1.1: Artificial Water Bodies (AWBs) included in the WFD Monitoring Programme.

Artificial Water Body (AWB)	*Catchment No*	*New ID Code*	*New Report Code*	*Length (km)*	*No of Sites*
GRAND CANAL					
Grand Canal Main Line - Liffey and Dublin Bay	9	IE_09_AWB_GCMLE	GC_09	41.4	6
Grand Canal Main Line East - Barrow	14	IE_14_AWB_GCMLE	GC_14E	15.7	2
Grand Canal Main Line West - Barrow	14	IE_14_AWB_GCMLW	GC_14W	12.9	2
Grand Canal Main Line - Boyne	7	IE_07_AWB_GCMLW	GC_07	14.5	2
Grand Canal Main Line - Lower Shannon	25A	IE_25A_AWB_GCMLW	GC_25A	47.0	6
Grand Canal Naas Line - Liffey and Dublin Bay	9	IE_09_AWB_GCNL	GCNL_09	11.9	1
Grand Canal Milltown Feeder - Barrow	14	IE_14_AWB_GCMF	GCMF_14	10.5	1
Grand Canal Barrow Line - Barrow	14	IE_14_AWB_GCBL	GCBL_14	50.8	4
Grand Canal Basin - Liffey and Dublin Bay	9	IE_09_AWB_GCB	GCB		2
ROYAL CANAL					
Royal Canal Main Line - Boyne Catchment	7	IE_07_AWB_RCMLE	RC_07	42.6	5
Royal Canal Main Line - Liffey and Dublin Bay	9	IE_09_AWB_RCMLE	RC_09	39.4	5
Royal Canal Main Line - Lower Shannon	25A	IE_25A_AWB_RCMLW	RC_25A	13.3	2
Royal Canal Main Line - Upper Shannon	26F	IE_26F_AWB_RCMLW	RC_26F	33.8	3
Royal Canal Main Line - Upper Shannon	26E	IE_26E_AWB_RCMLW	RC_26E	3.7	1
Royal Canal Main Line - Upper Shannon	26C	IE_26C_AWB_RCMLW	RC_26C	14.2	1
SHANNON ERNE WATERWAY					
Shannon Erne Waterway - Upper Shannon	26A	IE_26A_AWB_SEW	SE_26A	25.5	2

During 2020 a second site (SE42) was included on the Shannon-Erne Waterway to better represent the water quality status of this Waterway and AWB (Table 1.1). This site is located adjacent to the marina in Leitrim village, close to where the Shannon-Erne Waterway discharges to the River Shannon (Figure 1.2).



Figure 1.2: Location of the two WFD monitoring sites (SE40 and 42) on the Shannon-Erne Waterway.



Plate 1.1: A weed cutting boat on the Grand Canal West of Pollagh (GCW22) on the 28th of August 2025.

2. Materials and Methods

2.1. *Sampling locations*

Physico-chemical sampling is conducted on a quarterly basis at 50 monitoring sites – 41 on the Royal, Grand and Barrow Canals, two on the Grand Canal Basin, two on the Shannon-Erne Waterway, and five on selected canal feeder streams/drains (see Figures 1.1, 1.2 and 2.1). The canal feeders/drains have been a source of elevated nutrient and coliform inputs in the past. They include the Monread drain (GCE5.1) and Ballymullen (GCW12.1) and Ballylennon (GCW13.1) feeder streams on the Grand Canal, the Athy drain (BL15.1) on the Barrow Line, and the Kilcock Harbour drain (RCE16.1) on the Royal Canal. In addition to the quarterly water samples taken by INVAS at two sites in the Grand Canal Basin as part of the WFD Canals Surveillance Programme, Waterways Ireland (WI) and Dublin City Council (DCC) conduct regular water sampling for bacteriological (*E. coli* and *Enterococci*) analysis at up to 11 sites in the Basin (three in the Inner, eight in the Outer) and two in the adjacent Grand Canal (Figure 4). In 2022 and 2025, just five samples for bacteriology have been collected and analysed on a fortnightly basis. The sampling sites were 1st level of the Grand Canal (1), the inner basin (2 – sites 4 and 5 in Figure 2.2) and the outer basin (2 – sites 6 and 7 in Figure 2.2).

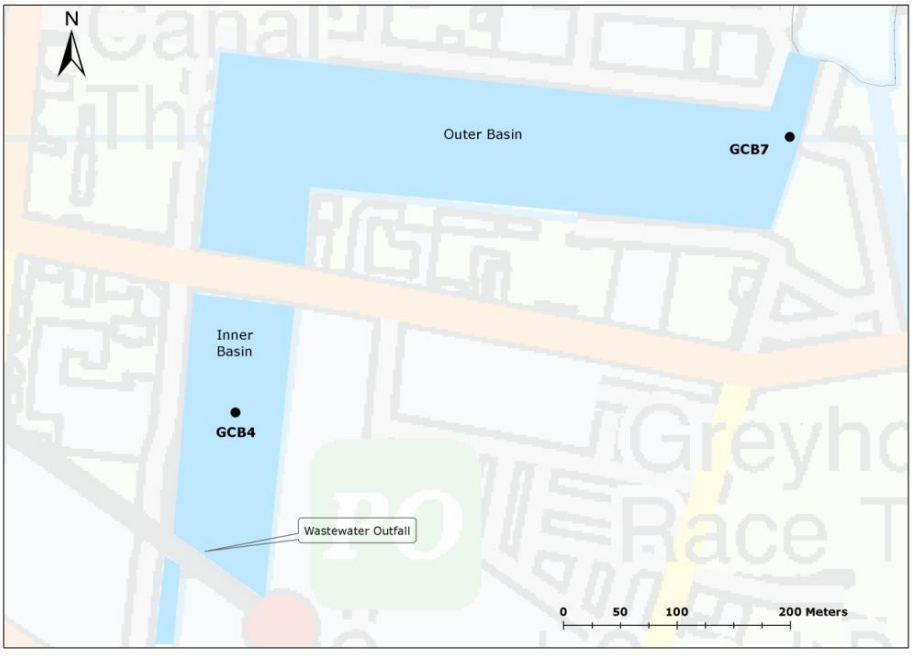


Figure 2.1: Grand Canal Basin (Dublin) showing the two monitoring sites (GCB4 and GCB7).

2.2. *Physico-Chemical Monitoring*

Water sampling involves the deployment of a YSI water logger at each site to measure temperature, conductivity, pH and dissolved oxygen (DO). Water samples are collected from canal sites and returned to the Independent Analytical Supplies (IAS) laboratory in Bagenalstown for analysis of a range of determinands (Table 2.1). A subset of these is used to assess indicative ecological potential - Total Phosphorus (TP), Soluble Reactive Phosphorus (SRP), Total Oxidised Nitrogen (TON), Ammonia, Biological Oxygen Demand (BOD) and Faecal Coliforms.

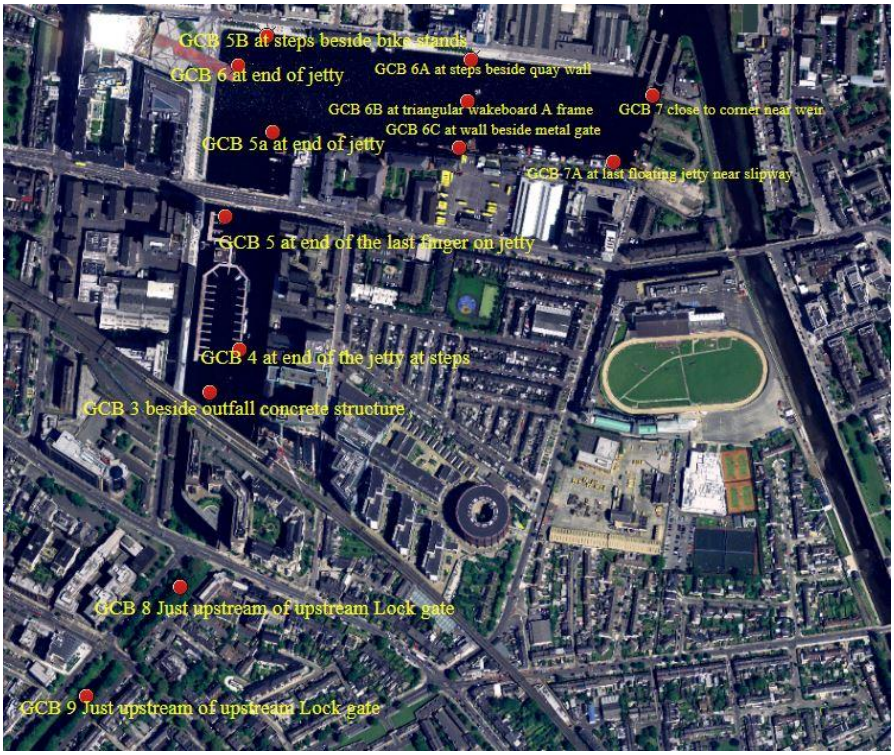


Figure 2.2: Grand Canal Basin (Dublin) showing the 13 sites that have been sampled in the past by Waterways Ireland and Dublin City Council for bacteriology.

Table 2.1: Physico-chemical determinands measured as part of WFD monitoring. (Chlorophyll monitoring has been discontinued since 2021.)

Determinand	Limit	Determinand	Limit
Total Phosphorus (TP) (mg/l P)*	0.063 mg/l P	Dissolved Oxygen (DO) (mg/l and % saturation)	>5.0 mg/l O_2
Molybdate Reactive Phosphorus (MRP) (mg/l P)	0.025 mg/l P	pH	
Soluble Reactive Phosphorus (SRP) (mg/l P)*	0.025 mg/l P	Conductivity (µS)	
Total Oxidised Nitrogen (TON) (mg/l N)*	4.1 mg/l N	Alkalinity (meq/l)	
Nitrite (mg/l)		Chlorophyll (µg/l)	
Nitrate (mg/l)		Biological Oxygen Demand (BOD) (mg/l O_2)*	<2.5 mg/l O_2
Ammonia (mg/l N)*	0.12 mg/l N	Total Coliforms (TC) (counts/100ml)	5000/100 ml
Temperature (°C)		Faecal Coliforms (counts/100ml)*	1000/100 ml

* Determinands used to assign ecological potential to the Artificial Water Bodies (AWBs)

3. Results

The full set of results from physico-chemical analysis of the water samples taken from the 50 canal, feeder/drain and Grand Canal Basin sites surveyed in Q3 2025 is presented in Appendices I and II.

3.1. *Physico-chemistry at Canal Sites*

Water sampling in Q3 2025 was conducted over two days – 20th and 28th of August 2025. The weather during the sampling period had been dry and warm, with relatively little sustained rainfall. The water levels were slightly below normal at many sites with levels being supplemented (Cover image) in some areas through the addition of water from local watercourses. This was taking place up to at least the 28th of August despite some rainfall in previous days. The lack of rain through the summer also contributed to very low flows at all of the feeders/drains, with the exception of the Athy drain where a good flow was observed. Infrastructural works at several sites during Q2 had reached completion upon sampling in Q3 (Plate 3.1). Water temperature over the sampling period varied from 18.0 to 21.2ºC and ranged from 18.1 to 21.2ºC on 20th and from 18.0 to 19.6ºC on 28th of August 2025 (see Appendix I). The highest temperature in Q3 of 21.2ºC was recorded at GCE10 (Clondalkin) and BL2 (East of Lock 22).



Plate 3.1: Completed infrastructural works adjacent to the Grand Canal at Baggot Street on the 28th of August 2025.

Water quality conditions in the eastern section of the Grand Canal (GCE) and the Milltown Feeder (MF1) were good at all sites during Q3, although slightly elevated Total P levels (> 0.1mg/l P) were recorded at three sites. These were Sallins (GCE4), Ponsonby Bridge (GCE6) and Hazelhatch (GCE8). There were also raised Total coliforms and *E.coli* values recorded for Sallins, Hazelhatch and Blackhorse (GCE12). In the western section of the Grand canal, physico-chemical analysis of the water from the 11 sites again revealed good water quality conditions generally (see Appendix I), with the exception of a single breach in Total P (0.070 mg/L P) recorded at GCW12 (West of Daingen). All other parameters at this site were well within the normal limits and the breach likely reflects the inputs from the Ballymullen feeder stream. It was also noted at the time of sampling that water conditions were slightly turbid following recent weed cutting in the area. It was anticipated that further breaches would have been recorded throughout the western section during Q3 because of the low water levels that operated at this canal section during the summer months. However, it is likely that these impacts were mitigated against by supplementing the canal with water from local watercourses and the pumping of water between levels (cover image). Although eight of the 11 sites exhibited a BOD value of 2.0 mg/L O_2, there were no values recorded above the acceptable threshold limit.

There was a significant accumulation of algal growth observed at the Naas Line of the Grand Canal during sampling in Q3 2023. High total coliform and *E. coli* counts were recorded at the Naas site but despite this, there were no breaches in any of the six determinands. The levels for TON and Nitrate were normal on this occasion, at 1.1 and 1.090 mg/l N, respectively. This is the first time in 2025 that these levels have been low, despite the fact that there has not been a breach in TON in the last six quarterly sampling events in a row.

During sampling in Q3, the water was very clear and there was a moderate flow in the Monread feeder (MF1). This continues a trend from recent sampling occasions as water quality was good for all parameters and well within the acceptable limits (Appendix I).

The water quality conditions at BL10 (Vicarstown) exhibited raised TON (4.3 mg/l N) and Nitrate (4.29 mg/l N) on the Q3 sampling occasion. Breaches in these parameters have been recorded along the Barrow Line in previous years, and it is believed they may be as result of a direct result of discharge from nearby feeder streams (Annonock Stream). This issue should again be brought to the attention of Kildare County Council (KCC) in an attempt to identify the offending issue to protect the water quality in the area in the long-term. Total coliform counts were elevated at all four Barrow Line sites, but otherwise water quality was generally good along this section of the canal network.

