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GRAPHICAL REPRESENTATIONS OF CERTAIN METALS AND ORGANICS CONCENTRATIONS VERSUS FLOW RATES FOR SOME OF THE RIVERS IN DISTRICTS 3 AND 6

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INTRODUCTION

The aim of this report is to present the data relating the concentrations of certain determinands to flow rates at a total of five sites on four different rivers. The determinands selected were Cadmium, Copper, Zinc and HCHγ and the samples were taken on the rivers Mole, Thames, Wey and two sites on the River Wandle.

The data used has been collated over the period January 1986 to December 1990.

RESULTS DESCRIPTION

1.

The relationship between rates of flow and Cadmium concentrations were investigated at four sites:

1.1 Variation in Cadmium concentrations with flow rates in the Hogsmill River, upstream of the Thames (Fig.1)

All the Cadmium concentrations were recorded at times when flows were less than 3 cumecs. The lowest and highest Cadmium concentrations of 0.0001 mgl^{-1} and 0.0021 mgl^{-1} respectively were recorded at flows of less than 1 cumec. The majority of concentrations ranged between 0.0001 and 0.0003 mgl^{-1}, with most values appearing independent of the flow rate.

1.2 Variation in Cadmium concentration with flow rate in the River Mole upstream of the Thames (Fig.2)

The majority of samples were taken at times of flow less than 3 cumecs, with only 4 of the samples taken at flows greater. Those Cadmium concentrations recorded at flows greater than 3 cumecs varied between 0.0001 and 0.0002 mgl^{-1}. The maximum recorded concentration of 0.0023 mgl^{-1} occurred when the flow was at 1.55 cumecs, with the joint minimum values of 0.0001 mgl^{-1} being recorded at flows ranging between 1 and 4 cumecs, plus one "outlier" result at 11.2 cumecs.

1.3 Variation in Cadmium concentration with flow rate in the River Wandle at the Causeway (Fig.3)

All samples were taken when flows varied between 1 and 4.5 cumecs. Apart from 4 samples, most Cadmium concentrations ranged between 0.0001 and 0.002 mgl^{-1} throughout the range of flows. The highest Cadmium concentration of 0.011 mgl^{-1} occurred at a flow of 3.55 cumecs, and the lowest concentration of 0.0001 mgl^{-1} at 1.5 cumecs.

1.4 Variation in Cadmium concentration with flow rate in the River Wandle at Watermeads, Mitcham (Fig.4)

The distributions of concentration values in relation to flow rates appears to be random. Concentrations vary between 0.0001 mgl^{-1} at 2.06 cumecs and 0.0024 mgl^{-1} at 1.62 cumecs, with most of the recorded values being less than 0.0011 mgl^{-1}.

2.

The relationship between Copper concentration and flow rates were investigated at two sites:

2.1 Variation in Copper concentration with flow rate in the River Wandle at Watermeads, Mitcham (Fig.5)

From Fig.5 it appears that Copper concentration is inversely proportional to the rate of flow. Samples were taken when the flow varied between 1.6 to 5.7 cumecs. The highest concentration of 0.126 mgl^{-1} was recorded at a flow of 2.2 cumecs, values then decrease to a minimum level that fluctuates between 0.24 and 0.46 mgl^{-1} at higher flows.

2.2 Variation in Copper concentration with flow rate in the River Wandle at the Causeway (Fig.6)

The majority of values occur in the 0.03 to 0.15 mgl^{-1} range, apart from three exceptionally high "outliers". The higher concentrations, excluding the "outliers", occurred at the relatively low flows of 20 cumecs or less with values descending from the maximum of 0.143 mgl^{-1} at 1.78 cumecs to 0.052 mgl^{-1} at 5.7 cumecs. However, the range of Copper concentrations in the 2 cumecs or less range varies between 0.05 and 0.143 mgl^{-1}.

3.

The relationship between Zinc concentration and flow rate was investigated at four sites:

3.1 Variation in Zinc concentration with flow rates in the River Hogsmill, upstream of the Thames (Fig.7)

Most of the samples taken for Zinc analysis were taken at the relatively low flow range of 0.7 cumecs to 1.4 cumecs. Over this range concentrations varied between 0.02 and 0.082 mgl^{-1} with no obvious direct relationship between flow rate and concentration. The maximum recorded value of 0.12 mgl^{-1} occurred when the flow was at 2.14 cumecs and the minimum value of 0.02 mgl^{-1} at 0.76 cumecs.

