A Biological Assessment of the Water Quality of the River Nore

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1. INTRODUCTION

The present report by Pascal Sweeney, Consultant Environmental Biologist, was commissioned by Glanbia Ireland, in accordance with the requirement of the IE Licence for the plant at Ballyragget, Co. Kilkenny. Its purpose is the biological assessment of water quality of the River Nore both upstream and downstream of the plant in order to assess the current effect, if any, of discharges on the biological water quality of the river. Sampling of a site on the Owveg River is included in order to assess the impact of this tributary on the water quality of the River Nore. The design of the survey is such that the data obtained can be directly compared with biological data collected in previous years.

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2. SAMPLING SITES

Five sites on the River Nore and one on the Owveg River were sampled. Sampling site locations are indicated on the sketch-map in Appendix 1. Site co-ordinates and other site information are presented in Appendix 2. Photographs of the sampling sites are shown in Appendix 3.

River Nore (EPA River Code 15/N/01)

Site 1. Immediately downstream of Tallyho Bridge (Corresponding to EPA Station 1300). This is the nearest EPA site upstream of the Glanbia plant. It was chosen to establish the status of the river upstream of the plant and for comparison with EPA findings.

Site 2. 300 metres upstream of the Glanbia water pump intake. This site was established in order to determine the status of the river immediately upstream of any influence which the Glanbia plant might have on the water quality of the river.

Site 3. Riffle area approximately 100 metres downstream of the treated effluent outfall. This site was established to determine the water quality of the river immediately downstream of the treated effluent discharge point.

Site 4. 30 metres downstream of the former cooling water discharge point, which no longer discharges to the river at this point and is diverted to the treated effluent outfall location. This site was originally established to determine the water quality immediately downstream of the cooling water discharge. Results from this site reflect the status of the river downstream of all Glanbia influences.

Site 5. Immediately downstream of Ballyragget Bridge (Corresponding to EPA Station 1450). This is the nearest EPA site downstream of the Glanbia plant. It is useful for comparison with EPA findings.

<u>Owveg River</u> (EPA River Code 15/O/01)

Site 6. 200 metres upstream of the confluence with the River Nore. This site was chosen to establish the water quality of this tributary in order to assess its impact on the water quality of the River Nore upstream of the Glanbia plant.

3. METHODOLOGY

Field work was carried out on 13 May, 2019. At each of the six sites, a qualitative assessment of habitat conditions was first carried out. Site co-ordinates were taken using a Garmin GPS 72 handset. The procedure of assessment of biological water quality in this survey is the EPA Q-scheme method (EPA, 2018). Based on the composition of the macroinvertebrate fauna and taking into account the physical conditions of the instream habitat, a Q-value was determined for each site.

4. RESULTS

4.1 Macroinvertebrate Community Analyses.

The macroinvertebrate community recorded, giving relative abundance for each taxon at each site, is presented in Appendix 4.

The Q-value ascribed to each site, together with current ecological status, classified in accordance with the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 (S.I. 77 of 2019) is given in Table 1. Also in this table, Q-values ascribed to these sites each year since 2009 are given.

At Site 1, four Group A (pollution sensitive) taxa are common in occurrence: *Isoperla grammatica, Heptagenia sulphurea, Ecdyonurus sp.* and *Ephemera danica.* Group B (relatively pollution sensitive) is represented by low numbers of *Lepidostoma hirtum,* Glossosomatidae and *Baetis muticus.* Thirteen Group C (relatively pollution tolerant), taxa are present here, but none in high abundance. Group D (pollution tolerant) and Group E (most pollution tolerant) are absent. With four Group A species well represent and Groups D & E absent, this site qualifies for Q-value of **Q4-5**.

At each of the other five sites, three Group A (pollution sensitive) species are present, with one Common in abundance and the other two present in low numbers. Group B (relatively pollution sensitive) species are reasonably well represented. Group C (relatively pollution tolerant) dominate overall, both in total abundance and numbers of taxa. Group D (pollution tolerant) is poorly represented at all sites. While all Family Tubificidae are classified as Group E (most pollution tolerant), the only species of this family present (at all sites) was *Rhyacodrilus coccineus*, a species which has been found to be associated with sandy, rather than enriched conditions (Sweeney, 2016). With this combination of indicator species and good diversity Sites 2 to 5 on the Nore main channel and Site 6 on the Owveg qualify for a Q-value of **Q4**.