There has been an improvement in the indicative physico-chemical potential of sites on the Royal canal east, with the number of sites exceeding the BOD threshold limits reduced from six to three out of ten. The three sites at Cloncurry (RCE12), Louisa Bridge (RCE19) and Castleknock (RCE22) to be

downgraded on this sampling occasion were also downgraded in Q2 2025. Even though only three sites were assigned Moderate physico-chemical potential in Q3 2025, just two of the ten sites in this branch of the canal had a BOD value of lower than 2.0 mg/L O_2 (RCE6 - Thomastown and RCE 25 - Croke Park). Even though there were no breaches in threshold limits for any of the other determinands, the recoded values for Total P (RCE8 and RCE12), Ammonia (RCE9, RCE12, RCE16, RCE22 and RCE25) and Total coliforms (RCE6, RCE12, RCE14, RCE16 and RCE19) were also above the normal readings at several sites.



Plate 3.2: Algal growth on the Royal Canal at Louisa Bridge (RCE19) where a high Q3 BOD value of 4.0mg/lO_2 was recorded on the 20th of August 2025.

Water levels were lower than normal at all seven sites in the Royal Canal West with each displaying a BOD value of greater than 2.0 mg/L O_2. Kellys Bridge (RCW7), Allards Bridge (RCW9), Island Bridge (RCW12) and West of Ballydrum (RCW14) all recorded a BOD of 5.0 mg/L O_2 and exceeded the acceptable limits for this determinand. The results from physico-chemical analysis of the sample taken at Kildallon Bridge (RCW5) exhibited a raised TON (2.9 mg/l N) and Nitrate (2.89 mg/l N), but did not go above the threshold limits. Total coliforms (RCW5, RCW7, RCW9 and RCW12) were also high, but the elevated Ammonia levels observed on the Royal Canal West in Q2 were not repeated in Q3, with values returning to normal.

Physico-chemical potential in Q3 for both WFD monitoring sites on the Shannon-Erne Waterway was Moderate, with both SE40 and SE42 exceeding the acceptable limits for BOD at 4 and 5mg/l O_2, respectively. The readings for Total P were elevated at both sites (0.05 mg/L P) but did not breach the classification standards. On the day of sampling the water appeared to be cloudy and Total coliform

count at Leitrim village was high. It is clear that deleterious matter from the village and/or marina is continuing to be discharged into the waterway in the vicinity of this sampling site and to compromise water quality here.



Plate 3.3: The Shannon Erne in Leitrim village (SE42) where an oily slick was observed on the water surface at the time of sampling on the 28th of August 2025.

3.2. *Indicative Ecological Potential of Canal Sites and Artificial Water Bodies*

Breaches of determinand threshold limits were recorded at thirteen of the 43 canal and Shannon-Erne Waterway sites examined when readings for Q1 to Q3 2025 were assessed, resulting in each being assigned Moderate rather than Good indicative eco-potential (Table 3.1 and Figure 4.1). On the combined assessment all thirteen sites recorded breaches for just a single determinand, with BOD being responsible at all of the sites (GCW18, GCW20, GCW24, RCE4, RCE9, RCE12, RCE14, RCE19, RCE22, RCW9, RCW12, SE40 and SE42).

Ten of the 15 AWBs were assigned Good indicative eco-potential when results from physico-chemical analyses from Q1 to Q3 2025 were combined (Table 3.2). All five of the AWBs that breached threshold limits were for BOD (Table 3.2). The increase in Moderate AWBs from two in Q1 to five in Q3 is as a direct result of the high number of BOD threshold breaches recorded in the Royal canal.

Table 3.1: Classification of the 43 canal sites in the 15 Artificial Water Bodies (AWBs), and the Grand Canal Basin, based on results for the six physico-chemical determinands from Q1 to Q3 combined in 2025.

AWB	Site Code	Year	Total P (mg/L P)	SRP (mg/L P)	TON (mg/L N)	*E. coli* (Count/100ml)	B.O.D. (mg/L O2)	Ammonia (mg/L N)	Indicative Physico-chemical Potential
GCE_09	GCE4	2025	0.023	0.010	1.233	168.667	1.333	0.030	Good
	GCE6	2025	0.020	0.010	1.167	14.333	1.000	0.027	Good
	GCE8	2025	0.023	0.010	1.000	173.333	1.333	0.030	Good
	GCE10	2025	0.013	0.010	1.000	23.333	1.667	0.033	Good
	GCE12	2025	0.013	0.010	1.000	323.000	1.667	0.023	Good
	GCE14	2025	0.020	0.010	1.000	99.000	2.000	0.033	Good
GCNL_09	NL1	2025	0.017	0.010	2.533	164.333	1.000	0.020	Good
GCMF_14	MF1	2025	0.010	0.010	1.867	49.333	1.333	0.030	Good
GCBL_14	BL2	2025	0.013	0.010	1.033	18.333	2.333	0.023	Good
	BL6	2025	0.013	0.010	1.000	28.333	1.667	0.020	Good
	BL10	2025	0.013	0.010	2.733	48.000	2.000	0.020	Good
	BL15	2025	0.017	0.010	1.367	42.667	1.333	0.027	Good
GC_14E	GCE1	2025	0.013	0.010	1.000	53.333	1.333	0.060	Good
	GCW1	2025	0.017	0.010	1.200	50.667	1.333	0.033	Good
GC_14W	GCW8	2025	0.013	0.010	0.833	44.000	1.000	0.027	Good
	GCW12	2025	0.043	0.010	0.833	79.333	1.333	0.040	Good
GC_07	GCW4	2025	0.013	0.010	0.833	125.000	2.000	0.033	Good
	GCW6	2025	0.010	0.010	0.833	104.333	2.000	0.030	Good
GC_25A	GCW16	2025	0.020	0.010	0.833	82.000	2.333	0.030	Good
	GCW18	2025	0.017	0.010	0.833	118.333	3.667	0.030	Moderate
	GCW20	2025	0.013	0.010	1.333	3.667	3.667	0.033	Moderate
	GCW22	2025	0.010	0.010	0.847	3.333	1.000	0.030	Good
	GCW24	2025	0.017	0.010	0.833	3.667	2.667	0.023	Moderate
	GCW27	2025	0.013	0.010	0.833	6.333	1.667	0.027	Good
GCB*	GCB4	2025	0.040	0.010	1.000	77.667	2.000	0.057	Good
	GCB7	2025	0.043	0.010	1.000	85.000	1.333	0.063	Good
RC_07	RCE4	2025	0.020	0.010	0.833	19.000	2.667	0.033	Moderate
	RCE6	2025	0.020	0.010	1.093	169.000	1.667	0.037	Good
	RCE8	2025	0.023	0.010	0.833	135.667	1.667	0.040	Good
	RCE9	2025	0.020	0.010	1.000	13.000	4.333	0.043	Moderate
	RCE12	2025	0.033	0.010	1.000	9.000	5.000	0.030	Moderate
RC_09	RCE14	2025	0.020	0.010	1.000	44.667	2.667	0.033	Moderate
	RCE16	2025	0.013	0.010	1.000	6.333	1.667	0.037	Good
	RCE19	2025	0.020	0.010	1.000	138.333	3.333	0.020	Moderate
	RCE22	2025	0.023	0.010	1.000	53.000	2.667	0.040	Moderate
	RCE25	2025	0.017	0.010	1.000	169.333	2.333	0.030	Good
RC_25A	RCW1	2025	0.020	0.010	0.833	18.333	1.667	0.043	Good
	RCW3	2025	0.020	0.010	0.833	4.667	1.667	0.070	Good
RC_26F	RCW5	2025	0.017	0.010	1.467	42.000	1.667	0.040	Good
	RCW7	2025	0.013	0.010	0.833	6.333	2.333	0.033	Good
	RCW9	2025	0.020	0.010	0.933	4.000	2.667	0.037	Moderate
RC_26E	RCW12	2025	0.010	0.010	0.933	25.333	3.000	0.060	Moderate
RC_26C	RCW14	2025	0.013	0.010	0.833	6.000	2.333	0.057	Good
SE_26A	SE40	2025	0.053	0.010	0.833	49.000	3.333	0.080	Moderate
	SE42	2025	0.050	0.010	0.833	29.333	3.333	0.047	Moderate

* The Grand Canal Basin is not a designated AWB.

Table 3.2: Indicative ecological potential for the 15 Artificial Water Bodies (AWBs), and the Grand Canal Basin, based on results for the six physico-chemical determinands from Q1 to Q3 combined in 2025.

AWB	Year	Total P (mg/L P)	SRP (mg/L P)	TON (mg/L N)	*E. coli* (Count/100ml)	B.O.D. (mg/L O2)	Ammonia (mg/L N)	Indicative Physico-chemical Potential
GCE_09	2025	0.019	0.010	1.067	133.611	1.500	0.029	Good
GCNL_09	2025	0.017	0.010	2.533	164.333	1.000	0.020	Good
GCMF_14	2025	0.010	0.010	1.867	49.333	1.333	0.030	Good
GCBL_14	2025	0.014	0.010	1.533	34.333	1.833	0.023	Good
GC_14E	2025	0.015	0.010	1.100	52.000	1.333	0.047	Good
GC_14W	2025	0.028	0.010	0.833	61.667	1.167	0.033	Good
GC_07	2025	0.012	0.010	0.833	114.667	2.000	0.032	Good
GC_25A	2025	0.015	0.010	0.919	36.222	2.500	0.029	Moderate
GCB*	2025	0.042	0.010	1.000	81.333	1.667	0.060	Good
RC_07	2025	0.023	0.010	0.952	69.133	3.067	0.037	Moderate
RC_09	2025	0.019	0.010	1.000	82.333	2.533	0.032	Moderate
RC_25A	2025	0.020	0.010	0.833	11.500	1.667	0.057	Good
RC_26F	2025	0.017	0.010	1.078	17.444	2.222	0.037	Good
RC_26E	2025	0.010	0.010	0.933	25.333	3.000	0.060	Moderate
RC_26C	2025	0.013	0.010	0.833	6.000	2.333	0.057	Good
SE_26A	2025	0.052	0.010	0.833	39.167	3.333	0.063	Moderate

*** The Grand Canal Basin is not a designated AWB.**

3.3. *Physico-chemistry and Indicative Ecological Potential of Canal Feeders/Drains*

Four of the five feeders/drains sampled in Q3 2025 were assigned Moderate indicative eco-potential following physico-chemical analysis and included the Monread drain (GCE5.1), Ballymullen feeder (GCW12.1), Ballylennon feeder (GCW13.1) and Athy drain (BL15.1) (see Appendix II). Kilcock drain (RCE16.1) was the only site allocated Good status in Q3 2025. Total coliform results were high for all five feeders/drains during the Q3 sampling.

When sampled on 20th of August 2025, the canal at the Monread drain was turbid as a result of ongoing weed cutting in the area. The *E. coli* count was high and in breach of the threshold limit for the second quarter in succession. The values recorded for TON (0.06 mg/l N) and Nitrate (2.08 mg/l N) were elevated but did not exceed the classification standards.

On 28th of May 2025 there was a very low flow from both the Ballylennon and Ballymullen feeders, with the sites exceeding the limits for one and four of the six determinands, respectively. The Ballylennon feeder breached the threshold for BOD (5.0 mg/L O_2), while the Ballymullen feeder breached the threshold for Total P (0.23 mg/L P), SRP (0.04 mg/L P), BOD (5.0 mg/L O_2) and Ammonia (0.19 mg/L N).

There was a strong flow of clear water from the Athy drain (BL15.1) when it was sampled in Q3 2025. The *E. coli* (2,420) and Total P (0.90 mg/L P) levels recorded breached the parameter limits, while TON (0.09 mg/l N) and Nitrate (1.88 mg/l N) were also high. It is clear that deleterious matter continues to be discharged at this point and will impact on the receiving Barrow Canal and the Barrow River. This is the second time that this site has been downgraded in 2025 and Kildare County Council should be informed of these results to aid in the decision making for restorative action at this site.

There was little to no flow of water from the Kilcock drain (RCE16.1) when sampled in Q3 2025. With the exception of elevations in bactreriological counts (Total coliforms (1,120) and *E. coli* (504)), the results for all of the parameters were low and well within acceptable limits (see Appendix II). This gave the site its first Good physico-chemical potential rating of 2025.

Table 3.3. Indicative ecological potential for the five canal feeders/drains based on results for the six physico-chemical determinands from Q1 to Q3 combined in 2025.

AWB	Site Code	Year	Total P (mg/L P)	SRP (mg/L P)	TON (mg/L N)	*E. coli* (Count/100ml)	B.O.D. (mg/L O2)	Ammonia (mg/L N)	Indicative Physico-chemical Potential
Monread	GCE5.1	2025	0.047	0.010	1.733	**1,278**	1.000	0.040	**Moderate**
Ballymullen	GCW12.1	2025	**0.113**	0.020	0.867	413	2.333	0.080	**Moderate**
Ballylennon	GCW13.1	2025	0.047	0.010	0.833	836	**4.667**	0.090	**Moderate**
Athy	BL15.1	2025	**0.063**	0.010	1.867	**1,014**	2.000	0.067	**Moderate**
Kilcock Harbour	RCE16.1	2025	0.033	0.010	1.133	**1,179**	1.333	0.097	**Moderate**

When physico-chemical results from Q1 to Q3 2025 were combined for the feeder/drain systems, no sites were assigned Good indicative eco-potential (Table 3.3). The Monread drain was assigned a combined eco-potential of Moderate for 2025 for persistent breaches in *E. coli*. The Ballymullen feeder is of particular concern having failed on four of the 6 determinands and although the site had been assigned Good status in Q1 and Q2, the impact of these breaches in Q3 resulted in its downgrading overall for 2025, to date. Consistently high BOD values in all three quarters of 2025 are responsible for the downgrade of the Ballylennon feeder. The Athy drain was assigned a Moderate eco-potential for breaches in Total P (Q1 and Q3) and *E. coli* (Q3). The high *E. coli* rating in Q2 meant Kilcock Harbour drain was also downgraded to Moderate status overall despite being assigned a Good rating for the Q3 sampling occasion.