3.2 Variation in Zinc concentration with flow rates in the River Mole upstream of the Thames (Fig.8)

Samples were taken when flows fluctuated between 1 and 29 cumecs, with most of the samples taken at flows varying between 1 and 3 cumecs. In the 1 to 3 cumec range concentrations varied between 0.009 mgl^{-1} (the minimum overall concentrations at a flow of 1.4 cumecs) and 0.048 mgl^{-1} at 2 cumecs, with no apparent relationship to flow. This random distribution was further emphasised in the samples taken at greater flows.

3.3 Variation in Zinc concentration with flow rates in the River Wey, upstream of the Thames (Fig.9)

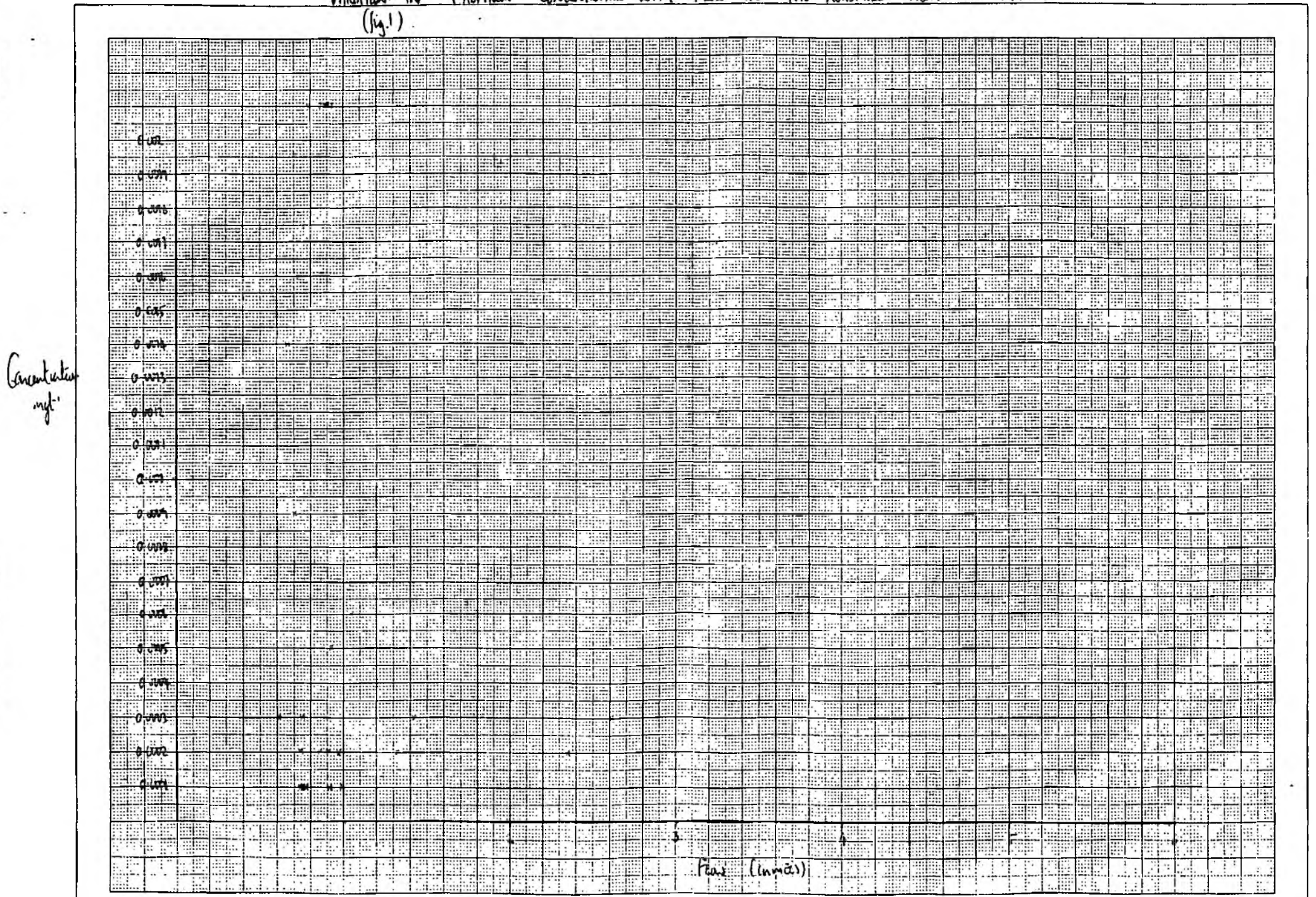
Zinc concentration was found to fluctuate between 0.09 mgl^{-1} at 4.1 cumecs and 0.143 mgl^{-1} at 11.2 cumecs. Over the range of flows when sampling occurred (1.45 cumecs to 26.2 cumecs) there appears to be no obvious relationship with Zinc concentration, whose distribution appears to be random.

