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BIOLOGICAL WATER QUALITY ASSESSMENT OF THE TOLKA RIVER, CLONEE, CO. DUBLIN

Kepak
c/o Rowan Consulting Engineers
Unit 1 Scurlockstown Business Park
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Trim
Co. Meath

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TABLE OF CONTENTS

1 INTRODUCTION ____ 3
2 METHODOLOGY ____ 4
3 RECEIVING ENVIRONMENT ____ 7
4 RESULTS OF THIS ASSESSMENT ____ 8
5 DISCUSSION ____ 10
6 APPENDIX I- RESULTS OF MONITORING ____ 11

1 INTRODUCTION

1.1 BACKGROUND

In June 2019, a cleaning chemical spill of TOPAZ CL4 occurred onsite at Kepak Clonee and entered the River Tolka through the SW2 outlet, which resulted in a fish kill downstream. This incident was reported to the EPA, and in response they requested that a full audit of the River Tolka be undertaken at points upstream and downstream of the Kepak discharge point. Therefore, in June 2019, Whitehill Environmental was commissioned by Rowan Consulting Engineers to undertake an investigation of the biological water quality (as measured by the Q value and SSRS) of the Tolka River, both upstream and downstream of the SW2 discharge point. This report presents the results of this survey.

1.2 Q VALUE ASSESSMENT

Along with other parameters (fish, morphology, chemistry), the Q value is used to determine the ecological status of the waterbody, which is an action required under the obligations set out in the EU Water Framework Directive. Under this Directive, all water bodies are required to meet good status within a certain time period. Ireland is now in the second cycle of the Water Framework Directive and therefore good status should be achieved in all water bodies by the end of this current cycle, i.e., 2021. If a waterbody is unlikely to achieve this status, then it is deemed to be *At Risk*. Table 1 summaries the Q values in relation to Water Framework Directive status.

Q Value	WFD Status	Pollution Status	Condition
Q5, Q4-5	High	Unpolluted	Satisfactory
Q4	Good	Unpolluted	Satisfactory
Q3-4	Moderate	Slightly polluted	Unsatisfactory
Q3, Q2-3	Poor	Moderately polluted	Unsatisfactory
Q2, Q1-2, Q1	Bad	Seriously polluted	Unsatisfactory

Table 1 – Q Rating in Relation to WFD Status

2 METHODOLOGY

2.1 PERSONNEL

This ecological assessment was carried out by Noreen McLoughlin, BA, MSc, MCIEEM, of Whitehill Environmental. Noreen has an honours degree in Zoology and an MSc in Freshwater Ecology from Trinity College, Dublin and she has been a full member of the Chartered Institute of Ecology and Environmental Managements for 13 years. Noreen has over 15 years' experience as a professional ecologist in Ireland.

2.2 BIOLOGICAL ASSESSMENT

SAMPLE COLLECTION

Biological water quality assessment was carried out at four separate locations on the Tolka River, both upstream and downstream of the effluent discharge point. These locations are summarised in Table 2 and illustrated in Figure 1.

Station No.	Location	Co-Ordinates
Upstream	150m upstream from discharge point	53.410636, -6.4327763
Downstream 1	100m downstream from discharge point	53.411933, -6.4301864
Downstream 2	350m downstream from discharge point	53.412049, -6.4274784
Downstream 3	350m downstream from discharge point	53.410776, -6.4251022