3.4. *Grand Canal Basin*

A Dublin City Council urban wastewater outfall is located in the inner Grand Canal Basin (see Figure 2.2). This outfall is used to carry storm water overflow but, on occasions, sewage contamination is discharged to the Basin *via* this outfall. Results from physico-chemical analysis of water samples taken from the inner and outer basins (GCB4 and GCB7, respectively) in Q3 2021 revealed elevated Total P, Ammonia and BOD values. However, the only breach in acceptable threshold limits was recorded for

Ammonia (0.12 mg/L N) at GCB7. Combining the data for the two sites in Grand Canal Basin for Q1, Q2 and Q3, this artificial waterbody was assigned Good indicative eco-potential (Table 3.2).

Table 3.4. Number of sites that breached acceptable limits for *E. coli* (>900 counts per 100ml) and *Enterococci* (>250 counts per 100ml) in water samples taken by Waterways Ireland and Dublin City Council with third party testing in Level 1 of the Grand Canal (1 site) and in the inner (2 sites) and outer (2 or 3 sites) Grand Canal Basins between January and July 2025.

Date	Canal *E. coli*	Canal Enterococci	Inner *E. coli*	Inner Enterococci	Outer *E. coli*	Outer Enterococci
14/01/2025	0	0	0	0	0	0
28/01/2025	0	1	2	2	2	2
11/02/2025	0	0	2	2	0	0
25/02/2025	0	0	2	2	0	0
11/03/2025	0	0	0	0	0	0
25/03/2025	0	0	0	0	0	0
07/04/2025	0	0	0	0	0	0
08/04/2025	0	1	0	0	0	0
14/04/2025	0	0	0	0	0	0
16/04/2025	0	0	2	1	0	0
22/04/2025	0	0	0	0	0	0
23/04/2025	0	0	0	0	0	0
28/04/2025	0	0	0	0	0	0
30/04/2025	0	0	0	0	0	0
06/05/2025	0	0	0	0	0	0
07/05/2025	0	0	0	0	0	0
12/05/2025	0	0	0	0	0	0
14/05/2025	0	0	0	0	0	0
19/05/2025	0	0	0	0	0	0
26/05/2025	0	0	0	0	0	0
28/05/2025	0	0	0	0	1	0
03/06/2025	0	0	2	2	0	1
04/06/2025	0	0	0	0	0	0
09/06/2025	0	0	0	0	0	0
11/06/2025	1	0	0	0	0	0
16/06/2025	0	0	2	2	0	0
17/06/2025	0	0	0	0	0	0
23/06/2025	0	0	0	0	0	0
25/06/2025	0	0	0	0	0	0
30/06/2025	0	0	0	0	0	0
01/07/2025	0	0	0	0	0	0
07/07/2025	0	0	0	0	0	0
09/07/2024	0	0	0	0	0	0
14/07/2024	0	0	0	0	0	0
15/07/2025	0	0	0	0	0	0
21/07/2025	0	0	2	2	0	0
23/07/2025	0	0	2	2	3	1
28/07/2025	0	0	0	0	0	0
29/07/2025	0	0	0	0	0	0
06/08/2025	0	0	0	0	0	0
11/08/2025	0	0	0	0	0	0
12/08/2025	0	0	0	0	0	0
18/08/2025	0	0	0	0	0	0
20/08/2025	0	0	0	0	0	0
25/08/2025	0	0	0	0	0	0
26/08/2025	0	1	0	0	0	0

Forty-six sets of samples for bacteriological analysis (*E. coli* and *Enterococci*) were taken by WI/DCC in and immediately upstream of the Grand Canal Basin between the January and August 2025 (Table 3.4). DCC sampling took places at sites 4, 5, 6, 7 and 8 with one site on the Grand Canal, two in the inner basin and two in the outer basin. WI sampling took place at 3, 5, 6, 6B, 7 and 8 (Figure 2.2) with one site on the Grand Canal, two in the inner basin and three in the outer basin.

Across all sampling by DCC and WI, a total of 45 breach events involving *E. coli* and *Enterococci* were reported from the water samples taken between January and August 2025 (Table 3.4). Of the 45, seventeen of these breaches occurred in samples tested between the 28th of January to the 25th of February. A further 11 of the breaches were recorded on samples taken between the 28th of May and the 16th of June. Thirteen subsequent breaches were recorded on the 21st and 23rd of July 2025.

A total of four breaches were recorded in the Grand Canal before it entered the basin, one for *E. coli* and three for *Enterococci* counts. In the inner basin, thirty one breaches were reported, with sixteen for *E. coli* and fifteen for *Enterococci*. The highest bacteriological counts detected were from the 21st of July 2025, with >24196 *E,coli* per 100ml and on the 23rd of July 2025 with 12,000 *Enterococci* per 100ml. It is notable that following a relatively dry July there was 48.1mm of rainfall recorded at Phoenix Park on the 21st of July 2025. In the outer basin, there were ten breaches reported, with six for *E. coli* and four for *Enterococci*. Five of the ten breaches were recorded in January and June when both sites in the inner basin failed on counts for both parameters (Table 3.4).

4. Issues for Waterways Ireland Resulting from Sampling in Q3 2025

A total of 11 sites of the 43 canal and Shannon-Erne Waterway sites were downgraded from Good to Moderate indicative physico-chemical status in Q3 2025. All sites breached on a single determinand and the breaches in threshold limits were attributed to three determinands, BOD, TON and Total P. Of the sites that were downgraded due to excessive readings, nine of the 11 resulted from BOD alone, with one each for TON and Total P.

Generally, water quality in the Royal canal has seen a spike in undesirable BOD readings in Q2 and Q3 2025. High BOD can be associated with an increased organic load, low water levels and warmer water temperatures increasing microbial activity and subsequent oxygen consumption. Significant surface algal growth was observed at several sites along the canals including Louisa Bridge in Q3 2025 (Plate 3.2). While this may be associated with the warm weather seen in late spring and summer 2025, there may also be issues relating to the input of organic nutrients. If this trend continues into Q4 when water temperatures begin to fall there may be a need to investigate the possibility of significant sources of organic matter along the waterway. While nine sites were downgraded on BOD, this was a reduction from the total of 15 seen in Q2.

During the Q3 sampling in August 2025, elevated levels of Total coliforms were recorded at several sites, while breaches in *E. coli* levels were recorded at two of the Feeder sites (GCE5.1 and BL15.1). Since then, throughout June and August, elevated Total coliforms and *E. coli* results have been a significant feature of the internal water quality sampling regimes of Waterways Ireland. Several excessively high results have been recorded at a wide range of sites throughout the canal network including some those covered in this report such as Athy, Croke Park, Grand canal basin, Hazelhatch, Kilcock, Leitrim village, Lock 12 and Nass Harbour. This has resulted in Waterways Ireland staff and contractors as well as recreational users being advised to make alternative arrangements for any activities planned at these locations. The high readings in some cases may be coming as a result of direct discharges or from runoff following generally dry periods seen in early May, mid-June and July. In advance of the Q4 water quality sampling, Waterways Ireland should continue with their in-house monitoring of areas that they have identified as problematic or recreational sites for sustained breaches in acceptable threshold limits.

Kilcock harbour drain was the only drain/feeder assigned Good indicative eco-potential on this sampling occasion. All five drains/feeders were assigned Moderate status for the period from Q1 to Q3 in 2025. The Ballymullen feeder was downgraded on four of the six determinands in Q3 indicating a significant issue at this site. The extremely high record for Total P in the Ballymullen feeder was also reflected in the breach of the threshold limits for the same determinand recorded at the West of Daingean site (GCW12) in Q3. Waterways Ireland and Offaly County Council staff held an onsite meeting at the

catchments for both the Ballylennon and Ballymullen feeders on the 25th of September (*circa*. one month after the Q3 sample collection). While there were no obvious point sources for the water quality issues, it was ascertained that the catchments for both feeders are relatively small with a limited area where issues may arise. The catchment sustains low intensity grazing and silage ground that may be subjected to periodic influxes of organic fertiliser spreading. Both Waterways Ireland and Offaly County Council have renewed appeals with local farmers to manage their slurry spreading activities and to make improvements to fencing and drinking water facilities for livestock.

The presence of a light oily layer was again noted in some areas close to Leitrim marina (SE42) on the Shannon-Erne Waterway. While the layer was less significant than in recent visits including the site investigation on the 22nd of May and Q2 sampling, its presence and potential deleterious discharges are still a cause for concern. The information regarding the persistent presence of possible hydrocarbons on the surface and the downgrading of the site status to Moderate in Q3 due to elevated BOD values should be communicated to Leitrim County Council for further investigation.

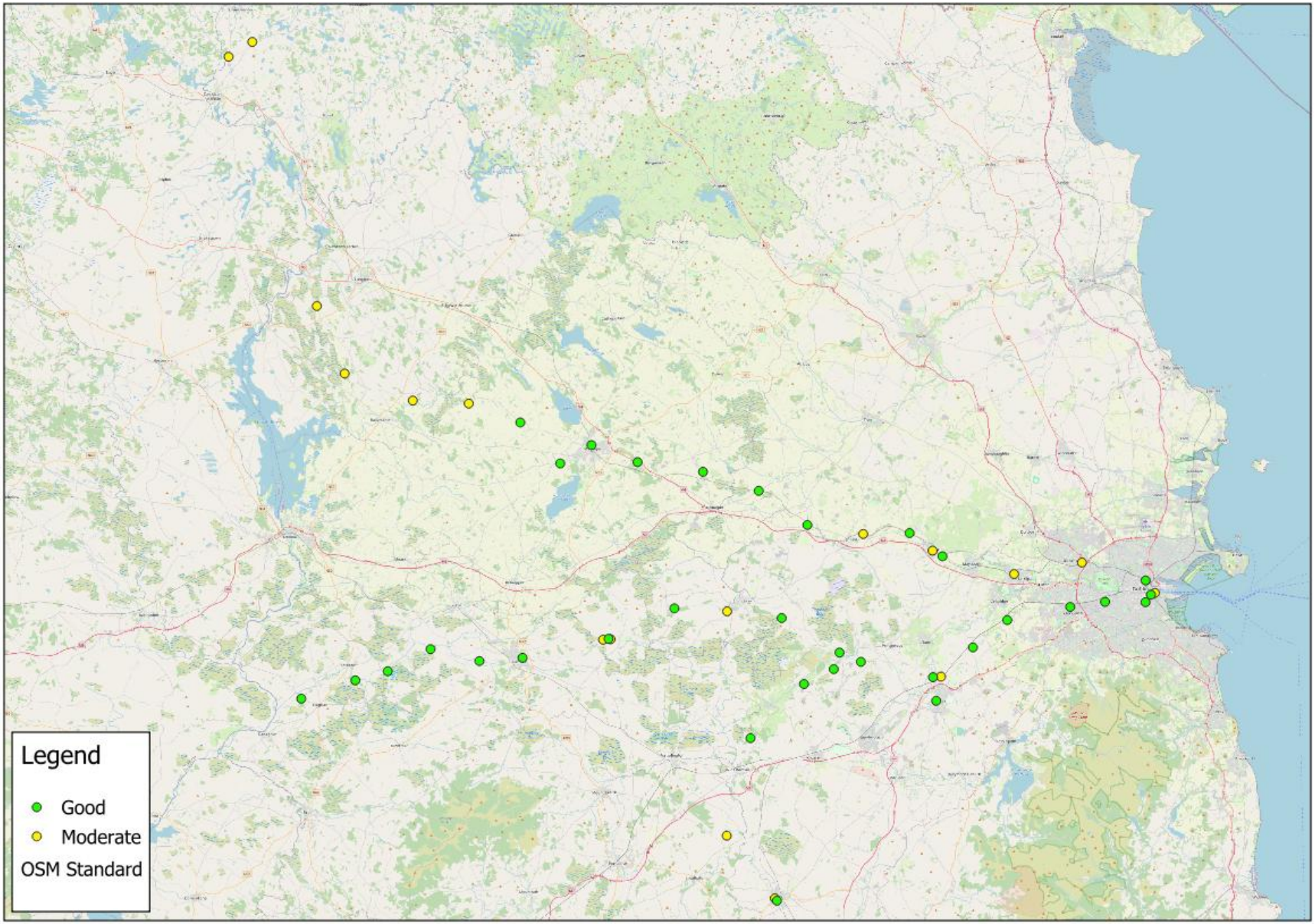


Figure 4.1. Indicative ecological potential based on physico-chemical data for the 50 canal, Shannon-Erne Waterway and feeder/drain sites monitored in Q3 2025 (Green = Good, Yellow = Moderate).

Appendix I. Physico-chemical results and indicative ecological potential for canal (41), Shannon-Erne Waterway (2) and Grand Canal Basin (2) sites sampled in Q3 2025.