3.4 Variation in Zinc concentration with flow rates in the River Thames upstream of the NSWC Intake, Egham (Fig.10)

On the whole most concentrations ranged between 0.008 and 0.02 mgl^{-1} with values appearing independent of the rate of flow. Larger values of up to the maximum of 0.09 mgl^{-1} at 68.5 cumecs were also recorded and these values also appear unrelated o the flow conditions.

Variation in Cadmium Concentration with Flow in the Hogshill above the Thames

(fig. 1)



The relationship between HCH γ concentration and flow rates were investigated at four sites:

4.1 Variation with HCH γ concentration with flow rates in the River Hogsmill upstream of the Thames (Fig.11)

Over the flow range 0.6 to 1.3 cumecs, when the majority of sampling took place, HCH γ concentration varied between 0.045 and 0.14 mgl^{-1} with no apparent relationship between the values and flow rate. The maximum concentration of 0.363 ugl^{-1} occurred when the flow was at 1.42 cumecs, and the minimum concentration of 0.028 ugl^{-1} at 2.35 cumecs.

4.2 Variation of HCH γ concentration with flow rates in the River Thames above the NSWC intake, Egham (Fig.12)

The majority of recorded HCH γ concentrations ranged between 0.01 and 0.033 ugl^{-1}, with these values being recorded at flows varying from 19.5 to 322 cumecs. The three highest HCH γ concentrations of 0.046 ugl^{-1}, 0.09 ugl^{-1} and the maximum recorded value of 0.12 ugl^{-1} occurred between flows of 50 and 65 cumecs. On the whole HCH γ concentration appears unrelated to the flow rate at this site.

4.3 Variation in HCH γ concentration with flow rates in the River Wey upstream of the Thames (Fig.13)

At this site a baseline concentration of values ranging between 0.01 and 0.1 ugl^{-1} was observed for all the flow rates (1-26 cumecs) recorded. The concentrations greater than 0.1 ugl^{-1} exhibited an increase in concentration from 0.165 ugl^{-1} at 3.5 cumecs to a maximum of 9.03 ugl^{-1} at 12.8 cumecs. However, these values were pollution incident related and are considered unrepresentative.

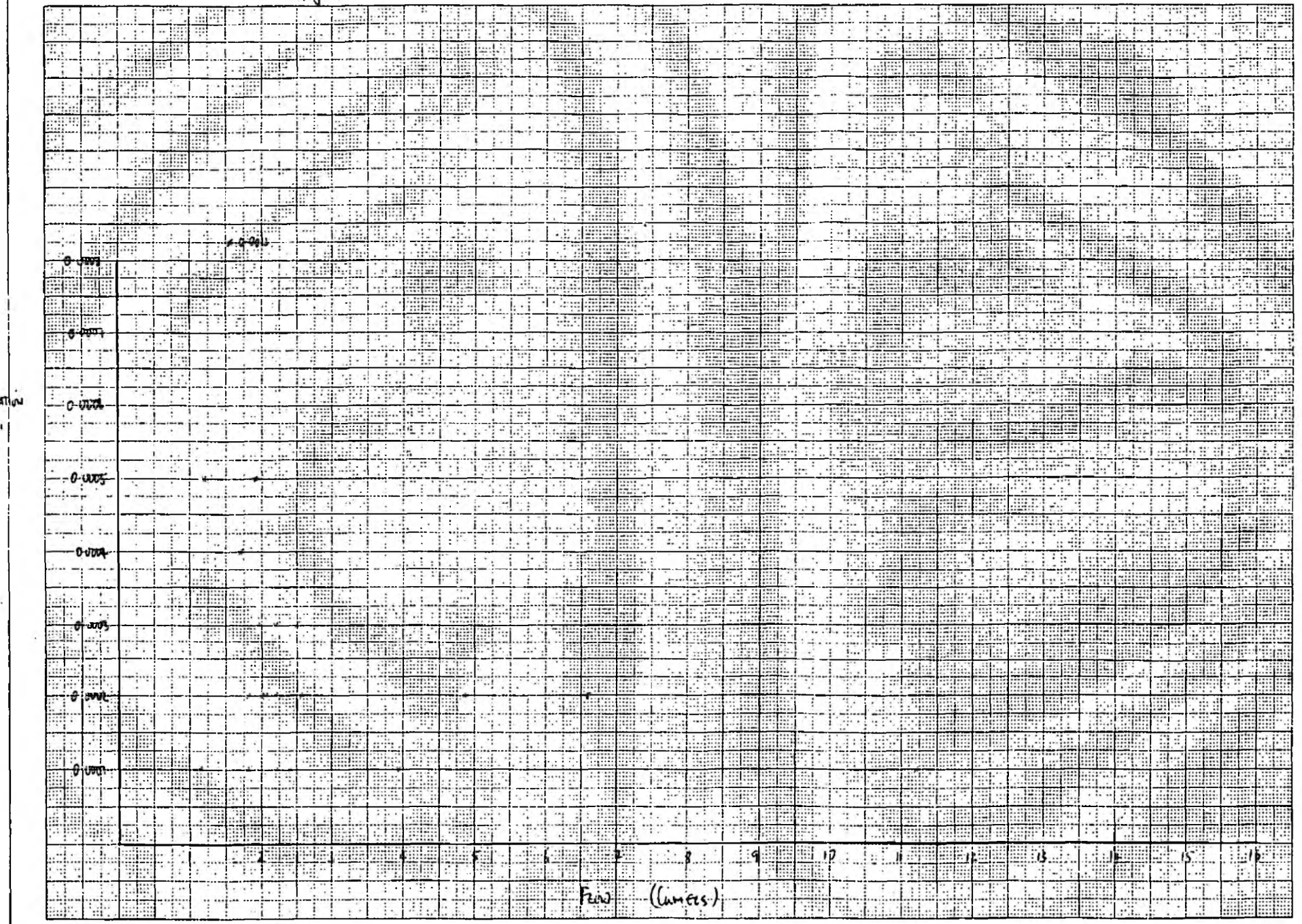
4.4 Variation in HCH γ concentration with flow rates in the River Mole upstream of the Thames (Fig.14)

