

River Pollution Case Study

Eastern Regional Fisheries Board

**Summary Report on pollution of the
Tolka River near Clonee, Co. Dublin**

Date of Offence: July, 2005

Background

Members of local angling groups reported a poor quality discharge of effluent (and an associated fish kill) on the Tolka River to the ERFB in mid July 2005. On arrival at the reported discharge location and on visual inspection in the vicinity of the implicated surface water discharge point, it was noted that there was no discharge coming from the pipe. However significant 'chemical burning' of bank-side vegetation around the discharge pipe, a discolouration of the river bed and a general absence of in-stream aquatic flora and fauna downstream of the discharge point were noted. Live fish (juvenile stickleback) and invertebrates were observed approximately 5 metres upstream of the discharge point but were absent downstream of this location. An ammonia-like odour was present in this area. There was no other apparent discharge above or below this point in this area.

A series of samples were collected at the site. During collection of water samples, the investigating Fishery Environmental Officer (FEO) experienced the sudden effect of a noxious (ammonia-like smell) gas which manifested itself in shortness of breath, and skin / eye irritation. Approximately 10 seconds after initial effects of the gaseous plume were felt, the surface water pipe discharged a voluminous effluent which was initially propelled a distance of approximately 5 metres directly into the river channel. This discharge continued for 5 minutes. Samples were collected of the effluent from the pipe and from the river channel downstream.

ERFB FEO's visited the plant from which the pipe was discharging immediately and explained the urgent situation to senior staff. FEO's insisted that a guarantee be given that no further effluent would enter the channel from the plant. Senior staff gave this guarantee. Subsequent inspection of the Tolka River downstream of the surface water discharge pipe revealed a massive fish kill (1000's of dead fish) in addition to an apparent wipe out of most macroinvertebrate life from the discharge point downstream for a substantial distance. A subsequent electrofishing survey carried out by ERFB staff revealed 100% mortality of all salmonid fish species for a distance of approximately 7km downstream of the discharge point.

Laboratory Analysis Report

The Tolka River supports salmonid populations; however it has not been designated as Salmonid Waters in accordance with EU Directive 78/659. S.I. 293/1988 sets down quality standards for waters capable of supporting salmonids and these are highlighted in the following data table. The table below presents results for laboratory analysis of samples collected from the Tolka River in July, 2005 pertaining to this case.

Table 1. Results for physico-chemical laboratory analysis of water / effluent samples

Sample No.	B.O.D. (mg/l)		C.O.D. (mg/l)		pH		Suspended Solids (mg/l)		Orthophosphate asPO ₄ -P(mg/l)		Ammonium as NH ₄ (mg/l)	
	Level	Limit	Level	Limit	Level	Limit	Level	Limit	Level	Limit	Level	Limit
S1 (Tolka R. 120m downstream of pipe)	0.6	≤ 5	13.2	≤ 5	8.3	6 – 9	<10	≤ 25	0.145	Not Specified ²	0.099	≤ 1
S2 (Tolka R. 5m downstream of pipe)	0.4	≤ 5	16.1	≤ 5	8.35	6 – 9	16	≤ 25	0.143	Not Specified ²	0.072	≤ 1
S3 (Tolka R. 5m upstream of pipe)	0.2	≤ 5	13.5	≤ 5	8.3	6 – 9	<10	≤ 25	0.141	Not Specified ²	0.064	≤ 1
S4 (pool directly beneath pipe)	52.5	N/A ¹	367	N/A ¹	10.25	N/A ¹	25	N/A ¹	2.32	N/A ¹	2,195.0	N/A ¹
S5 (seepage to river)	17.6	N/A ¹	186	N/A ¹	8.8	N/A ¹	345	N/A ¹	0.112	N/A ¹	98.1	N/A ¹
S6 (Sample of effluent from pipe)	50.0	N/A ¹	505	N/A ¹	10.8	N/A ¹	62	N/A ¹	2.16	N/A ¹	7,280.0	N/A ¹
S7 (120m downstream of discharge when active)	6.8	≤ 5	51	≤ 5	10.05	6 – 9	37	≤ 25	0.150	Not Specified ²	306.0	≤ 1

Limit Under S.I. No. 293/1988: European Communities (Quality of Salmonid Waters) Regulations 1988



Indicates violation of limit under S.I. No. 293/1988: European Communities (Quality of Salmonid Waters) Regulations 1988



Indicates upstream background sample

- 1 Limits not applicable to actual discharge, only to receiving waters
- 2 Though no limits are specified under S.I. No. 293/1988 the Local Government (Water Pollution) Act 1977 (Water Quality Standards for Phosphorus) Regulations 1998, S.I. 258 of 1998 states that an increase in Annual Median PO₄ (orthophosphate) leads to a decrease in Biological Quality Class (Q value).