	Canal	Site Code	AWB	Quarter	Date	Total P (mg/L P)	MRP (mg/L P)	SRP (mg/L P)	TON (mg/L N)	Temperature	Conductivity (µS)	pH	DO %	DO (mg/L O_2)	Total Coliform (Count/100ml)	*E.coli* (Count/100ml)	B.O.D. (mg/L O2)	Ammonia (mg/L N)	Nitrite (mg/L N)	Nitrate (mg/L N)	Alkalinity (mg/L $CaCO_3$)	Indicative Physico-chemical Potential
GCE1_Q3	Grand Canal	GCE1	GC_14E	Q3	20/08/2025	0.010	0.010	0.010	1.000	20.4	373	8.11	98.6	9.06	613	52	1.00	0.040	0.030	1.000	115.00	Good
GCE4_Q3	Grand Canal	GCE4	GC_14E	Q3	20/08/2025	0.020	0.010	0.010	1.000	18.8	416	8.43	92.7	9.93	2,420	388	1.00	0.040	0.030	1.000	150.10	Good
GCE6_Q3	Grand Canal	GCE6	GC_14E	Q3	20/08/2025	0.020	0.010	0.010	1.000	20.3	409	8.23	94.3	9.21	248	41	1.00	0.040	0.030	1.000	129.20	Good
GCE8_Q3	Grand Canal	GCE8	GC_14E	Q3	20/08/2025	0.030	0.010	0.010	1.000	19.7	393	7.71	88.2	8.08	1,986	318	1.00	0.030	0.030	1.000	127.70	Good
GCE10_Q3	Grand Canal	GCE10	GC_14E	Q3	20/08/2025	0.010	0.010	0.010	1.000	21.2	397	7.81	83.5	6.84	387	63	1.00	0.050	0.030	1.000	167.00	Good
GCE12_Q3	Grand Canal	GCE12	GC_14E	Q3	20/08/2025	0.010	0.010	0.010	1.000	20.5	390	7.95	68.2	8.43	2,420	880	1.00	0.030	0.030	1.000	131.60	Good
GCE14_Q3	Grand Canal	GCE14	GC_14E	Q3	20/08/2025	0.020	0.010	0.010	1.000	20.6	383	8.01	79.1	8.34	488	285	1.00	0.040	0.030	1.000	163.10	Good
GCW1_Q3	Grand Canal	GCW1	GC_14E	Q3	20/08/2025	0.020	0.010	0.010	1.000	20.2	381	8.38	80.2	9.56	579	148	1.00	0.040	0.030	1.000	128.60	Good
GCW4_Q3	Grand Canal	GCW4	GC_07	Q3	28/08/2025	0.010	0.010	0.010	1.000	19.2	339	8.39	103.2	10.10	1,860	30	2.00	0.030	0.030	1.000	167.60	Good
GCW6_Q3	Grand Canal	GCW6	GC_07	Q3	28/08/2025	0.010	0.010	0.010	1.000	19.5	364	8.23	93.4	9.86	1,529	288	2.00	0.030	0.030	1.000	155.80	Good
GCW8_Q3	Grand Canal	GCW8	GC_14W	Q3	28/08/2025	0.010	0.010	0.010	1.000	19.1	332	7.83	91.6	9.32	233	10	1.00	0.020	0.030	1.000	151.80	Good
GCW12_Q3	Grand Canal	GCW12	GC_14W	Q3	28/08/2025	0.070	0.010	0.010	1.000	19.4	353	8.03	85.3	9.12	298	10	2.00	0.040	0.030	1.000	120.70	Moderate
GCW16_Q3	Grand Canal	GCW16	GC_25A	Q3	28/08/2025	0.030	0.010	0.010	1.000	18.4	331	8.34	89.6	8.94	2,420	238	2.00	0.030	0.030	1.000	155.00	Good
GCW18_Q3	Grand Canal	GCW18	GC_25A	Q3	28/08/2025	0.020	0.010	0.010	1.000	18.7	386	8.46	102.4	9.75	389	10	2.00	0.020	0.030	1.000	141.10	Good
GCW20_Q3	Grand Canal	GCW20	GC_25A	Q3	28/08/2025	0.010	0.010	0.010	2.500	18.1	369	8.41	113.4	10.31	738	10	2.00	0.030	0.030	2.490	186.70	Good
GCW22_Q3	Grand Canal	GCW22	GC_25A	Q3	28/08/2025	0.010	0.010	0.010	1.000	18.9	326	8.37	99.6	9.46	2,420	10	1.00	0.030	0.030	1.000	127.00	Good
GCW24_Q3	Grand Canal	GCW24	GC_25A	Q3	28/08/2025	0.020	0.010	0.010	1.000	18.5	362	8.12	95.7	9.24	450	10	2.00	0.020	0.030	1.000	141.50	Good
GCW27_Q3	Grand Canal	GCW27	GC_25A	Q3	28/08/2025	0.010	0.010	0.010	1.000	18.2	341	8.42	108.6	9.63	784	10	2.00	0.020	0.030	1.000	98.80	Good
NL1_Q3	Grand Canal	NL1	GCNL_09	Q3	20/08/2025	0.010	0.010	0.010	1.100	18.1	373	8.13	76.1	10.13	2,420	455	1.00	0.020	0.030	1.090	159.40	Good
MF1_Q3	Grand Canal	MF1	GCMF_14	Q3	20/08/2025	0.010	0.010	0.010	1.800	19.6	521	8.24	89.3	10.29	727	146	1.00	0.040	0.030	1.790	226.70	Good
BL2_Q3	Grand Canal	BL2	GCBL_14	Q3	20/08/2025	0.010	0.010	0.010	1.000	21.2	474	8.41	101.4	10.17	2,420	52	2.00	0.020	0.030	1.000	162.40	Good
BL6_Q3	Grand Canal	BL6	GCBL_14	Q3	20/08/2025	0.010	0.010	0.010	1.000	20.8	439	8.26	94.1	9.71	649	84	1.00	0.020	0.030	1.000	128.50	Good
BL10_Q3	Grand Canal	BL10	GCBL_14	Q3	20/08/2025	0.010	0.010	0.010	4.300	18.4	427	8.38	96.2	10.30	1,414	144	1.00	0.020	0.030	4.290	205.90	Moderate
BL15_Q3	Grand Canal	BL15	GCBL_14	Q3	20/08/2025	0.010	0.010	0.010	1.000	19.8	389	7.99	89.1	9.43	1,300	110	1.00	0.030	0.030	1.000	105.10	Good
GCB4_Q3	Grand Canal	GCB4	GCB*	Q3	20/08/2025	0.040	0.010	0.010	1.000	20.8	378	8.20	75.3	7.89	411	75	2.00	0.070	0.030	1.000	142.80	Good
GCB7_Q3	Grand Canal	GCB7	GCB*	Q3	20/08/2025	0.060	0.010	0.010	1.000	21.1	379	8.18	72.4	7.29	108	86	2.00	0.120	0.030	1.000	140.30	Moderate
RCE4_Q3	Royal Canal	RCE4	RC_07	Q3	28/08/2025	0.020	0.010	0.010	1.000	18.8	342	8.01	95.3	8.81	581	20	2.00	0.020	0.030	1.000	147.70	Good
RCE6_Q3	Royal Canal	RCE6	RC_07	Q3	28/08/2025	0.020	0.010	0.010	1.400	18.2	337	8.21	102.1	9.76	2,046	216	1.00	0.020	0.030	1.390	184.20	Good
RCE8_Q3	Royal Canal	RCE8	RC_07	Q3	28/08/2025	0.040	0.010	0.010	1.000	18.6	364	8.25	94.7	9.45	404	10	2.00	0.020	0.030	1.000	140.70	Good
RCE9_Q3	Royal Canal	RCE9	RC_07	Q3	20/08/2025	0.020	0.010	0.010	1.000	20.9	418	8.05	86.3	8.36	326	10	2.00	0.090	0.030	1.000	263.70	Good
RCE12_Q3	Royal Canal	RCE12	RC_07	Q3	20/08/2025	0.050	0.010	0.010	1.000	19.4	400	7.86	79.3	7.96	2,420	20	4.00	0.050	0.030	1.000	192.70	Moderate
RCE14_Q3	Royal Canal	RCE14	RC_09	Q3	20/08/2025	0.020	0.010	0.010	1.000	20.6	433	7.91	85.2	7.43	1,986	120	2.00	0.020	0.030	1.000	219.50	Good
RCE16_Q3	Royal Canal	RCE16	RC_09	Q3	20/08/2025	0.010	0.010	0.010	1.000	20.2	414	8.06	65.8	7.47	1,553	10	2.00	0.060	0.030	1.000	232.90	Good
RCE19_Q3	Royal Canal	RCE19	RC_09	Q3	20/08/2025	0.020	0.010	0.010	1.000	20.3	402	7.78	77.2	6.97	2,420	404	4.00	0.020	0.030	1.000	177.90	Moderate
RCE22_Q3	Royal Canal	RCE22	RC_09	Q3	20/08/2025	0.020	0.010	0.010	1.000	19.8	380	8.28	95.3	7.72	179	30	4.00	0.060	0.030	1.000	177.00	Moderate
RCE25_Q3	Royal Canal	RCE25	RC_09	Q3	20/08/2025	0.010	0.010	0.010	1.000	20.2	387	8.15	83.5	7.04	770	496	1.00	0.030	0.030	1.000	127.80	Good
RCW1_Q3	Royal Canal	RCW1	RC_25A	Q3	28/08/2025	0.030	0.010	0.010	1.000	18.2	356	8.08	103.5	9.86	521	10	2.00	0.030	0.030	1.000	146.00	Good
RCW3_Q3	Royal Canal	RCW3	RC_25A	Q3	28/08/2025	0.020	0.010	0.010	1.000	18.1	357	8.24	109.6	10.10	350	10	2.00	0.030	0.030	1.000	110.70	Good
RCW5_Q3	Royal Canal	RCW5	RC_26F	Q3	28/08/2025	0.020	0.010	0.010	2.900	18.6	356	8.31	97.2	9.42	1,333	120	2.00	0.020	0.030	2.890	106.40	Good
RCW7_Q3	Royal Canal	RCW7	RC_26F	Q3	28/08/2025	0.020	0.010	0.010	1.000	18.3	343	8.06	83.6	8.91	1,671	10	5.00	0.020	0.030	1.000	148.50	Moderate
RCW9_Q3	Royal Canal	RCW9	RC_26F	Q3	28/08/2025	0.030	0.010	0.010	1.300	18.0	326	8.18	79.4	9.32	2,014	10	5.00	0.020	0.030	1.300	114.70	Moderate
RCW12_Q3	Royal Canal	RCW12	RC_26E	Q3	28/08/2025	0.010	0.010	0.010	1.300	18.4	311	8.12	75.1	9.20	2,420	52	5.00	0.020	0.030	1.300	116.20	Moderate
RCW14_Q3	Royal Canal	RCW14	RC_26C	Q3	28/08/2025	0.020	0.010	0.010	1.000	18.6	312	8.01	81.2	8.78	435	10	5.00	0.020	0.030	1.000	141.20	Moderate
SE40_Q3	Shannon Erne	SE40	SE_26A	Q3	28/08/2025	0.050	0.010	0.010	1.000	18.4	237	7.35	89.0	9.48	173	10	4.00	0.080	0.030	1.000	72.50	Moderate
SE42_Q3	Shannon Erne	SE42	SE_26A	Q3	28/08/2025	0.050	0.010	0.010	1.000	18.2	225	7.74	88.4	9.19	1,223	41	5.00	0.050	0.030	1.000	96.80	Moderate

Appendix II. Physico-chemical results and indicative ecological potential for canal feeder/drain sites sampled in Q3 2025.

Canal	Site	Location	AWB_Code	Quarter	Date	Total P (mg/L P)	MRP (mg/L P)	SRP (mg/L P)	TON (mg/L N)	Temperature (degree C)	Conductivity (µS)	pH	DO %	DO (mg/L O_2)	Total Coliform (Count/100ml)	*E.coli* (Count/100ml)	B.O.D. (mg/L O2)	Ammonia (mg/L N)	Nitrite (mg/L N)	Nitrate (mg/L N)	Alkalinity (mg/L $CaCO_3$)	Indicative Physico-chemical Potential
Grand Canal	GCE5.1	Monread Feeder	GC_09	Q3	20/08/2025	0.060	0.010	0.010	2.100	16.20	495	8.36	93.7	10.08	2,420	**2,420**	1.00	0.040	0.030	2.080	128.70	**Moderate**
Grand Canal	GCW12.1	Ballymullen Feeder	GC_14	Q3	28/08/2025	**0.230**	0.050	**0.040**	1.000	18.30	526	8.16	78.2	8.10	3,873	657	**5.00**	**0.190**	0.030	1.000	214.40	**Moderate**
Grand Canal	GCW13.1	Ballylennon Feeder	GC_14	Q3	28/08/2025	0.040	0.010	0.010	1.000	17.90	482	7.91	72.4	7.61	1,500	63	**5.00**	0.070	0.030	1.000	272.60	**Moderate**
Grand Canal Barrow Line	BL15.1	Athy Drain	GCBL_14	Q3	20/08/2025	**0.090**	0.010	0.010	1.900	18.20	426	8.40	90.2	8.92	2,420	**2,420**	1.00	0.070	0.030	1.880	119.70	**Moderate**
Royal Canal	RCE16.1	Kilcock Harbour Drain	RC_09	Q3	20/08/2025	0.020	0.010	0.010	1.000	19.60	492	8.65	84.3	9.65	1,120	504	1.00	0.050	0.030	1.000	189.90	**Good**



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Appendix VII

Water Framework Directive Compliance Report

Physico-Chemistry

Fourth Quarter 2025

Water Framework Directive Compliance Report

Physico-chemistry

Fourth Quarter 2025



December 2025

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Front Cover: A Swan at Clondalkin (GCE10) in October 2025.

1. Introduction

Water Framework Directive (WFD) surveillance monitoring of the Royal and Grand Canals and the canalised section of the Shannon-Erne Waterway for Q4 2025 was carried out on 23rd and 29th of October 2025.

A canal is identified as an Artificial Water Body (AWB) in the WFD and is defined as 'a body of water created by human activity'. In recognition of their navigational role, AWBs must achieve good ecological potential as opposed to good ecological status, the latter which applies to natural water bodies, such as rivers and lakes. Ecological potential is assessed using a combination of biological (native and invasive macroinvertebrate and macrophyte), physico-chemical and hydromorphological quality elements. For classification purposes, the ecological potential of a site or AWB can be Maximum, Good, Moderate, Poor or Bad. Where physico-chemistry alone is being assessed, as in this report, sites and AWBs can achieve either Good or Moderate potential only. In assigning ecological potential, the one-out-all-out rule applies, whereby the lowest value quality element determines the overall classification of the AWB. A system for classifying British and Irish canals based on macroinvertebrate, macrophyte, invasive species, physico-chemical and hydromorphological quality elements is used to assess the ecological potential of AWBs. In the current reporting period (Q4 2025), the canals are classified based on the physico-chemistry of the water during this period.