Table 2 – Stations Sampled as Part of this Assessment

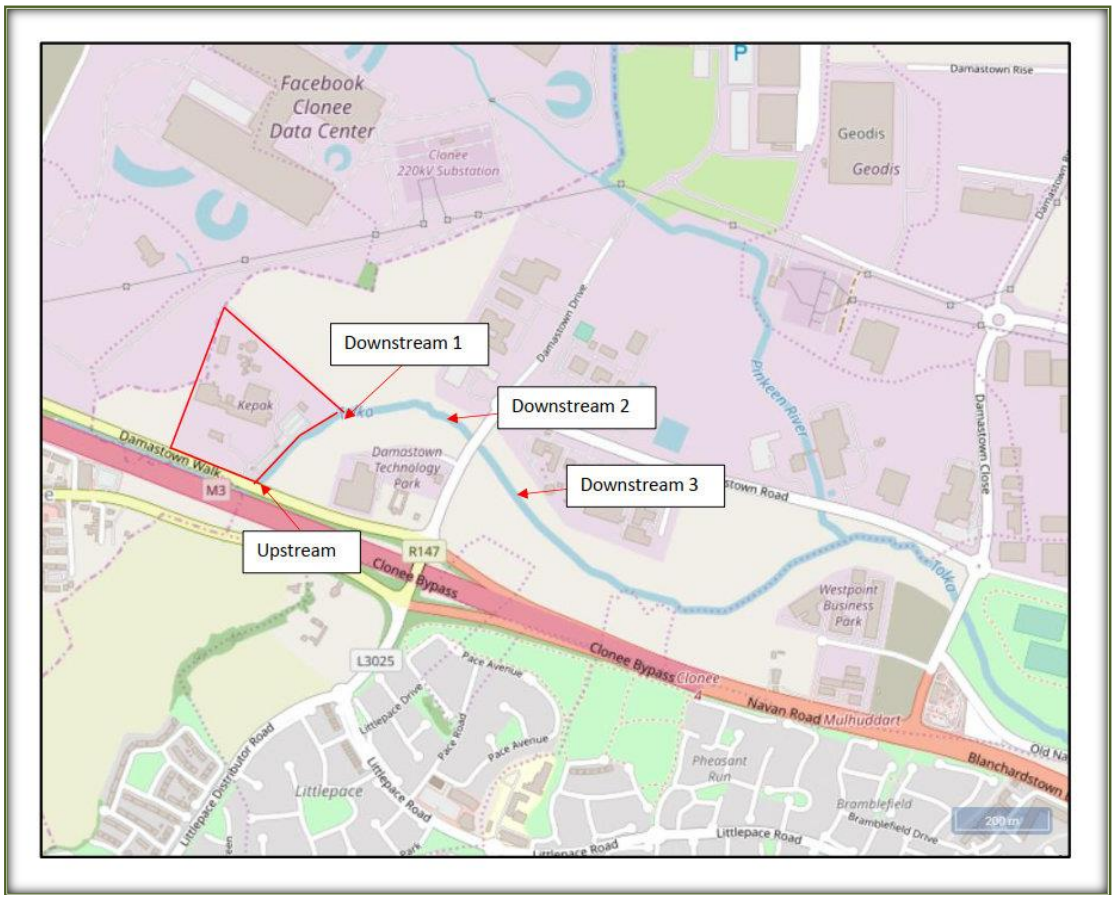

Figure 1 – Location of Sampling Points on the River Tolka

Fieldwork was carried out on June 26th 2019 by trained personnel from Rowan Engineering Consultants Ltd (Rowan). Samples were then subsequently delivered to Whitehill Environmental.

At each station, the surrounding habitats were noted along with other parameters such as water flow, stream depth and the predominance of vegetation. All samples were taken with a Freshwater Biological Association approved hand held sweep net with a mesh diameter of 500µm. At both stations, a two minute kick and stone wash sample was taken at a suitable riffle site, if there was one present. The samples were retained in plastic containers at the sampling site. In the lab, any fine mud and debris were removed from each sample by sieving under running water through a 500 µm sieve. The samples were then sorted live in a white tray under a bench lamp. All macro-invertebrates were preserved in 70% methanol, before being counted and identified to the appropriate taxonomic level. This was generally to family level but where necessary to species level.

Q VALUE

Based on the relative abundance of indicator species, the Q value was determined for the sites in accordance with the biological assessment procedure used by the Environmental Protection Agency (Toner *et al.* 2005). The method categorises invertebrates into one of five different groups based on their sensitivity or tolerance to pollution. Group A are the most sensitive forms, Group B are less sensitive, Group C are tolerant, Group D are very tolerant and Group E are the most tolerant. Overall, the higher the biological diversity and the greater the abundance of invertebrate species that are sensitive to organic pollution, then the higher the water quality is assumed to be and the higher the Q value assigned to that sampling station.

The relative abundance of each group of invertebrates in the samples was assigned as follows:

- Present (1/2 individuals)
- Scarce/Few (<1%)
- Small Numbers (<5%)
- Fair Numbers (5-10%)
- Common (10-20%)
- Numerous (25-50%)
- Dominant (50-75%)
- Excessive (>75%)

3 RECEIVING ENVIRONMENT

3.1 SITE LOCATION

Kepak Clonee is located in the townland of Damastown, approximately 700m north-east of Clonee town centre. The site is surrounded by improved agricultural grassland habitats. A site location map is shown in Figure 2.

Figure 2 – Site Location Map. Location of Kepak is Pinned.

3.2 WATER FEATURES AND QUALITY

The River Tolka is in the Liffey and Dublin Bay River Basin District and Catchment, and the Tolka Sub-Catchment and Sub-Basin. The EPA has classified the ecological status of the Tolka River and its tributaries as bad in the Clonee area. Under the requirements of the Water Framework Directive, this is unsatisfactory and all waterbodies must achieve good status by 2021.

4 RESULTS OF THIS ASSESSMENT

Results of the biological water quality monitoring are summarised in Table 4.