Most of the samples taken at this site were taken when flows were

relatively low, ranging between 1.25 cumecs and 2.8 cumecs. Over this flow range HCHγ concentrations varied markedly between 0.02 and 0.086 ugl^{-1} with no apparent relationship to the flow rate. Only four samples were taken at flows exceeding 2.8 cumecs and the concentrations exhibited a gradual decline from 0.027 ugl^{-1} at 5.75 cumecs to 0.014 ugl^{-1} at 15.8 cumecs.

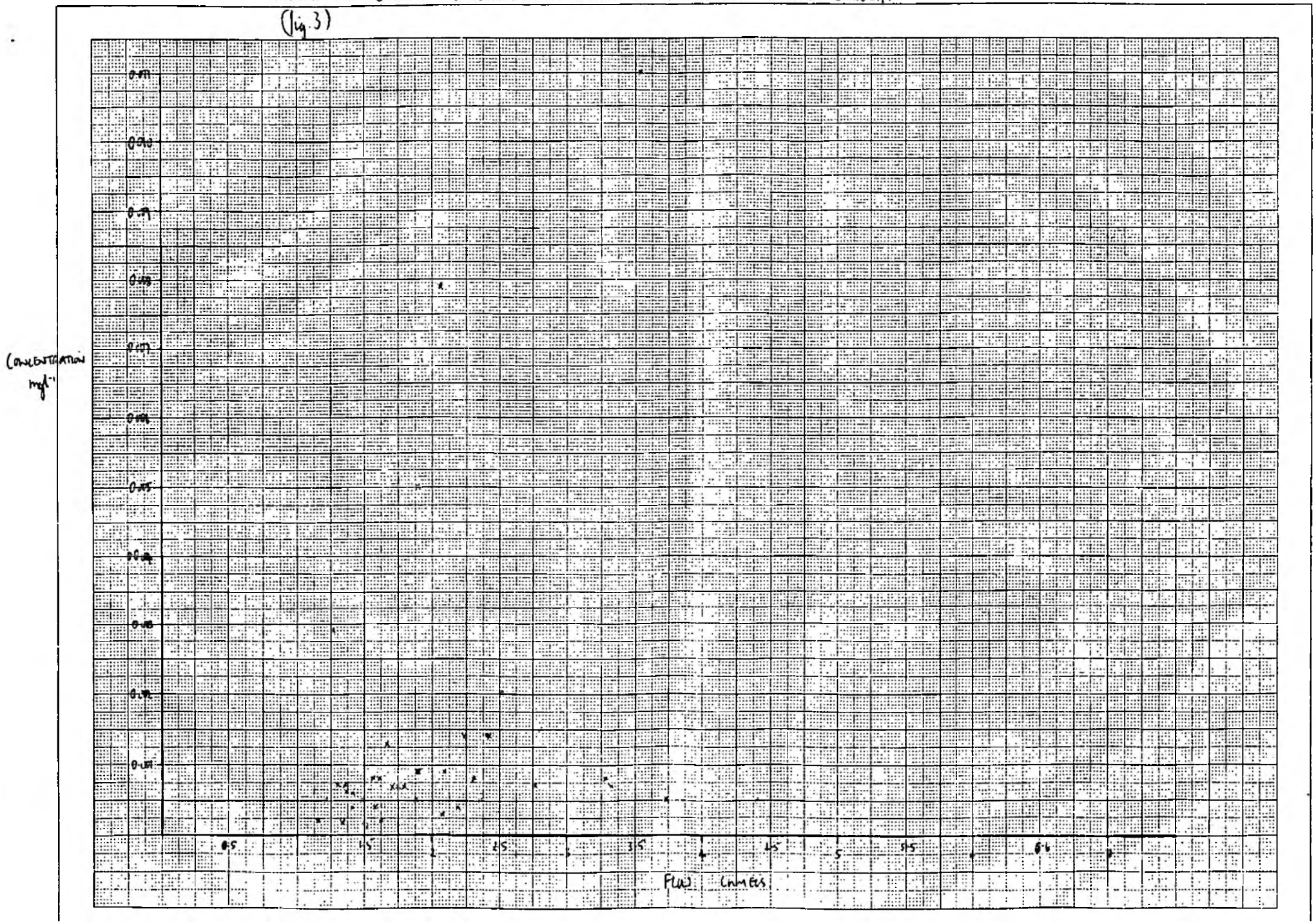
Variation in Cadmium Concentration with Flow Rate in the River Mole above the Thames.