Table 1. Q-values 2009 – 2019

Site	"Q" 2009	"Q" 2010	"Q" 2011	"Q" 2012	"Q" 2013	"Q" 2014	"Q" 2015	"Q" 2016	"Q" 2017	"Q" 2018	"Q" 2019	Water Framework Directive Ecological Status 2019
1	Q4	Q4	Q4	Q4-5	Q4-5	Q4-5	Q4	Q4-5	Q4	Q4	Q4-5	High
2	Q3-4	Q4-5	Q4	Q4	Q4-5	Q4-5	Q4	Q4-5	Q4	Q4	Q4	Good
3	Q3-4	Q4-5	Q4	Q4	Q4-5	Q4-5	Q4	Q4-5	Q4	Q4	Q4	Good
4	Q3-4	Q4	Q4	Q4	Q4-5	Q4-5	Q4	Q4-5	Q4	Q4	Q4	Good
5	Q3-4	Q4	Q4	Q4	Q4-5	Q4-5	Q4	Q4-5	Q4	Q4	Q4	Good
6	Q3-4	Q4	Q4-5	Q3-4	Q4-5	Q4-5	Q4	Q4	Q4	Q4	Q4	Good

4.2 Protected Species.

Freshwater Pearl Mussel *(Margaritifera margaritifera)*.

Protection Status: EU Habitats Directive (92/43/EEC), Annex II. Wildlife Act 1976.

None found at any of the sampling sites.

The area near the right bank, immediately upstream of Tallyho Bridge, where a few mussels were previously known to be located (J. Lucey, *pers. comm*.), was checked to confirm that no mussels are present, as was found to be the case in from 2008 to 2018.

No freshwater pearl mussels are known to occur in any part of the river downstream of the Glanbia plant (E. Moorkens, *pers. comm.*).

White-Clawed Crayfish *(Austropotamobius pallipes)*.

Protection Status: EU Habitats Directive (92/43/EEC), Annex II. Wildlife Acts 1976-2012.

None found at any of the sampling sites. This species formerly occurred throughout much of the River Nore (J. Lucey, *pers. comm.*). It was found at Sites 1 and 2 in from 1997 to 2000, as well as at Site 3 in 1997 and 2000 and at Site 4 in 1999. A decline in the population of this species was first noted in 2001, when only one individual was found during the yearly invertebrate monitoring. Information from a local angler indicates that a considerable kill occurred around this time, with accumulations of dead crayfish in areas of slack water. No crayfish have since been found at any of the yearly monitoring sites.

Brook Lamprey *(Lampreta planeri)*.

Protection Status: EU Habitats Directive (92/43/EEC).

This species does not appear to occur in the main channel of the River Nore, but is widespread in the tributaries. (I. Kurz, *pers. comm*.).

River Lamprey *(Lampreta fluviatilis)*.

Protection Status: EU Habitats Directive (92/43/EEC).

An individual of this species was found in the kick sample take in the Owveg River (Site 6) for the 2018 biological water quality assessment undertaken by Sweeney Consultancy for Glanbia. These is also some habitat suitable for lamprey spawning and nursery in this part of the River Nore.

Sea Lamprey *(Pertomyzon marinus)*.

Protection Status: EU Habitats Directive (92/43/EEC).

It is thought that this species usually does not occur far upstream of the tidal reach of the river, (I. Kurz, *pers. comm.*).

Salmon *(Salmo salar)*.

Protection Status: EU Habitats Directive (92/43/EEC), Fisheries Acts. The main channel of the River Nore is a Salmonid Water, designated under the European Communities (Quality of Salmonid Waters) Regulations of 1988 (S.I. No. 293 of 1988).

Some suitable salmon spawning habitat occurs adjacent to the Glanbia plant.

Brown Trout *(Salmo trutta)*.