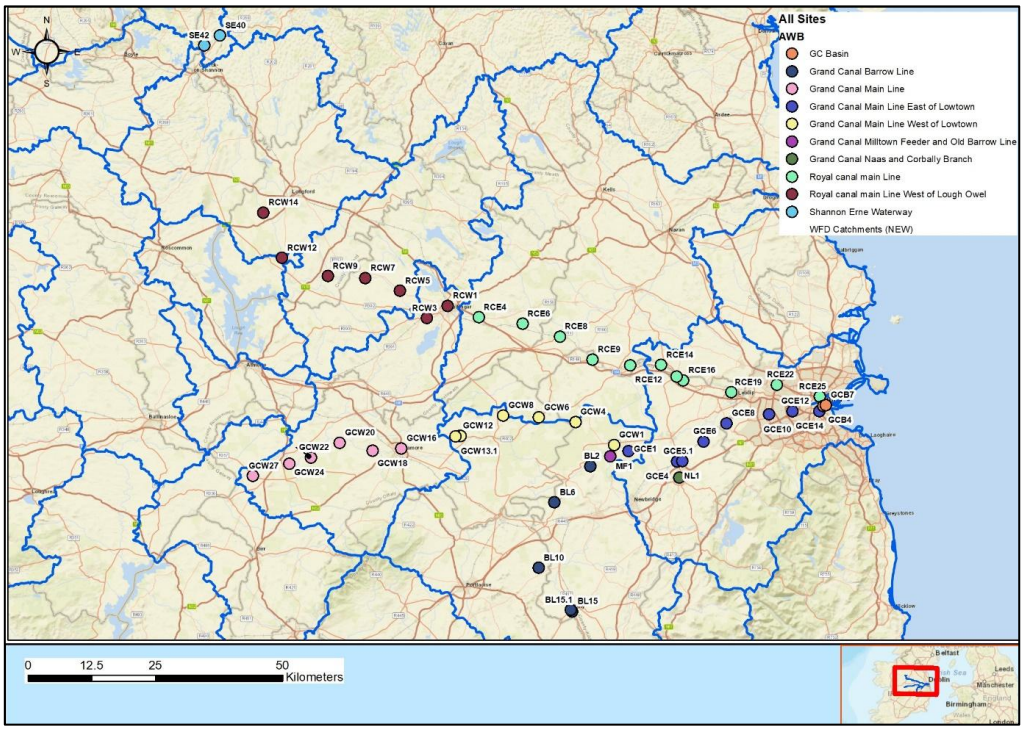


Figure 1.1: Artificial Water Bodies (AWBs), sites and monitored feeder streams on the Royal and Grand Canals, and the Shannon-Erne Waterway. The AWBs are grouped based on associated river catchments.

The canals are currently divided into 15 AWBs based on their locations within river catchments (Table 1.1). The Grand Canal supports eight AWBs (this does not include the Grand Canal Basin), the Royal Canal has six AWBs and there is just a single AWB on the Shannon-Erne Waterway. Four of the AWBs have only a single canal sampling site (Table 1.1), which can be potentially problematic when ecological potential for individual AWBs is being assigned. This reflects the fact that a breach in any biological or abiotic parameter can result in the AWB being changed from Good to Moderate.

For reporting purposes, a simple code has been assigned, whereby AWBs are labelled according to the river catchment in which they occur (Table 1.1).

Table 1.1: Artificial Water Bodies (AWBs) included in the WFD Monitoring Programme.

Artificial Water Body (AWB)	*Catchment No*	*New ID Code*	*New Report Code*	*Length (km)*	*No of Sites*
GRAND CANAL					
Grand Canal Main Line - Liffey and Dublin Bay	9	IE_09_AWB_GCMLE	GC_09	41.4	6
Grand Canal Main Line East - Barrow	14	IE_14_AWB_GCMLE	GC_14E	15.7	2
Grand Canal Main Line West - Barrow	14	IE_14_AWB_GCMLW	GC_14W	12.9	2
Grand Canal Main Line - Boyne	7	IE_07_AWB_GCMLW	GC_07	14.5	2
Grand Canal Main Line - Lower Shannon	25A	IE_25A_AWB_GCMLW	GC_25A	47.0	6
Grand Canal Naas Line - Liffey and Dublin Bay	9	IE_09_AWB_GCNL	GCNL_09	11.9	1
Grand Canal Milltown Feeder - Barrow	14	IE_14_AWB_GCMF	GCMF_14	10.5	1
Grand Canal Barrow Line - Barrow	14	IE_14_AWB_GCBL	GCBL_14	50.8	4
Grand Canal Basin - Liffey and Dublin Bay	9	IE_09_AWB_GCB	GCB		2
ROYAL CANAL					
Royal Canal Main Line - Boyne Catchment	7	IE_07_AWB_RCMLE	RC_07	42.6	5
Royal Canal Main Line - Liffey and Dublin Bay	9	IE_09_AWB_RCMLE	RC_09	39.4	5
Royal Canal Main Line - Lower Shannon	25A	IE_25A_AWB_RCMLW	RC_25A	13.3	2
Royal Canal Main Line - Upper Shannon	26F	IE_26F_AWB_RCMLW	RC_26F	33.8	3
Royal Canal Main Line - Upper Shannon	26E	IE_26E_AWB_RCMLW	RC_26E	3.7	1
Royal Canal Main Line - Upper Shannon	26C	IE_26C_AWB_RCMLW	RC_26C	14.2	1
SHANNON ERNE WATERWAY					
Shannon Erne Waterway - Upper Shannon	26A	IE_26A_AWB_SEW	SE_26A	25.5	2

During 2020 a second site (SE42) was included on the Shannon-Erne Waterway to better represent the water quality status of this Waterway and AWB (Table 1.1). This site is located adjacent to the marina in Leitrim village, close to where the Shannon-Erne Waterway discharges to the River Shannon (Figure 1.2).



Figure 1.2: Location of the two WFD monitoring sites (SE40 and 42) on the Shannon-Erne Waterway.



Plate 1.1: Grand Canal Basin in October 2025.

2. Materials and Methods

2.1. *Sampling locations*

Physico-chemical sampling is conducted on a quarterly basis at 50 monitoring sites – 41 on the Royal, Grand and Barrow Canals, two on the Grand Canal Basin, two on the Shannon-Erne Waterway, and five on selected canal feeder streams/drains (see Figures 1.1, 1.2 and 2.1). The canal feeders/drains have been a source of elevated nutrient and coliform inputs in the past. They include the Monread drain (GCE5.1) and Ballymullen (GCW12.1) and Ballylennon (GCW13.1) feeder streams on the Grand Canal, the Athy drain (BL15.1) on the Barrow Line, and the Kilcock Harbour drain (RCE16.1) on the Royal Canal. In addition to the quarterly water samples taken by INVAS at two sites in the Grand Canal Basin as part of the WFD Canals Surveillance Programme, Waterways Ireland (WI) and Dublin City Council (DCC) conduct regular water sampling for bacteriological (*E. coli* and *Enterococci*) analysis at up to 11 sites in the Basin (three in the Inner, eight in the Outer) and two in the adjacent Grand Canal (Figure 4). The sampling sites were 1st level of the Grand Canal (1), the inner basin (2 – sites 4 and 5 in Figure 2.2) and the outer basin (2 – sites 6 and 7 in Figure 2.2).

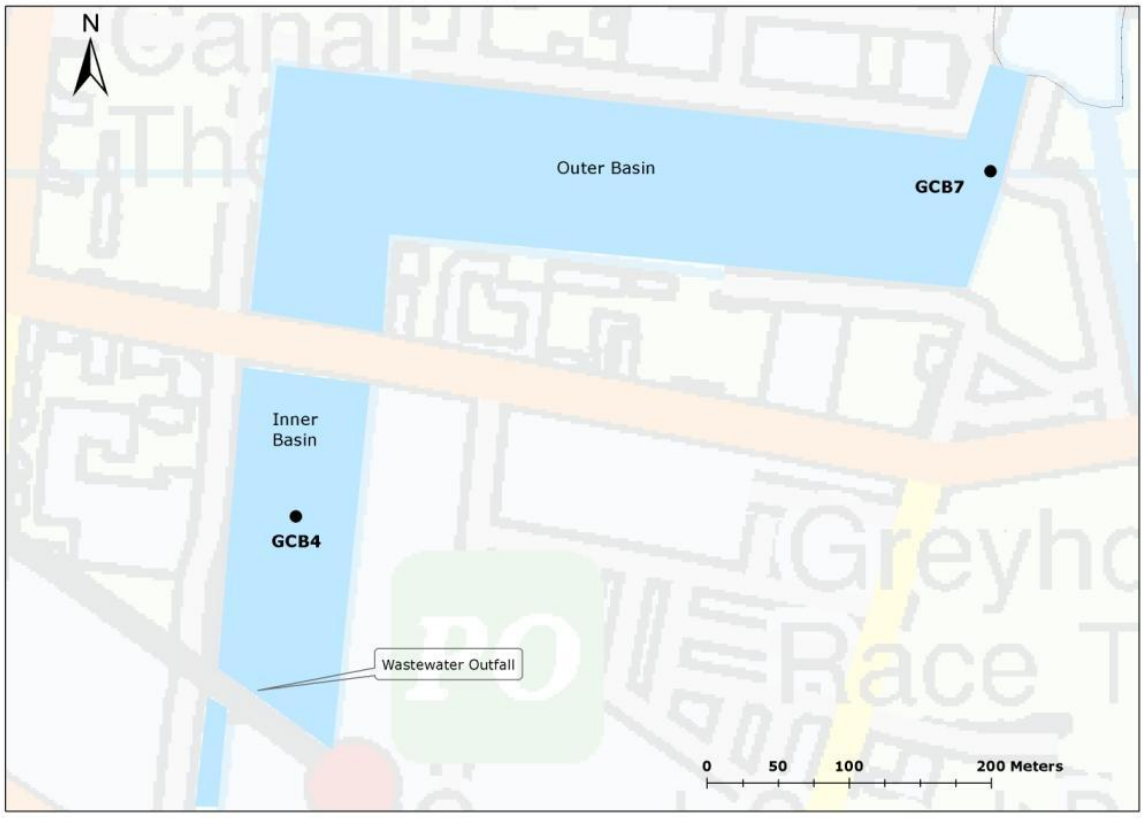


Figure 2.1: Grand Canal Basin (Dublin) showing the two monitoring sites (GCB4 and GCB7).

2.2. *Physico-Chemical Monitoring*

Water sampling involves the deployment of a YSI water logger at each site to measure temperature, conductivity, pH and dissolved oxygen (DO). Water samples are collected from canal sites and returned to the Independent Analytical Supplies (IAS) laboratory in Bagenalstown for analysis of a range of determinands (Table 2.1). A subset of these is used to assess indicative ecological potential - Total Phosphorus (TP), Soluble Reactive Phosphorus (SRP), Total Oxidised Nitrogen (TON), Ammonia, Biological Oxygen Demand (BOD) and Faecal Coliforms.

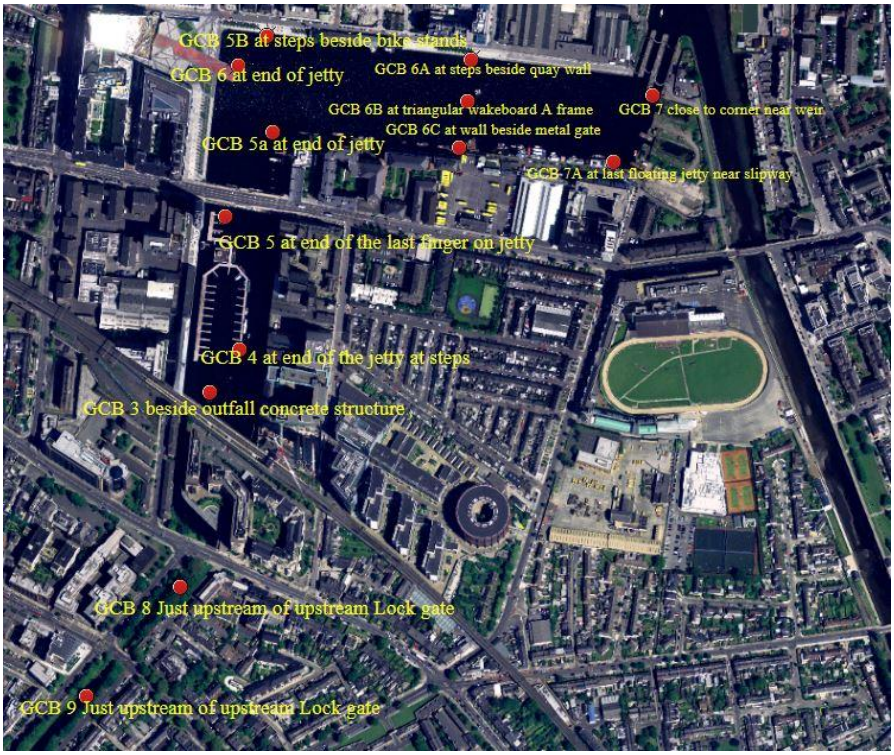


Figure 2.2: Grand Canal Basin (Dublin) showing the 13 sites that have been sampled in the past by Waterways Ireland and Dublin City Council for bacteriology.

Table 2.1: Physico-chemical determinands measured as part of WFD monitoring. (Chlorophyll monitoring has been discontinued since 2021.)

Determinand	Limit	Determinand	Limit
Total Phosphorus (TP) (mg/l P)*	0.063 mg/l P	Dissolved Oxygen (DO) (mg/l and % saturation)	>5.0 mg/l O_2
Molybdate Reactive Phosphorus (MRP) (mg/l P)	0.025 mg/l P	pH	
Soluble Reactive Phosphorus (SRP) (mg/l P)*	0.025 mg/l P	Conductivity (µS)	
Total Oxidised Nitrogen (TON) (mg/l N)*	4.1 mg/l N	Alkalinity (meq/l)	
Nitrite (mg/l)		Chlorophyll (µg/l)	
Nitrate (mg/l)		Biological Oxygen Demand (BOD) (mg/l O_2)*	<2.5 mg/l O_2
Ammonia (mg/l N)*	0.12 mg/l N	Total Coliforms (TC) (counts/100ml)	5000/100 ml
Temperature (°C)		Faecal Coliforms (counts/100ml)*	1000/100 ml

* Determinands used to assign ecological potential to the Artificial Water Bodies (AWBs)

3. Results

The full set of results from physico-chemical analysis of the water samples taken from the 50 canal, feeder/drain and Grand Canal Basin sites surveyed in Q4 2025 is presented in Appendices I and II.