(Fig 2)



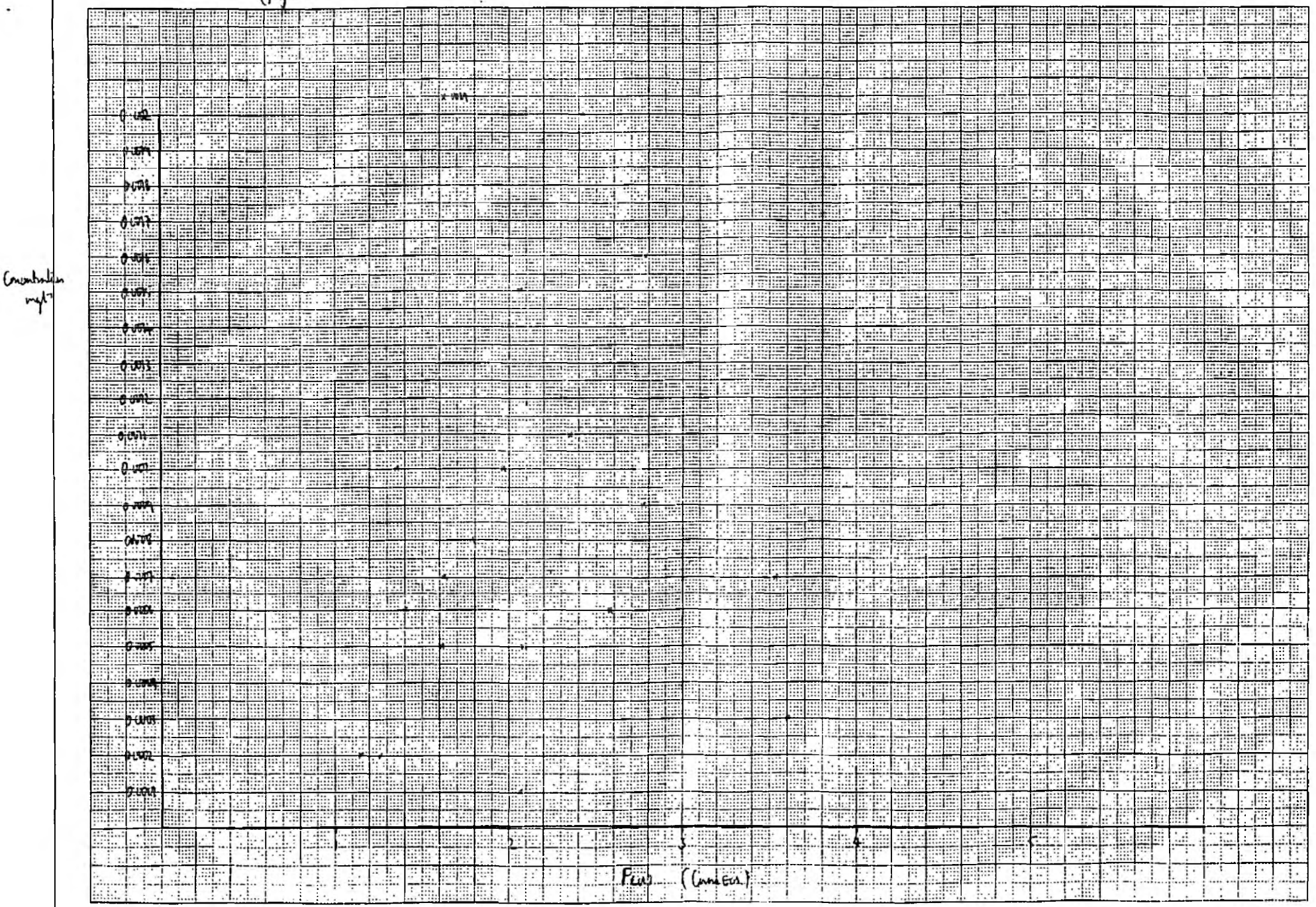
VARIATION IN CADMIUM CONCENTRATION WITH FLOW IN THE LIMPOLE AT THE CAUSEWAY.