Protection Status: Fisheries Acts.

Excellent stocks of brown trout occur in the Nore (O'Reilly, 2002). Some suitable trout spawning habitat occurs adjacent to the Glanbia plant.

5. CONCLUSIONS

- In the May 2019 biological water quality survey, Q4-5 was ascribed to Site 1

- Q4 was ascribed to all the other four main channel sites of the River Nore and also to the site on the Owveg.

- A slight drop from High to Good ecological condition occurs in the c. 5km of the Nore main channel between Site 1 (Tallyho Bridge) and Site 2 (upstream of any influence of the Glanbia plant). The cause or causes of this slight decline were not determined. The input from the Owveg, at a biological water quality of Q4, would not, on its own, be sufficient to cause this decline, given the relatively small volume of this tributary in comparison to that of the Nore main channel.

- The invertebrate analyses indicate that the stretch of the River Nore, from a short distance upstream of the Glanbia plant to Ballyragget Bridge downstream is in Good Status, as defined by the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 (S.I. 77 of 2019).

- The Q-value results indicate no negative effects of the discharges from the Glanbia plant on the biological water quality of the River Nore.

6. NON TECHNICAL SUMMARY

- A biological assessment of water quality was carried out in order to establish the current water quality status of the River Nore in proximity to the Glanbia plant at Ballyragget and to assess any impact of the discharges to the river. The design of the survey is such that the data obtained can be directly compared with past and future data collected by the same method at the same sampling sites. Sampling was undertaken on 13 May, 2019, with samples taken at five sites on the River Nore, both upstream and downstream of the Glanbia plant and one site on the Owveg River.

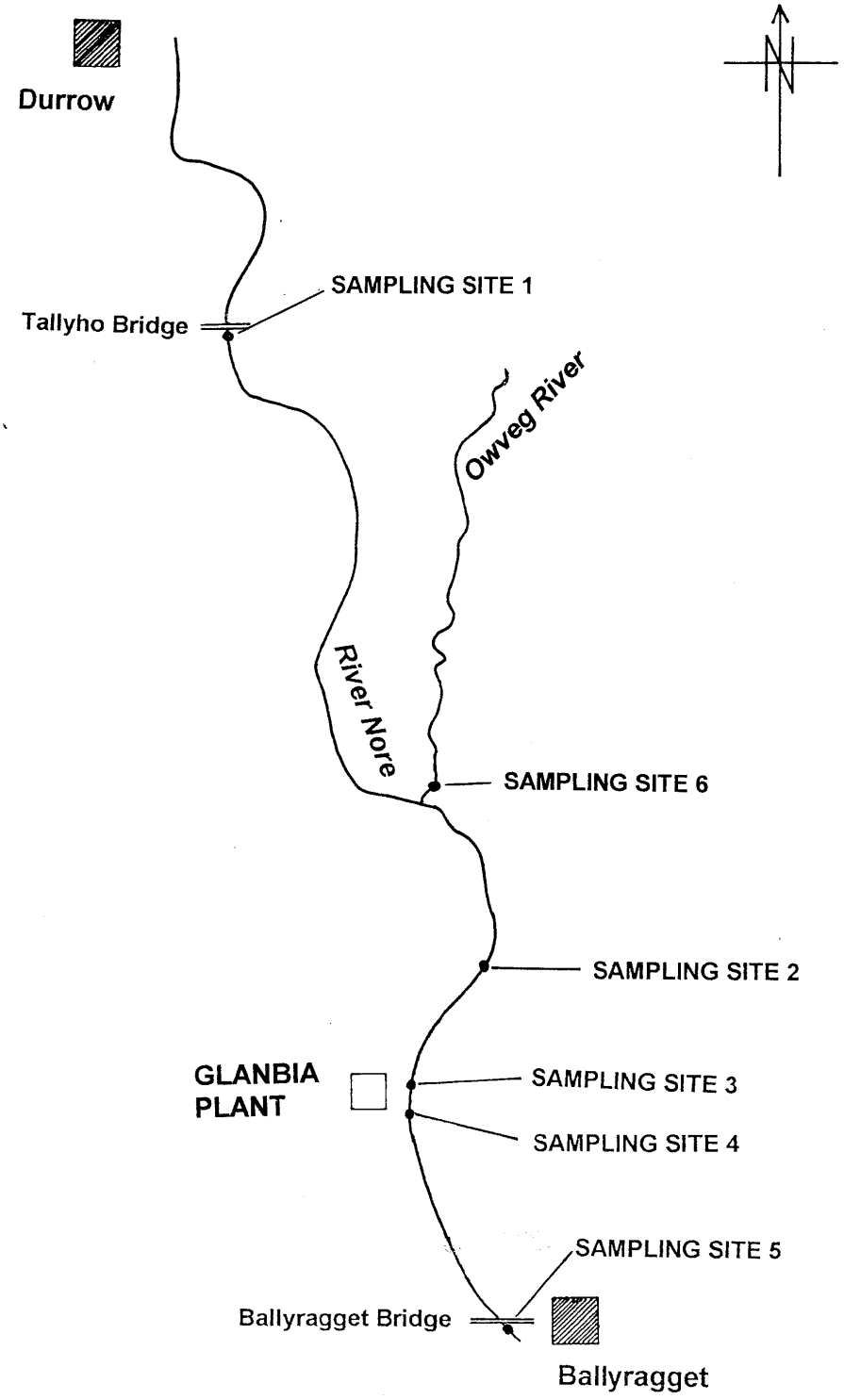
- Results show this stretch of the River Nore to be in satisfactory condition throughout, with High Status recorded at Tallyho Bridge, approximately 5km upstream of the Glanbia plant and Good Status recorded from a short distance upstream of the water intake to Ballyragget Bridge.