3.1. *Physico-chemistry at Canal Sites*

Water sampling in Q4 2025 was conducted over two days – 23rd and 29th of October 2025. While the beginning of October experienced almost no rainfall, the weather during the sampling period was wet with some heavy rain. The water levels were slightly below normal at many sites with levels being supplemented in some areas through the addition of water from local watercourses in the months prior to the Q4 sample collection. The heavy and prolonged periods of rain resulted in strong flows from all of the feeders/drains sampled in Q4. Water temperature over the sampling period varied from 10.9 to 14.1°C and ranged from 11.7 to 14.1°C on 23rd and from 10.9 to 12.2°C on 29th of October 2025 (see Appendix I). The highest temperature in Q4 of 14.1°C was recorded at GCW24 (Armstrong Bridge) with a notable drop in water temperature between the two Q4 sampling events.



Plate 3.1: Slightly low water level and a light oily slick observed at Ferns Lock (RCE14) on the 29th of October 2025.

Water quality conditions at all seven sites on the eastern section of the Grand Canal (GCE) were good when sampled in Q4, with nutrient levels generally very low (see Appendix I). While none of the determinand limits were breached there were elevated values for *E. coli* at Robertstown (GCE1) and Hazelhatch (GCE8), with slightly raised TON and Nitrate levels recorded for Sallins (GCE4), Ponsonby

Bridge (GCE6) and Hazelhatch. The Milltown Feeder (MF1) was downgraded due to an unacceptably high Ammonia reading (0.120 mg/L N). The Nitrate (1.99 mg/L N) and TON (2.00 mg/L N) were also high at this site but did not exceed the threshold limits.

The physico-chemical analysis of samples from the western section of the Grand canal resulted in three sites of the 11 being downgraded from Good to Moderate status in Q4 2025. For the second quarter in succession, the site West of Daingean (GCW12) exceeded the limit for Total P with a value of (0.070 mg/L N). The results from the West of Daingean site and the next downstream site at Tullamore (GCW16) returned a breach in BOD of 5.00mg/L O_2 and 6.00mg/L O_2, respectively. The breach in Total P in the last two quarterly samples and subsequent high BOD observed in Q4 may indicate that the Ballymullen feeder continues be a source of excessive nutrient input with knock on impacts on water quality. Finally, the site at Armstrong Bridge (GCW24) was the third in the Grand Canal West system to exceed one of the six determinands with an elevated Ammonia reading (0.130 mg/L N). Several sites displayed raised Total Coliform values with the highest total counts recorded at Lock 20 (GCW4)(3,255) and L'Estrange Bridge (GCW27)(1,296).

There were no breaches in any of the parameter limits, however the Naas Line (NL1) has seen a return to elevated TON (2.10mg/L N) and Nitrate levels (2.080mg/L N) in Q4 2025 (see Appendix I), but significantly lower than had been recorded on many previous sampling occasions. Ammonia (0.100mg/L N), Total coliform (1,616) and *E. coli* (697) were also elevated but not excessive at Naas, while BOD, Total P, MRP, SRP levels were all low.

A reading of 0.120mg/L N for Ammonia resulted in a breach of the determinand limit for Athy (BL15), while an elevated Ammonia reading of 0.110mg/L that did not breach the limit was recorded upstream at Vicarstown (BL10). The values for all other physico-chemical parameters at all four sites on the Barrow Line were good on this sampling occasion.

There has been a further improvement in the indicative physico-chemical potential of sites on the Royal canal east, with the number of sites exceeding the BOD threshold limits reduced from six out of ten in Q2 to zero in Q4. The sites at McNeads Bridge (RCE4), Moy Valley (RCE9), Cloncurry (RCE12) and Fern's Lock (RCE14) all displayed a raised BOD of 2.00 mg/L O_2, however this represents a vast improvement in values that peaked at 9.00 mg/L O_2 in Cloncurry during the Q2 2025 sampling event. Despite the significant amelioration in water quality throughout this section of the Royal canal, water samples from McNeads Bridge and Moy Valley exhibited breaches in Ammonia (both 0.120mg/L N).

Following on from several breaches in BOD parameter limits in Q3, water quality conditions at all seven sites on the western section of the Royal Canal (RCW) were good when sampled in Q4, with nutrient levels generally very low (see Appendix I). Likewise, levels for Total coliform, *E. coli* and

BOD were low and well within acceptable limits. The only parameter that showed an elevation was BOD - for RCW9 (Allard's Bridge), where a value of 2.00mg/l O_2 was recorded.

With both SE40 and SE42 exceeding the acceptable limits for BOD at 4 and 3mg/l O_2, respectively, physico-chemical potential in Q4 for both WFD monitoring sites on the Shannon-Erne Waterway was Moderate. An excessive Total P value of 0.090mg/L P was also recorded at SE42 for the first time since Q3 2024. Total Coliforms were also very high at both SE40 (2,613) and SE42 (9,804), but all other parameters were low in Q4 2025. Water quality continues to be impacted by the input of deleterious matter in proximity to both of the Shannon-Erne sites in County Leitrim.



Plate 3.2: The Royal Canal at Croke Park (RCE25) in October 2025 where construction works have recently been completed.

3.2. *Indicative Ecological Potential of Canal Sites and Artificial Water Bodies*

Breaches of determinand threshold limits were recorded at twelve of the 43 canal and Shannon-Erne Waterway sites examined when readings for Q1 to Q4 2025 were assessed, resulting in each being assigned Moderate rather than Good indicative eco-potential (Table 3.1 and Figure 4.1). On the combined assessment all twelve sites recorded breaches for just a single determinand, with BOD being responsible at all of the sites (GCW16, GCW18, GCW20, RCE4, RCE9, RCE12, RCE14, RCE19, RCW9, RCW12, SE40 and SE42).

Twelve of the 15 AWBs were assigned Good indicative eco-potential when results from physico-chemical analyses from Q1 to Q4 2025 were combined (Table 3.2). All three of the AWBs that breached threshold limits were for BOD (Table 3.2). The increase in Moderate AWBs from two in Q1 to three in Q4 is as a direct result of the high number of BOD threshold breaches recorded in the Royal canal.

Table 3.1: Classification of the 43 canal sites in the 15 Artificial Water Bodies (AWBs), and the Grand Canal Basin, based on results for the six physico-chemical determinands from Q1 to Q4 combined in 2025.

AWB	Site Code	Year	Total P (mg/L P)	SRP (mg/L P)	TON (mg/L N)	*E. coli* (Count/100ml)	B.O.D. (mg/L O2)	Ammonia (mg/L N)	Indicative Physico-chemical Potential
GCE_09	GCE4	2025	0.025	0.010	1.375	129.000	1.250	0.035	Good
	GCE6	2025	0.023	0.010	1.225	18.250	1.000	0.030	Good
	GCE8	2025	0.025	0.010	1.100	313.250	1.250	0.045	Good
	GCE10	2025	0.015	0.010	1.000	20.000	1.500	0.035	Good
	GCE12	2025	0.015	0.010	1.000	244.750	1.500	0.028	Good
	GCE14	2025	0.023	0.010	1.000	79.250	1.750	0.033	Good
GCNL_09	NL1	2025	0.020	0.010	2.425	297.500	1.000	0.040	Good
GCMF_14	MF1	2025	0.013	0.010	1.900	39.500	1.250	0.053	Good
GCBL_14	BL2	2025	0.015	0.010	1.025	16.250	2.000	0.035	Good
	BL6	2025	0.015	0.010	1.000	31.500	1.500	0.033	Good
	BL10	2025	0.018	0.010	2.300	38.500	1.750	0.043	Good
	BL15	2025	0.018	0.010	1.275	34.500	1.250	0.050	Good
GC_14E	GCE1	2025	0.018	0.010	1.000	120.750	1.500	0.063	Good
	GCW1	2025	0.018	0.010	1.200	40.500	1.250	0.038	Good
GC_14W	GCW8	2025	0.015	0.010	0.875	35.500	1.250	0.030	Good
	GCW12	2025	0.050	0.010	0.875	67.250	2.250	0.038	Good
GC_07	GCW4	2025	0.015	0.010	0.875	96.250	1.750	0.033	Good
	GCW6	2025	0.013	0.010	0.875	111.250	1.750	0.035	Good
GC_25A	GCW16	2025	0.028	0.010	0.875	64.000	3.250	0.055	Moderate
	GCW18	2025	0.020	0.010	0.875	91.250	3.000	0.035	Moderate
	GCW20	2025	0.018	0.010	1.250	7.750	3.000	0.043	Moderate
	GCW22	2025	0.013	0.010	0.885	5.000	1.000	0.040	Good
	GCW24	2025	0.018	0.010	0.875	5.250	2.250	0.050	Good
	GCW27	2025	0.015	0.010	0.875	12.250	1.500	0.045	Good
GCB*	GCB4	2025	0.048	0.010	1.000	82.000	2.000	0.055	Good
	GCB7	2025	0.053	0.013	1.000	79.500	1.250	0.063	Good
RC_07	RCE4	2025	0.025	0.010	0.875	16.750	2.500	0.055	Moderate
	RCE6	2025	0.023	0.010	1.070	129.250	1.500	0.045	Good
	RCE8	2025	0.025	0.010	0.875	112.000	1.500	0.043	Good
	RCE9	2025	0.023	0.010	1.000	12.250	3.750	0.063	Moderate
	RCE12	2025	0.033	0.010	1.075	9.250	4.250	0.043	Moderate
RC_09	RCE14	2025	0.020	0.010	1.000	36.000	2.500	0.053	Moderate
	RCE16	2025	0.018	0.010	1.000	7.250	1.500	0.043	Good
	RCE19	2025	0.023	0.010	1.000	106.250	2.750	0.043	Moderate
	RCE22	2025	0.028	0.010	1.000	67.250	2.250	0.045	Good
	RCE25	2025	0.020	0.010	1.000	172.250	2.000	0.033	Good
RC_25A	RCW1	2025	0.023	0.010	0.875	26.750	1.500	0.043	Good
	RCW3	2025	0.023	0.010	0.875	8.500	1.500	0.065	Good
RC_26F	RCW5	2025	0.018	0.010	1.350	73.750	1.500	0.045	Good
	RCW7	2025	0.015	0.010	0.875	7.250	2.000	0.038	Good
	RCW9	2025	0.028	0.010	0.950	10.500	2.500	0.045	Moderate
RC_26E	RCW12	2025	0.013	0.010	0.950	21.500	2.500	0.060	Moderate
RC_26C	RCW14	2025	0.015	0.010	0.875	7.000	2.000	0.055	Good
SE_26A	SE40	2025	0.055	0.010	0.875	73.750	3.500	0.083	Moderate
	SE42	2025	0.060	0.010	0.875	69.250	3.250	0.058	Moderate

* The Grand Canal Basin is not a designated AWB.

Table 3.2: Indicative ecological potential for the 15 Artificial Water Bodies (AWBs), and the Grand Canal Basin, based on results for the six physico-chemical determinands from Q1 to Q4 combined in 2025.

AWB	Year	Total P (mg/L P)	SRP (mg/L P)	TON (mg/L N)	*E. coli* (Count/100ml)	B.O.D. (mg/L O2)	Ammonia (mg/L N)	Indicative Physico-chemical Potential
GCE_09	2025	0.021	0.010	1.117	134.083	1.375	0.034	Good
GCNL_09	2025	0.020	0.010	2.425	297.500	1.000	0.040	Good
GCMF_14	2025	0.013	0.010	1.900	39.500	1.250	0.053	Good
GCBL_14	2025	0.016	0.010	1.400	30.188	1.625	0.040	Good
GC_14E	2025	0.018	0.010	1.100	80.625	1.375	0.050	Good
GC_14W	2025	0.033	0.010	0.875	51.375	1.750	0.034	Good
GC_07	2025	0.014	0.010	0.875	103.750	1.750	0.034	Good
GC_25A	2025	0.018	0.010	0.939	30.917	2.333	0.045	Good
GCB*	2025	0.050	0.011	1.000	80.750	1.625	0.059	Good
RC_07	2025	0.026	0.010	0.979	55.900	2.700	0.050	Moderate
RC_09	2025	0.022	0.010	1.000	77.800	2.200	0.043	Good
RC_25A	2025	0.023	0.010	0.875	17.625	1.500	0.054	Good
RC_26F	2025	0.020	0.010	1.058	30.500	2.000	0.043	Good
RC_26E	2025	0.013	0.010	0.950	21.500	2.500	0.060	Moderate
RC_26C	2025	0.015	0.010	0.875	7.000	2.000	0.055	Good
SE_26A	2025	0.058	0.010	0.875	71.500	3.375	0.070	Moderate

*** The Grand Canal Basin is not a designated AWB.**

3.3. *Physico-chemistry and Indicative Ecological Potential of Canal Feeders/Drains*

Four of the five feeders/drains sampled in Q4 2025 were assigned Moderate indicative eco-potential following physico-chemical analysis and included the Ballymullen feeder (GCW12.1), Ballylennon feeder (GCW13.1), Athy drain (BL15.1) and Kilcock Harbour drain (RCE16.1) (see Appendix II). All sites exhibited a good flow of water owing to heavy rain in the weeks before the Q4 sampling. Total coliform results were high for all five feeders/drains with the highest value of 11,199 recorded at Kilcock Harbour drain.

The Monread feeder (GCE5.1) was the only site allocated Good status in Q4. The site has shown elevations in values for TON (1.90mg/l N) and Nitrate (1.89mg/l N) in Q4 and throughout 2025 but did not exceed the classification standards in any of the quarterly samples.

There was a strong flow of clear water with a slight oily film on the 29th of October 2025 from the Ballymullen feeder. Both the Ballymullen and Ballylennon feeders breached the BOD threshold limit with readings of 3. 00mg/L O_2 and 4. 00mg/L O_2, respectively. The Ballymullen feeder also exceeded the limit for Total P (0.100mg/L P) and appears to be having a continued impact on the water quality of the adjacent site West of Daingean. Aside from elevated Total coliforms at the Ballymullen feeder all other physico-chemical parameters were normal at both sites.



Plate 3.2: A light oily film emerging from the Ballymullen feeder (GCE12.1) during sampling in October 2025.