(fig. 3)



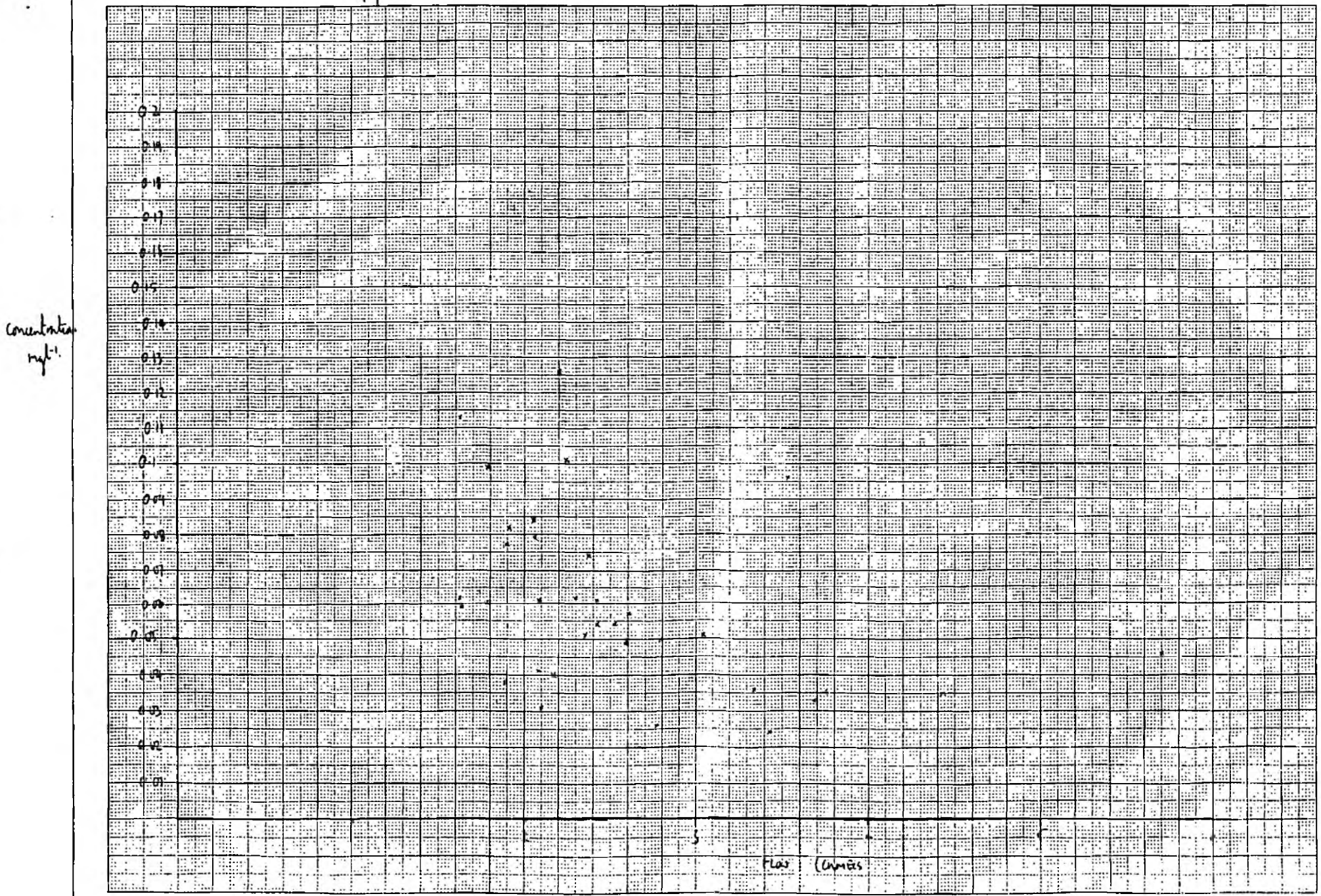
Variation in Cadmium Concentration with Flow in the Handle at Waterhead, Mitcham