- Good Status was also recorded in the lower section of the Owveg River.

- The cause of the slight decline in quality recorded upstream of the plant was not determined.

- Results of the survey indicate that the Glanbia plant is currently having no significant impact on the biological water quality of the River Nore.

APPENDIX 1
SKETCH MAP OF RIVER NORE RIVER
INDICATING LOCATIONS OF SAMPLING SITES



APPENDIX 2
SAMPLING SITE LOCATIONS
and
SITE DETAILS

Watercourse	River Nore
EPA River Code	15/N/01
Site Code	1
Grid Reference	S4234 7622
EPA Station	1300
Location	Immediately downstream of Tallyho Bridge. Middle to right side of channel.
Substrate (in order of occurrence)	1. Cobble 2. Sand 3. Gravel
Sampling Depth (cm.)	55
Flow Type	Riffle: 50% Glide: 50%
Instream Vegetation (% Cover)	*Cladophora sp.* 1% *Fontinalis antipyretica* 5% *Ranunculus sp.* 1%

Watercourse	River Nore
EPA River Code	15/N/01
Site Code	2
Grid Reference	S4441 7273
Location	300 metres upstream of water intake. Right hand side of watercourse.
Substrate (in order of occurrence)	1. Cobble (mostly embedded) 2. Sand 3. Gravel
Sampling Depth (cm.)	60
Flow Type	Fast Glide: 100%
Instream Vegetation (% Cover)	*Vaucheria sp.* 1% *Fontinalis antipyretica* 5% *Ranunculus sp.* 5%

Watercourse	River Nore
EPA River Code	15/N/01
Site Code	3
Grid Reference	S4404 7229
Location	100 metres downstream of treated effluent outfall.
Substrate (in order of occurrence)	1. Cobble (mostly embedded) 2. Sand 3. Gravel
Sampling Depth (cm.)	50
Flow Type	Riffle: 100%
Instream Vegetation (% Cover)	*Cladophora sp.* 1% *Fontinalis antipyretica* 5% *Ranunculus sp.* 1%

Watercourse	River Nore
EPA River Code	15/N/01
Site Code	4
Grid Reference	S4397 7208
Location	30 metres downstream of former cooling water outfall. Right hand side of channel, out from slack flow.
Substrate (in order of occurrence)	1. Cobble (mostly embedded) 2. Sand 3. Gravel
Sampling Depth (cm.)	50
Flow Type	Riffle: 60% Glide: 40%
Instream Vegetation (% Cover)	*Cladophora sp.* 1% *Fontinalis antipyretica* 25% *Ranunculus sp.* 5%