Water samples collected from the outflow of the Athy drain (BL15.1) on the 23rd of October breached the classification standard for Ammonia (0.140mg/L N). This site has also displayed raised values for both TON and Nitrate in Q4 and although there has only been one breach of TON since Q1 2024, these high levels are characteristic of the Athy drain.

On this sampling occasion, levels for all nutrient parameters at Kilcock Harbour drain, including Ammonia, were low, as was BOD (see Appendix II). However, physico-chemical results showed highly elevated Total Coliform (11,199) and *E. coli* (1,670) counts from the water suggesting the presence of sewage contamination in the outfall. This is the third time in the last five quarterly samples that this site has exceeded the determinand limit for *E.coli* at the drain.

Table 3.3. Indicative ecological potential for the five canal feeders/drains based on results for the six physico-chemical determinands from Q1 to Q5 combined in 2025.

AWB	Site Code	Year	Total P (mg/L P)	SRP (mg/L P)	TON (mg/L N)	*E. coli* (Count/100ml)	B.O.D. (mg/L O2)	Ammonia (mg/L N)	Indicative Physico-chemical Potential
Monread	GCE5.1	2025	0.045	0.010	1.775	1,012	1.000	0.040	Moderate
Ballymullen	GCW12.1	2025	0.110	0.018	0.900	344	2.500	0.070	Moderate
Ballylennon	GCW13.1	2025	0.050	0.010	0.875	643	4.500	0.085	Moderate
Athy	BL15.1	2025	0.063	0.010	2.050	928	1.750	0.085	Good
Kilcock Harbour	RCE16.1	2025	0.035	0.010	1.225	1,302	1.250	0.085	Moderate

When physico-chemical results from Q1 to Q4 2025 were combined for the feeder/drain systems, just Athy drain was assigned Good indicative eco-potential (Table 3.3). The Monread drain and Kilcock Harbour drain were assigned a combined eco-potential of Moderate for 2025 for persistent breaches in *E. coli*. As these drains are generally urban in nature, it may be possible that there are unidentified 'tap-ins' from domestic or other sources in each area that are contributing to the bacteriological load that is being recorded at the sampling points. These issues should be highlighted to Kildare County Council (KCC) to ensure that efforts are underway to identify and eliminate the source(s) of this enrichment.

The Ballymullen and Ballylennon feeders have been downgraded due to persistently high BOD values at both sites. For the second year in a row the Ballymullen feeder also breaches the threshold limit for Total P from Q1 to Q4. This suggests that there is a yet unidentified source of nutrient entering the drain upstream prior to its confluence with the Grand Canal system. In 2025, Waterways Ireland and Offaly County Council staff met with landowners at the sources of these feeder streams in an effort to establish water protection measures and identify sources of nutrient input. This relationship must continue to strive to improve the quality of water entering the Grand Canal through riparian protection of the drains and the identification of possible sources of pollution.

3.4. *Grand Canal Basin*

A Dublin City Council urban wastewater outfall is located in the inner Grand Canal Basin (see Figure 2.2). This outfall is used to carry storm water overflow but, on occasions, sewage contamination is discharged to the Basin *via* this outfall. Results from physico-chemical analysis of water samples taken from the inner and outer basins (GCB4 and GCB7, respectively) in Q4 2025 revealed breaches in the classification standard for Total P at both sites. Despite this the combined indicative eco-potential for Q1 to Q4 for both Grand Canal basin sites was Good (Table 3.2).

Fifty-four sets of samples for bacteriological analysis (*E. coli* and *Enterococci*) were taken by WI/DCC in and immediately upstream of the Grand Canal Basin between the January and December 2025 (Table 3.4). DCC sampling took places at sites 4, 5, 6, 7 and 8 with one site on the Grand Canal, two in the inner basin and two in the outer basin. WI sampling took place at 3, 5, 6, 6B, 7 and 8 (Figure 2.2) with one site on the Grand Canal, two in the inner basin and three in the outer basin.

Across all sampling by DCC and WI, a total of 61 breach events involving *E. coli* and *Enterococci* were reported from the water samples taken between January and December 2025 (Table 3.4). Of the 61, seventeen of these occurred in samples tested between the 28th of January to the 25th of February. A further 11 of the breaches were recorded on samples taken between the 28th of May and the 16th of June. Thirteen subsequent breaches were recorded from the 21st and 23rd of July 2025. The acceptable limits were exceeded fourteen times from the 21st of October to the 4th of November. The dates for most of these breaches corresponded with high levels of rainfall recorded at the weather station in Phoenix Park.

Table 3.4. Number of sites that breached acceptable limits for *E. coli* (>900 counts per 100ml) and *Enterococci* (>250 counts per 100ml) in water samples taken by Waterways Ireland and Dublin City Council with third party testing in Level 1 of the Grand Canal (1 site) and in the inner (2 sites) and outer (2 or 3 sites) Grand Canal Basins between January and December 2025.

Date	Canal *E. coli*	Canal Enterococci	Inner *E. coli*	Inner Enterococci	Outer *E. coli*	Outer Enterococci
14/01/2025	0	0	0	0	0	0
28/01/2025	0	1	2	2	2	2
11/02/2025	0	0	2	2	0	0
25/02/2025	0	0	2	2	0	0
11/03/2025	0	0	0	0	0	0
25/03/2025	0	0	0	0	0	0
07/04/2025	0	0	0	0	0	0
08/04/2025	0	1	0	0	0	0
14/04/2025	0	0	0	0	0	0
16/04/2025	0	0	2	1	0	0
22/04/2025	0	0	0	0	0	0
23/04/2025	0	0	0	0	0	0
28/04/2025	0	0	0	0	0	0
30/04/2025	0	0	0	0	0	0
06/05/2025	0	0	0	0	0	0
07/05/2025	0	0	0	0	0	0
12/05/2025	0	0	0	0	0	0
14/05/2025	0	0	0	0	0	0
19/05/2025	0	0	0	0	0	0
26/05/2025	0	0	0	0	0	0
28/05/2025	0	0	0	0	1	0
03/06/2025	0	0	2	2	0	1
04/06/2025	0	0	0	0	0	0
09/06/2025	0	0	0	0	0	0
11/06/2025	1	0	0	0	0	0
16/06/2025	0	0	2	2	0	0
17/06/2025	0	0	0	0	0	0
23/06/2025	0	0	0	0	0	0
25/06/2025	0	0	0	0	0	0
30/06/2025	0	0	0	0	0	0
01/07/2025	0	0	0	0	0	0
07/07/2025	0	0	0	0	0	0
09/07/2024	0	0	0	0	0	0
14/07/2024	0	0	0	0	0	0
15/07/2025	0	0	0	0	0	0
21/07/2025	0	0	2	2	0	0
23/07/2025	0	0	2	2	3	1
28/07/2025	0	0	0	0	0	0
29/07/2025	0	0	0	0	0	0
06/08/2025	0	0	0	0	0	0
11/08/2025	0	0	0	0	0	0
12/08/2025	0	0	0	0	0	0
18/08/2025	0	0	0	0	0	0
20/08/2025	0	0	0	0	0	0
25/08/2025	0	0	0	0	0	0
26/08/2025	0	1	0	0	0	0
01/09/2025	0	0	0	0	0	0
03/09/2025	0	1	0	0	0	1
08/09/2025	0	0	0	0	0	0
09/09/2025	0	0	0	0	0	0
23/09/2025	0	0	0	0	0	0
07/10/2025	0	0	0	0	0	0
21/10/2025	0	0	2	2	2	2
04/11/2025	0	0	2	2	1	1

A total of five breaches were recorded in the Grand Canal before it entered the basin, one for *E. coli* and four for *Enterococci* counts. In the inner basin, thirty nine breaches were reported, with twenty for *E. coli* and nineteen for *Enterococci*. The highest bacteriological counts detected were from the 21st of July and 21st of October 2025, with >24196 *E,coli* per 100ml and on the 23rd of July 2025 with 12,000 *Enterococci* per 100ml. It is notable that following a relatively dry July there was 48.1mm of rainfall recorded at Phoenix Park on the 21st of July 2025. In the outer basin, there were seventeen breaches reported, with nine for *E. coli* and eight for *Enterococci*. Eleven of the seventeen breaches were recorded in January, June, October and November when both sites in the inner basin failed on counts for both parameters (Table 3.4).

4. Issues for Waterways Ireland Resulting from Sampling in Q4 2025

A total of 9 sites of the 43 canal and Shannon-Erne Waterway sites were downgraded from Good to Moderate indicative physico-chemical status in Q4 2025. Three sites breached on two determinands and the other six sites breached on a single determinand. Total P and BOD thresholds were exceeded at two and four sites, respectively, while Ammonia limits were breached on six occasions.

Of the six breaches in Ammoia recorded in Q4, all were between 0.120mg/L N and 0.130mg/L N, just above the WFD classification standard of 0.120mg/L N. Meetings to discuss the modification of this limit have taken place between WI and the EPA to assess if it is appropriate to the Irish Canal systems. For all six breaches in the determinand, each one was below the proposed modified limit of 0.157mg/L N. If the modified limit was considered for the Q4 sampling the total number of downgraded sites would drop from nine to four out of 43 sites. The Q4 results for Ammonia support the case where five of the six sites that exceeded the current lower limit were downgraded on this determinand alone.

The water quality issues relating to high BOD values recorded from Q1 to Q3 on the Royal canal seem to have abated. In Q4, two of the seventeen Royal Canal sites were downgraded based on Ammonia values of 0.120mg/L N alone, with no breaches in BOD recorded at any site. These areas of the Royal Canal should be closely monitored in 2026 in an attempt to identify if the high BOD values were related to dry and warm weather conditions seen in 2025 or if there was any link to the spread of organic fertilisers in the early spring. This short-term spike in BOD in the Royal Canal is in contrast to the issues observed on the Shannon-Erne waterway where there have been six and five breaches for SE40 and SE42, respectively, across the previous eight sampling occasions from Q1 2024 to Q4 2025. The excessive total P recorded at SE42, light oily layer at SE40 and significant Total Coliform counts for both sites suggest that there are undesirable discharges entering the system in Leitrim. It is understood that there has been further recent communication with Leitrim County Council regarding the water quality issues in the waterway and this may result in progress towards identifying the sources of deleterious matter in these areas.

The Monread drain was the only drain/feeder assigned Good indicative eco-potential on this sampling occasion. The combined physico-chemical potential from Q1 to Q4 for the Ballymullen feeder has been downgraded from Good to Moderate as a result of excessive Total P and BOD throughout 2025. The high record for Total P from Q3 (0.230mg/L P) has persisted into Q4 with a probable knock-on effect in the excessive BOD record in this quarter. Again, this input of poor water quality is reflected in the breach of the threshold limits for Total P and BOD recorded at the West of Daingean site (GCW12) in Q4. The site downstream at Tullamore has also been downgraded in Q4 due to a high record for BOD, with slight elevations in Total P observed. It will be important to support the efforts of both Waterways

Ireland and Offaly County Council staff to date through the continued engagement with land and property owners in the region of the Ballymullen and Ballylennon feeders.

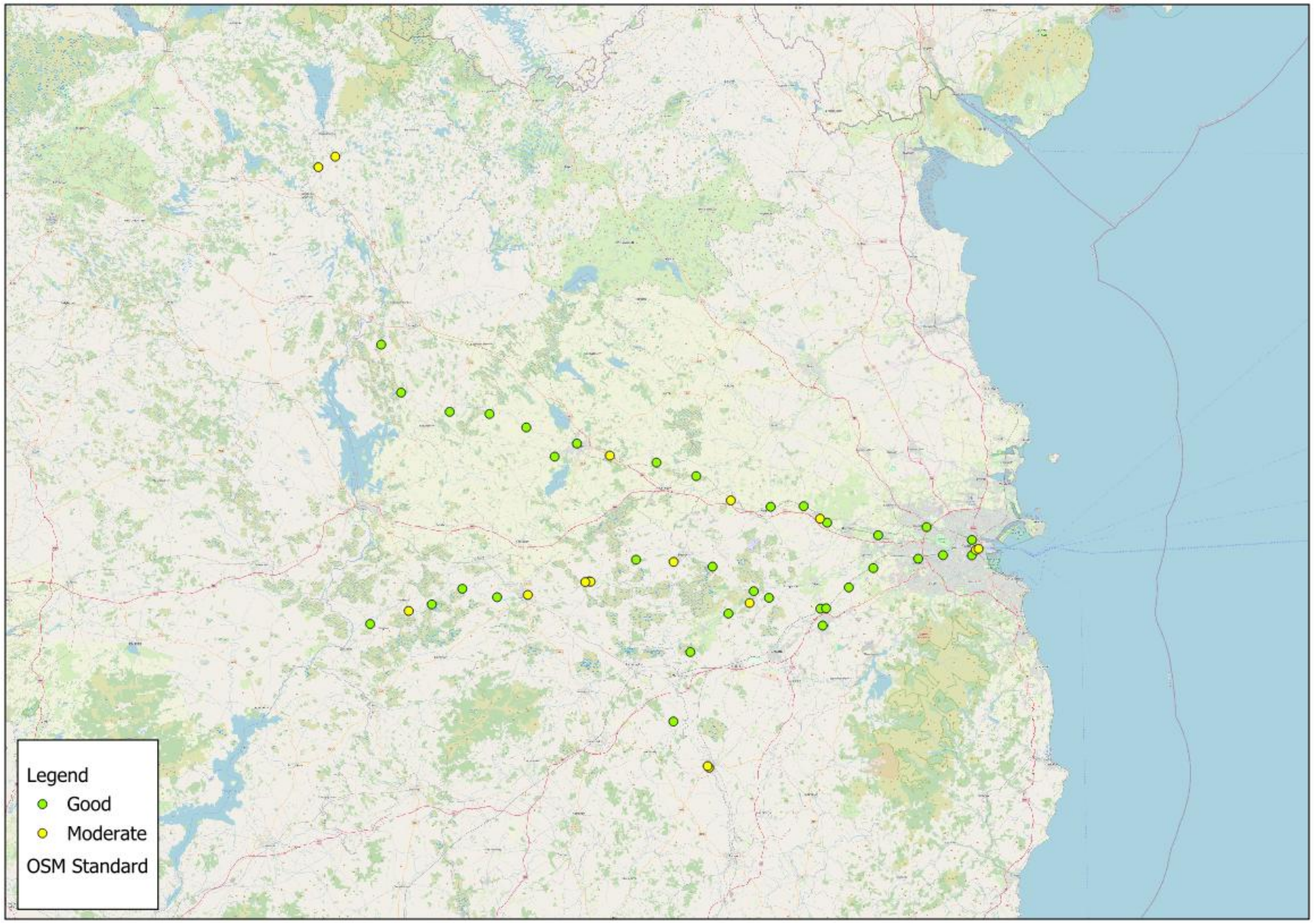


Figure 4.1. Indicative ecological potential based on physico-chemical data for the 50 canal, Shannon-Erne Waterway and feeder/drain sites monitored in Q4 2025 (Green = Good, Yellow = Moderate).