Station	Location	Q Value & Status
1	Upstream	Q3 – Poor
2	Downstream 1	Q3 - Poor
3	Downstream 2	Q2/3 – Poor
4	Downstream 3	Q2/3 - Poor

Table 4 – Summary of Findings of the Tolka Biological Water Quality Assessment

TOLKA RIVER UPSTREAM

The numbers (N=128) and biodiversity of taxa in this sample were moderate. No one taxa from any group dominated the sample or occurred in the sample in excessive numbers. Overall, Group C taxa dominated the faunal assemblage at 48%. Group C taxa are indicative of moderate pollution. The most common Group C organism and the most common taxon overall in the sample were mayflies from the Caenidae family. These comprised 23% of the fauna. Other Group C taxa that were common included diptern larvae from the Chironomidae family. The remaining Group C taxa were only present in low numbers. Group D taxa are quite tolerant of pollution, and these were common in the sample. They were mostly represented by the water louse, *Asellus aquaticus.* The most tolerant Group E taxa were absent from the sample. Group A were represented by one single specimen of the mayfly species *Ephemera danica*. Group B were absent. Oligochetes were numerous in the sample. These are not assigned to a group for Q value purposes, although they are considered quite tolerant of pollution.

Overall, based on the relative abundance of the indicator groups and the fact that Group C was numerous, and Group D were common, this station was assigned a Q3, i.e., poor ecological status. This is unsatisfactory.

TOLKA RIVER DOWNSTREAM 1

The numbers (N=281) and biodiversity at this downstream station were also moderate. Group C were the dominant taxa in this sample, comprising over 54% of the total faunal assemblage. The most common Group C organisms in the sample were C chironomids and mayflies from the Caenidae families. Other Group C taxa present in the sample included the freshwater shrimp *Gammarus duebeni* and the mayfly *Ephemerella ignita*. Group D taxa were numerous in the sample, comprising over 32% of the total assemblage. The most common Group D taxa was the louse *Asellus aquaticus*. This comprised over 31% of the total fauna, and it was the

most abundant taxon in the sample overall. These lice are generally quite tolerant of pollution. Groups A, B and E were all absent from this sample. Oligochaetes were common.

Overall, based on the relative abundance of the indicator groups and the fact that Group C were dominant (not excessive) and Group D were numerous, this station was assigned a Q3, indicating poor ecological status. This is unsatisfactory.

TOLKA RIVER DOWNSTREAM 2

The numbers in this sample were quite high (N=599) and overall biodiversity was also moderate. Unlike the previous stations, the more tolerant Group D taxa dominated the sample, with *Asellus aquaticus* being the dominant taxa present at 52%. Group C taxa were numerous, and the most common taxa from this group included mayflies from the Caenidae family and chironomid larvae. Other Group C were only present in small numbers or less. Groups A, B and E were all absent from this sample. Oligochaetes were only present in small numbers.

Overall, based on the relative abundance of the indicator groups and the fact that Group D were dominant, and Group C were numerous, this station was assigned a Q2-3, indicating poor ecological status. This is unsatisfactory.

TOLKA RIVER DOWNSTREAM 3

The numbers in this sample were quite high (N=695) and overall biodiversity was also moderate. Like the previous stations, Group D taxa dominated the sample, with *Asellus aquaticus* being the dominant taxa present at 46%. Group C taxa were numerous at 33%, and the most common taxa from this group included mayflies from the Caenidae family and beetles from the Elminthidae families. Other Group C were present included the diptern Simuliidae, chironomid larvae and *Gammarus duebeni*. The snail *Lymnaea glabra* (*Omphiscola glabra*) was present in fair numbers. Groups A, B and E were all absent from this sample. Oligochaetes were common in this sample.

Overall, based on the relative abundance of the indicator groups and the fact that Group D were dominant, and Group C were numerous, this station was assigned a Q2-3, indicating poor ecological status. This is unsatisfactory.

5 DISCUSSION

Overall, based on a comparison of the results between the upstream and downstream samples of the River Tolka, there does not seem to have been any apparent or obvious toxic effect arising from the chemical spill into the Tolka on the macroinvertebrate assemblages of the river. If a comparison is made of the fauna from Sample 1 (upstream) with Sample 2 (Downstream 1), there are no significant differences in the numbers or species composition between the two samples. There is one Group A mayfly present in the upstream sample, which is absent in all downstream samples. However, one specimen is not a significant number and no inference can be made on the presence or absence of one specimen. Other specimens absent from downstream samples which are present in the upstream samples include the water bugs (Corixidae). It is unusual to find these invertebrates in rivers and they are mostly a group associated with lakes. Their absence in downstream samples is not unusual.