(Fig 4)



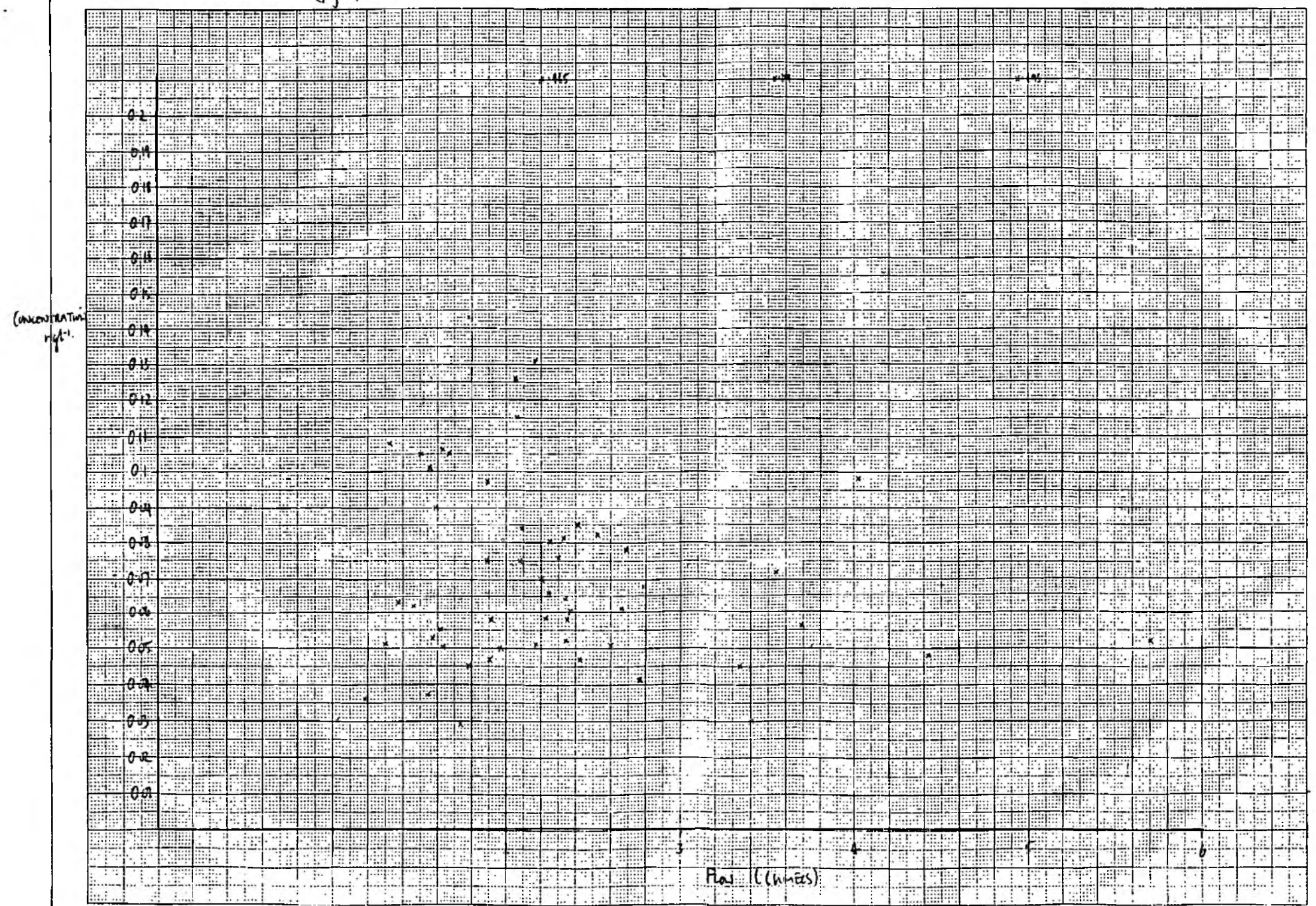
VARIATION IN COPPER CONCENTRATION WITH FLOW IN THE WANDLE AT WATERMEADS, MITCHAM.