Appendix I. Physico-chemical results and indicative ecological potential for canal (41), Shannon-Erne Waterway (2) and Grand Canal Basin (2) sites sampled in Q4 2025.

Canal	Site Code	AWB	Quarter	Date	Total P (mg/L P)	MRP (mg/L P)	SRP (mg/L P)	TON (mg/L N)	Temperature	Conductivity (µS)	pH	DO %	DO ($mg/L O_2$)	Total Coliform (Count/100ml)	*E.coli* (Count/100ml)	B.O.D. (mg/L O2)	Ammonia (mg/L N)	Nitrite (mg/L N)	Nitrate (mg/L N)	Alkalinity (meq/L)	Alkalinity (mg/L $CaCO_3$)	Indicative Physico-chemical Potential
Grand Canal	GCE1	GC_14E	Q4	29/10/2025	0.030	0.010	0.010	1.000	11.6	474	8.46	108.6	8.38	749	323	2.00	0.070	0.030	1.000	2.645	132.40	Good
Grand Canal	GCE4	GC_14E	Q4	29/10/2025	0.030	0.010	0.010	1.800	11.4	415	8.10	102.0	7.85	414	10	1.00	0.050	0.030	1.790	4.206	210.50	Good
Grand Canal	GCE6	GC_14E	Q4	29/10/2025	0.030	0.010	0.010	1.400	11.7	522	8.07	83.1	8.63	120	30	1.00	0.040	0.030	1.390	2.991	149.70	Good
Grand Canal	GCE8	GC_14E	Q4	29/10/2025	0.030	0.010	0.010	1.400	10.9	344	8.40	110.9	10.24	1,081	733	1.00	0.090	0.030	1.380	3.435	171.90	Good
Grand Canal	GCE10	GC_14E	Q4	29/10/2025	0.020	0.010	0.010	1.000	11.6	340	8.13	93.5	10.93	98	10	1.00	0.040	0.030	1.000	2.669	133.60	Good
Grand Canal	GCE12	GC_14E	Q4	29/10/2025	0.020	0.010	0.010	1.000	11.8	516	8.43	88.4	8.89	86	10	1.00	0.040	0.030	1.000	2.336	116.90	Good
Grand Canal	GCE14	GC_14E	Q4	29/10/2025	0.030	0.010	0.010	1.000	11.8	455	7.88	102.4	10.2	75	20	1.00	0.030	0.030	1.000	2.378	119.00	Good
Grand Canal	GCW1	GC_14E	Q4	29/10/2025	0.020	0.010	0.010	1.200	11.8	368	8.35	98.2	9.59	84	10	1.00	0.050	0.030	1.190	2.811	140.70	Good
Grand Canal	GCW4	GC_07	Q4	23/10/2025	0.020	0.010	0.010	1.000	12.6	483	7.97	102.7	10.8	3,255	10	1.00	0.030	0.030	1.000	3.423	171.30	Good
Grand Canal	GCW6	GC_07	Q4	23/10/2025	0.020	0.010	0.010	1.000	12.4	350	8.14	81.6	9.94	443	132	1.00	0.050	0.030	1.000	2.392	119.70	Good
Grand Canal	GCW8	GC_14W	Q4	23/10/2025	0.020	0.010	0.010	1.000	12.2	471	8.24	97.6	9.77	644	10	2.00	0.040	0.030	1.000	3.257	163.00	Good
Grand Canal	GCW12	GC_14W	Q4	23/10/2025	**0.070**	0.010	0.010	1.000	11.8	435	8.19	101.7	8.18	842	31	**5.00**	0.030	0.030	1.000	4.078	204.10	Moderate
Grand Canal	GCW16	GC_25A	Q4	23/10/2025	0.050	0.010	0.010	1.000	12.9	324	7.86	88.0	8.67	10	10	**6.00**	**0.130**	0.030	1.000	2.911	145.70	Moderate
Grand Canal	GCW18	GC_25A	Q4	23/10/2025	0.030	0.010	0.010	1.000	13.6	339	7.90	107.9	10.96	368	10	1.00	0.050	0.030	1.000	2.939	147.10	Good
Grand Canal	GCW20	GC_25A	Q4	23/10/2025	0.030	0.010	0.010	1.000	13.8	319	8.03	90.1	10.26	528	20	1.00	0.070	0.030	1.000	3.353	167.80	Good
Grand Canal	GCW22	GC_25A	Q4	23/10/2025	0.020	0.010	0.010	1.000	13.2	514	8.11	83.8	10.56	108	10	1.00	0.070	0.030	1.000	3.489	174.60	Good
Grand Canal	GCW24	GC_25A	Q4	23/10/2025	0.020	0.010	0.010	1.000	14.1	349	8.32	103.5	9.17	109	10	1.00	**0.130**	0.030	1.000	3.127	156.50	Moderate
Grand Canal	GCW27	GC_25A	Q4	23/10/2025	0.020	0.010	0.010	1.000	12.4	431	8.18	82.5	9.3	1,296	30	1.00	0.100	0.030	1.000	3.431	171.70	Good
Grand Canal	NL1	GCNL_09	Q4	29/10/2025	0.030	0.010	0.010	2.100	11.7	498	8.44	79.8	11.04	1,616	697	1.00	0.100	0.030	2.080	2.915	145.90	Good
Grand Canal	MF1	GCMF_14	Q4	29/10/2025	0.020	0.010	0.010	2.000	11.8	328	8.30	81.8	9.15	10	10	1.00	**0.120**	0.030	1.990	3.361	168.20	Moderate
Grand Canal	BL2	GCBL_14	Q4	29/10/2025	0.020	0.010	0.010	1.000	11.3	438	7.96	84.0	8.95	97	10	1.00	0.070	0.030	1.000	3.880	194.20	Good
Grand Canal	BL6	GCBL_14	Q4	29/10/2025	0.020	0.010	0.010	1.000	11.6	333	8.38	92.8	11.27	95	41	1.00	0.070	0.030	1.000	2.915	145.90	Good
Grand Canal	BL10	GCBL_14	Q4	29/10/2025	0.030	0.010	0.010	1.000	11.4	363	7.95	87.2	8.9	10	10	1.00	0.110	0.030	1.000	2.835	141.90	Good
Grand Canal	BL15	GCBL_14	Q4	29/10/2025	0.020	0.010	0.010	1.000	11.6	479	8.23	91.7	10.07	41	10	1.00	**0.120**	0.030	1.000	3.421	171.20	Moderate
Grand Canal	GCB4	GCB*	Q4	29/10/2025	**0.070**	0.010	0.010	1.000	11.8	521	8.34	85.8	8.23	1,211	95	2.00	0.050	0.030	1.000	3.696	185.00	Moderate
Grand Canal	GCB7	GCB*	Q4	29/10/2025	**0.080**	0.020	0.020	1.000	11.9	517	8.04	82.2	9.57	203	63	1.00	0.060	0.030	1.000	3.960	198.20	Moderate
Royal Canal	RCE4	RC_07	Q4	23/10/2025	0.040	0.010	0.010	1.000	11.7	329	8.39	82.6	10.32	504	10	2.00	**0.120**	0.030	1.000	5.512	275.90	Moderate
Royal Canal	RCE6	RC_07	Q4	23/10/2025	0.030	0.010	0.010	1.000	12.3	323	7.94	88.1	8.24	266	10	1.00	0.070	0.030	1.000	4.881	244.30	Good
Royal Canal	RCE8	RC_07	Q4	23/10/2025	0.030	0.010	0.010	1.000	11.9	426	8.47	83.0	8.26	538	41	1.00	0.050	0.030	1.000	3.235	161.90	Good
Royal Canal	RCE9	RC_07	Q4	29/10/2025	0.030	0.010	0.010	1.000	11.5	381	8.00	103.8	10.43	122	10	2.00	**0.120**	0.030	1.000	3.996	200.00	Moderate
Royal Canal	RCE12	RC_07	Q4	29/10/2025	0.030	0.010	0.010	1.300	11.7	413	8.28	88.2	11.26	121	10	2.00	0.080	0.030	1.280	4.278	214.10	Good
Royal Canal	RCE14	RC_09	Q4	29/10/2025	0.020	0.010	0.010	1.000	12.2	385	8.36	94.2	8.58	30	10	2.00	0.110	0.030	1.000	3.500	175.20	Good
Royal Canal	RCE16	RC_09	Q4	29/10/2025	0.030	0.010	0.010	1.000	10.9	464	7.87	108.4	8.57	63	10	1.00	0.060	0.030	1.000	3.704	185.40	Good
Royal Canal	RCE19	RC_09	Q4	29/10/2025	0.030	0.010	0.010	1.000	11.7	437	8.08	86.4	10.91	41	10	1.00	0.110	0.030	1.000	2.601	130.20	Good
Royal Canal	RCE22	RC_09	Q4	29/10/2025	0.040	0.010	0.010	1.000	12.1	442	8.37	82.0	8.83	556	110	1.00	0.060	0.030	1.000	3.516	176.00	Good
Royal Canal	RCE25	RC_09	Q4	29/10/2025	0.030	0.010	0.010	1.000	10.9	511	8.26	102.2	9.65	95	181	1.00	0.040	0.030	1.000	2.496	124.90	Good
Royal Canal	RCW1	RC_25A	Q4	23/10/2025	0.030	0.010	0.010	1.000	12.6	418	8.01	95.5	11.1	480	52	1.00	0.040	0.030	1.000	4.058	203.10	Good
Royal Canal	RCW3	RC_25A	Q4	23/10/2025	0.030	0.010	0.010	1.000	13.1	346	7.99	111.2	10.85	169	20	1.00	0.050	0.030	1.000	3.077	154.00	Good
Royal Canal	RCW5	RC_26F	Q4	23/10/2025	0.020	0.010	0.010	1.000	13.4	499	8.02	84.6	10.3	414	169	1.00	0.060	0.030	1.000	3.407	170.50	Good
Royal Canal	RCW7	RC_26F	Q4	23/10/2025	0.020	0.010	0.010	1.000	13.8	366	8.31	105.1	8.02	95	10	1.00	0.050	0.030	1.000	4.014	200.90	Good
Royal Canal	RCW9	RC_26F	Q4	23/10/2025	0.050	0.010	0.010	1.000	13.2	523	8.41	105.0	8.06	259	30	2.00	0.070	0.030	1.000	3.107	155.50	Good
Royal Canal	RCW12	RC_26E	Q4	23/10/2025	0.020	0.010	0.010	1.000	13.3	362	8.33	101.3	10.57	218	10	1.00	0.060	0.030	1.000	4.298	215.10	Good
Royal Canal	RCW14	RC_26C	Q4	23/10/2025	0.020	0.010	0.010	1.000	12.9	345	8.05	94.3	8.61	266	10	1.00	0.050	0.030	1.000	3.253	162.80	Good
Shannon Erne	SE40	SE_26A	Q4	23/10/2025	0.060	0.010	0.010	1.000	12.6	298	7.86	86.3	10.15	2,613	148	**4.00**	0.090	0.030	1.000	1.978	99.00	Moderate
Shannon Erne	SE42	SE_26A	Q4	23/10/2025	**0.090**	0.010	0.010	1.000	12.8	324	7.73	81.5	9.68	9,804	189	**3.00**	0.090	0.030	1.000	2.270	113.60	Moderate

Appendix II. Physico-chemical results and indicative ecological potential for canal feeder/drain sites sampled in Q4 2025.

Canal	Site	Location	AWB_Code	Quarter	Date	Total P (mg/L P)	MRP (mg/L P)	SRP (mg/L P)	TON (mg/L N)	Temperature (degree C)	Conductivity (µS)	pH	DO %	DO (mg/L O_2)	Total Coliform (Count/100ml)	*E.coli* (Count/100ml)	B.O.D. (mg/L O2)	Ammonia (mg/L N)	Nitrite (mg/L N)	Nitrate (mg/L N)	Alkalinity (meq/L)	Alkalinity (mg/L $CaCO_3$)	Indicative Physico-chemical Potential
Grand Canal	GCE5.1	Monread Feeder	GC_09	Q4	23/10/2025	0.040	0.010	0.010	1.900	12.40	503	7.86	88.9	9.7	1,785	213	1.00	0.040	0.030	1.890	3.137	157.00	Good
Grand Canal	GCW12.1	Ballymullen Feeder	GC_14	Q4	29/10/2025	**0.100**	0.010	0.010	1.000	11.60	542	8.16	94.6	8.79	2,909	134	**3.00**	0.040	0.030	1.000	4.070	203.70	Moderate
Grand Canal	GCW13.1	Ballylennon Feeder	GC_14	Q4	29/10/2025	0.060	0.020	0.010	1.000	12.20	453	8.32	86.2	7.96	525	63	**4.00**	0.070	0.030	1.000	3.704	185.40	Moderate
Grand Canal Barrow Line	BL15.1	Athy Drain	GCBL_14	Q4	23/10/2025	0.060	0.010	0.010	2.600	12.60	497	8.23	76.4	9.6	3,448	670	1.00	**0.140**	0.030	2.580	3.832	191.80	Moderate
Royal Canal	RCE16.1	Kilcock Harbour Drain	RC_09	Q4	23/10/2025	0.040	0.010	0.010	1.500	13.20	521	8.06	93.4	8.5	11,199	**1,670**	1.00	0.050	0.030	1.490	3.479	174.10	Moderate



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