Water quality in the four samples is poor overall. There is no significant difference in the biological water quality in the upstream sample with the first downstream sample. Both received a Q3. Further downstream there is a deterioration however, and both samples 3 and 4 received a Q2-3, based on the dominance of Group D taxa. This deterioration may be influenced by other discharges into the Tolka from the industrial and urban areas of Clonee.

6 APPENDIX I- RESULTS OF MONITORING

River Tolka Upstream

Indicator Group	Taxon	Number	% Abundance
Group A		**1**	**0.7**
(Very sensitive)	**Ephemeroptera**	**1**	**0.7**
	Ephemera danica		
Group B		**0**	**0**
(Moderately sensitive)	Absent		
Group C		**62**	**48.4**
(Moderately tolerant)	**Ephemeroptera**		
	Caeniidae	30	23.4
	Ephemerella ignita	2	1.4
	Amphipoda		
	Gammarus duebeni	1	0.7
	Diptera		
	Chironomidae	18	14
	Coleoptera		
	Haliplidae	1	0.7
	Gastropoda		
	Bithynia	1	0.7
	Hemiptera		
	Corixidae	9	7
Group D		**20**	**15.6**
(Very tolerant)	**Isopoda**		
	Asellus aquaticus	18	14
	Gastropoda		
	Lymnaea peregra	2	1.4
Group E		**0**	**0**
(Most tolerant)	**Absent**		
Not Assigned		**45**	**35.1**
	Oligochates		
	Naidinae	45	35.1
Total Abundance		**128**	
Q Value - Q3 Poor Ecological Status			

River Tolka Downstream 1

Indicator Group	Taxon	Number	% Abundance
Group A		**0**	**0**
(Very sensitive)	Absent		
Group B		**0**	**0**
(Moderately sensitive)	Absent		
Group C		**154**	**54.8**
(Moderately tolerant)	**Ephemeroptera**		
	Caenidae	64	22.7
	Ephemerella ignita	11	3.9
	Baetis rhodani	4	1.4
	Amphipoda		
	Gammarus duebeni	6	2.1
	Diptera		
	Chironomidae	67	23.8
	Coleoptera		
	Haliplidae	1	0.35
	Elminthidae	1	0.35
Group D		**91**	**32.3**
(Very tolerant)	**Isopoda**		
	Asellus aquaticus	88	31.3
	Hirudinea		
	Glossiphonidae	3	1
Group E		**0**	**0**
(Most tolerant)	**Absent**		
Not Assigned		**36**	**12.8**
	Oligochates		
	Naidinae	36	12.8
Total Abundance		**281**	
Q Value - Q3 Poor Ecological Status			

River Tolka Downstream 2

Indicator Group	Taxon	Number	% Abundance
Group A		**0**	**0**
(Very sensitive)	Absent		
Group B		**0**	**0**
(Moderately sensitive)	Absent		
Group C		**256**	**42.7**
(Moderately tolerant)	**Ephemeroptera**		
	Caenidae	186	31
	Ephemerella ignita		
	Baetis rhodani	1	0.16
	Amphipoda		
	Gammarus duebeni	9	1.5
	Diptera		
	Chironomidae	55	9.1
	Coleoptera		
	Haliplidae	1	0.16
	Elminthidae	2	0.32
	Gastropoda		
	Bithynia	2	0.32
Group D		**315**	**52.5**
(Very tolerant)	**Isopoda**		
	Asellus aquaticus	312	52
	Hirudinea		
	Glossiphoniidae	2	0.32
	Erpobdellidae	1	0.16
Group E		**0**	**0**
(Most tolerant)	**Absent**		
Not Assigned		**28**	**4.6**
	Oligochates		
	Naidinae	28	4.6
Total Abundance		**599**	
Q Value - Q2-3 Poor Ecological Status			

River Tolka Downstream 3

Indicator Group	Taxon	Number	% Abundance
Group A		**0**	**0**
(Very sensitive)	Absent		
Group B		**0**	**0**
(Moderately sensitive)	Absent		
Group C		**230**	**33**
(Moderately tolerant)	**Ephemeroptera**		
	Caenidae	90	12.9
	Amphipoda		
	Gammarus duebeni	14	2
	Diptera		
	Chironomidae	17	2.4
	Simuliidae	3	0.43
	Coleoptera		
	Elminthidae	42	6
	Gastropoda		
	Bithynia	4	0.57
	Lymnaea glabra	60	8.6
Group D		**366**	**52**
(Very tolerant)	**Isopoda**		
	Asellus aquaticus	325	46.7
	Hirudinea		
	Glossiphoniidae	1	0.14
	Bivalvia		
	Pisidium	40	5.7
Group E		**0**	**0**
(Most tolerant)	**Absent**		
Not Assigned		**99**	**14.2**
	Oligochates		
	Naidinae	99	14.2
Total Abundance		**695**	
Q Value - Q2-3 Poor Ecological Status			