Discussion

- Physico-chemical characteristics for Tolka River samples S1 (120m downstream of pipe), S2 (5m downstream) and S3 (5m upstream) show little or no impact of any discharge in this area. The surface water pipe was not flowing when collection of these samples took place. Results would be considered typical for this river at this time of year.
- Sample S4 (from the river bank pool beneath the pipe) was characterised as toxic effluent displaying elevated BOD and COD levels and substantially elevated pH, Ortho-P and particularly elevated Ammonium levels. This pool of effluent had been retained on the channel bank following an unrecorded previous discharge.
- Sample S5 was characterised as diluted toxic effluent – formed as a result of effluent mixing with river water as it seeped toward the main channel. The effluent again displayed elevated BOD, COD, pH, Ortho-P and Ammonium levels.
- Sample S6 was collected directly from surface water pipe SW3 when actively discharging. The effluent proved highly toxic to aquatic organisms and comprised elevated BOD, COD, pH and Ortho-P levels and a significantly elevated concentration of Ammonium (7,280 mg/l). Ammonia is generally present in natural waters, through in very small amounts. When present in natural waters in levels above 0.1mg/l N, sewage or industrial contamination may be indicated (EPA, 2001)).
- Sample 7 was collected in the Tolka River 120m downstream of the surface water pipe (i.e. the same location as sample S1) when the discharge was active. Sample

results contrast notably with S3 (upstream sample) and S1 (downstream sample prior to the discharge). This contrast represents an alteration of physico-chemical conditions within the Tolka River under the influence of the discharge. River water was highly contaminated and displayed breaches of limits for BOD, COD, pH, Suspended Solids, and Total Ammonium as stated under S.I. No. 293/1988: European Communities (Quality of Salmonid Waters) Regulations 1988. Most notable of these breaches was the level of Total Ammonium - 306 times the upper limit for salmonid waters at time of sampling. Un-ionised ammonia ($\text{NH}_3\text{-N}$) and ionised ammonia ($\text{NH}_4^+\text{-N}$) represent two forms of reduced inorganic nitrogen which exist in equilibrium depending upon the pH and temperature of the waters in which they are found. Of the two, the free ammonia form is considerably more toxic to organisms such as fish and, therefore, we pay considerable attention to the relative concentration of this particular contaminant. In the Tolka River at S7 a Total Ammonium concentration in water of 306mg/l at pH 10.05 and a temperature of 25°C would have resulted in an un-ionised ammonia concentration of 264.5mg/l. This concentration is highly toxic to freshwater aquatic organisms including all fish and most invertebrate species and represents a level approximately 13,000 times that specified as the upper limit for salmonid waters to be conformed with by 95% of samples over a 12 month period in S.I. No. 293/1988: European Communities (Quality of Salmonid Waters) Regulations 1988.



Plate 1: Voluminous discharge of noxious effluent from discharge pipe (side view).
Noxious gas in the vicinity of this discharge made it impossible to breathe



Plate 2: Discolouration of water downstream of the discharge from surface water pipe.



Plate 3: Discolouration of water at sampling location S7. Arrow denotes front of polluting plume as it flows downstream



Plate 4: Dead trout downstream of surface water discharge pipe SW3. 1000's of trout were found dead in this area



Plate 5: Dead adult trout downstream of surface water discharge pipe SW3. 100's of trout were found dead in this area



Plate 6: Dead eel and stickleback downstream of surface water discharge pipe. 1000's of stickleback, 100's of minnow, 10's of stoneloach and eels were found dead in this area

Subsequent site visits

The industrial site, the riverside discharge point and the Tolka River in this area have been visited by the ERFB numerous times to monitor the ongoing situation and ensure no subsequent pollution of the river has occurred since July, 2005. Following initial ERFB investigations, the site has subsequently been investigated by Fingal County Council (in conjunction with the ERFB) and has been comprehensively audited by the EPA. All agencies are now satisfied that processes at the plant have been reviewed and problem areas addressed.

Prosecution

The discharge from the industrial plant's surface water pipe in July, 2005 was 'deleterious matter' and as such was contrary to Section 171 (1) (b) of the Fisheries Consolidation Acts, 1959, as amended.

Eastern Regional Fisheries Board –v– Defendant, case heard in January, 2006 at Dunshaughlin District Court

Legal representatives of the industrial plant (defendant) pleaded guilty to the ERFB's charge under section 171 (1)(b) of the Fisheries Consolidation Act, 1959.

The defendant, having already paid the costs and expenses incurred, was fined €250.00 and allowed one month to pay with distress in default. In addition, on being cross-examined by the judge in relation to re-stocking expenses, a FEO for the ERFB cited a sum of €10,000 as the projected costs to reinstate salmonid populations in the river. The defendant undertook to pay this sum in order to defray these costs. A comprehensive restocking programme was initiated by the ERFB soon after the event in July of last year and continued this summer. While short term ecological damage in the system was extensive, the river would appear to be returning to normal conditions relatively quickly. Kick samples (to assess biological quality) taken about one month after the event were already showing down-migration and re-colonisation by macroinvertebrate populations of effected channel areas. Routine ERFB monitoring of the area continues.

The invaluable assistance afforded by River Tolka angling and environmental groups to the ERFB both in initial detection of the discharge and subsequent investigations must be highlighted. Our sincere thanks are extended to all those involved.