Watercourse	River Nore
EPA River Code	15/N/01
Site Code	5
Grid Reference	S4452 7082
EPA Station	1450
Location	Immediately downstream of Ballyragget Bridge. Right side of channel.
Substrate (in order of occurrence)	1. Cobble (mostly embedded) 2. Gravel 3. Sand
Sampling Depth (cm.)	30
Flow Type	Riffle: 100%
Instream Vegetation (% Cover)	*Cladophora* 1% *Fontinalis antipyretica* 25% *Ranunculus sp.* 5%

Watercourse	Owveg River
EPA River Code	15/O/01
Site Code	6
Grid Reference	S4407 7377
Location	Riffle area 200 metres upstream of the confluence with the River Nore.
Substrate (in order of occurrence)	1. Cobble 2. Gravel
Sampling Depth (cm.)	30
Flow Type	Riffle: 100%
Instream Vegetation (% Cover)	*Ranunculus sp.* 5%
Comments	Cattle have access to this part of the Owveg River.

APPENDIX 3
PHOTOGRAPHS

Site 1. Tallyho Bridge

Site 2. Upstream of water intake

Site 3. Downstream of effluent outfall

Site 4. Downstream of cooling water

Site 5. Ballyragget Bridge

Site 6. Owveg River

APPENDIX 4
INVERTEBRATE COMMUNITY COMPOSITION

SITES 1 to 5: RIVER NORE; SITE 6: OWVEG RIVER

Relative abundance expressed as D: Dominant; N: Numerous; C: Common; F: Few; SS: Single Specimen

TAXON	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	SITE 6
Group A (Sensitive)						
Ecdyonurus sp.	C		SS			F
Heptagenia sp.	C	F			F	
Rhithrogena sp		F	F	SS	SS	C
Ephemera danica	C			F		F
Isoperla sp.	C	C	C	C	C	
Group B (Less Sensitive)						
Leuctra sp.						SS
Baetis muticus	F	F			F	
Glossosomatidae	SS				SS	
Hydroptilidae						
Lepidostomatidae	F	SS		F	F	
Leptoceridae		F	SS	F	SS	
Limnephilidae		F		SS		N
Sericostomatidae		SS	F	F		F
Group C (Relatively Tolerant)						
Nematoda						
Lumbriculidae	F		F	F	F	
Lumbricidae	SS			F	F	
Hydrachnidae	C	C				SS
Ancylus fluviatilis	F					
Potamopyrgus antipodarum	F					SS
Gammarus sp.	F	C	C	C	N	C
Baetis rhodani	C	N	N	C	N	C
Caenis sp.		SS				
Serratella ignita	C	SS	F	F		
Cheumatopsyche lepida			N	N	C	
Hydropsyche sp.		F	C	N	C	
Rhyacophilidae			F	F	F	
Polycentropodidae		SS				
Elmis aenea	F	C	C		F	C
Limnius volckmari	F	C	F	F	F	F
Haliplidae	F	SS				

Gyrinidae			SS			
Dicranota sp.					F	F
Simuliidae				SS		
Ceratopogonidae	SS			SS		
Chironomidae (ex. *Chironomus*)		N	N	C	C	F
Group D (Very Tolerant)						
Enchytraeidae			F		SS	
Naididae						SS
Pisidium sp.				SS		
Asellus sp.		SS		F		
Glossiphonidae						
Group E (Most Tolerant)						
Tubificidae*		F	F	F		

*All tubificids found were *Rhyacodrilus coccineus,* a species associated with sandy, rather than enriched conditions.

APPENDIX 5
REFERENCES

EPA (2018). Standard Operating Procedure for River Biological Monitoring Field Sampling Surveys (Version 1.7). EPA internal publication.

Sweeney, P. (2016). Current status of aquatic oligochaetes in Ireland. *Bulletin of the Irish Biogeographical Society* 40: 3-17.