(Fig. 5)



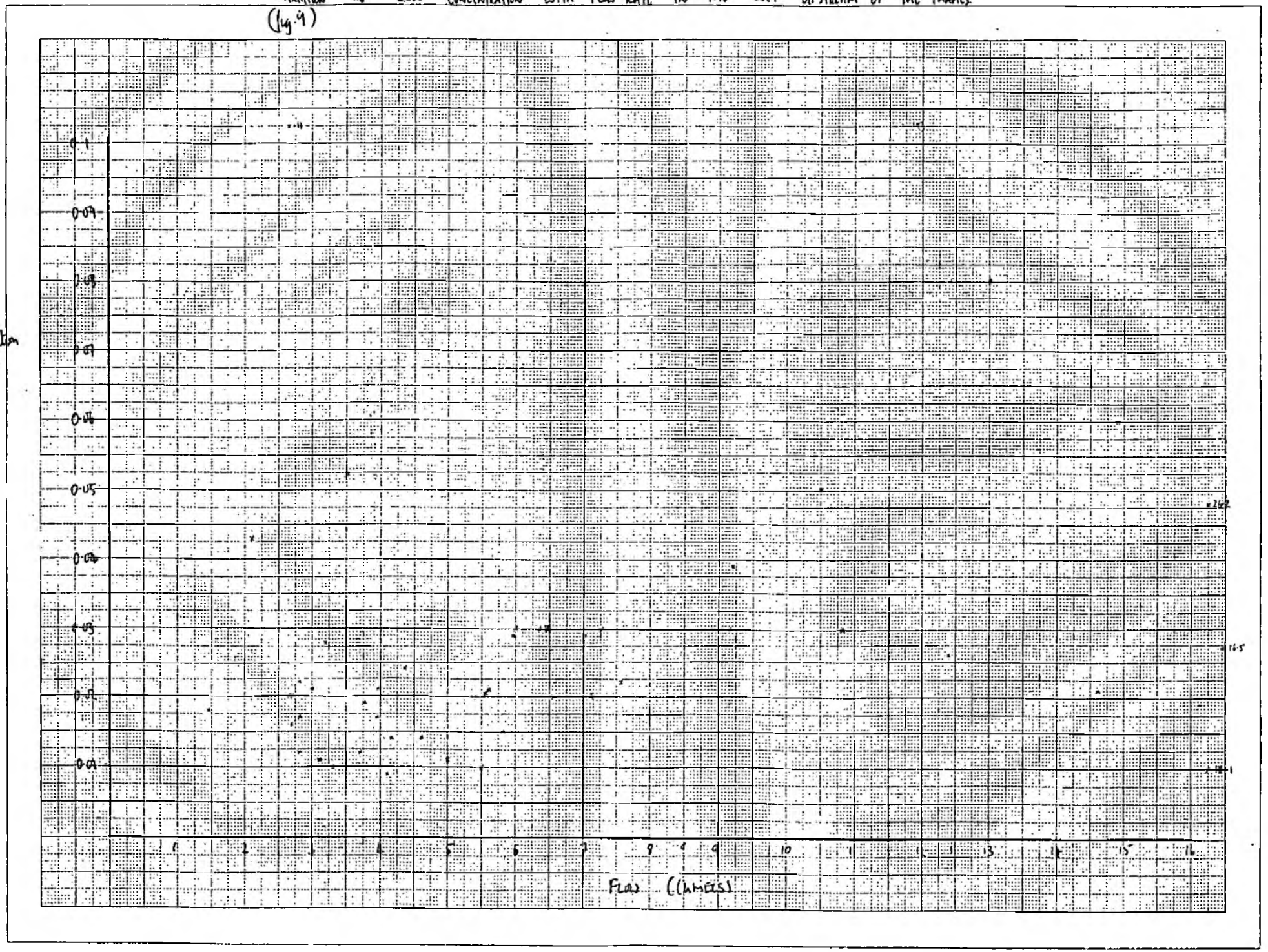
VARIATION IN COPPER CONCENTRATION WITH FLOW IN THE LANDLE AT THE CAUSEWAY

(Fig. 6)

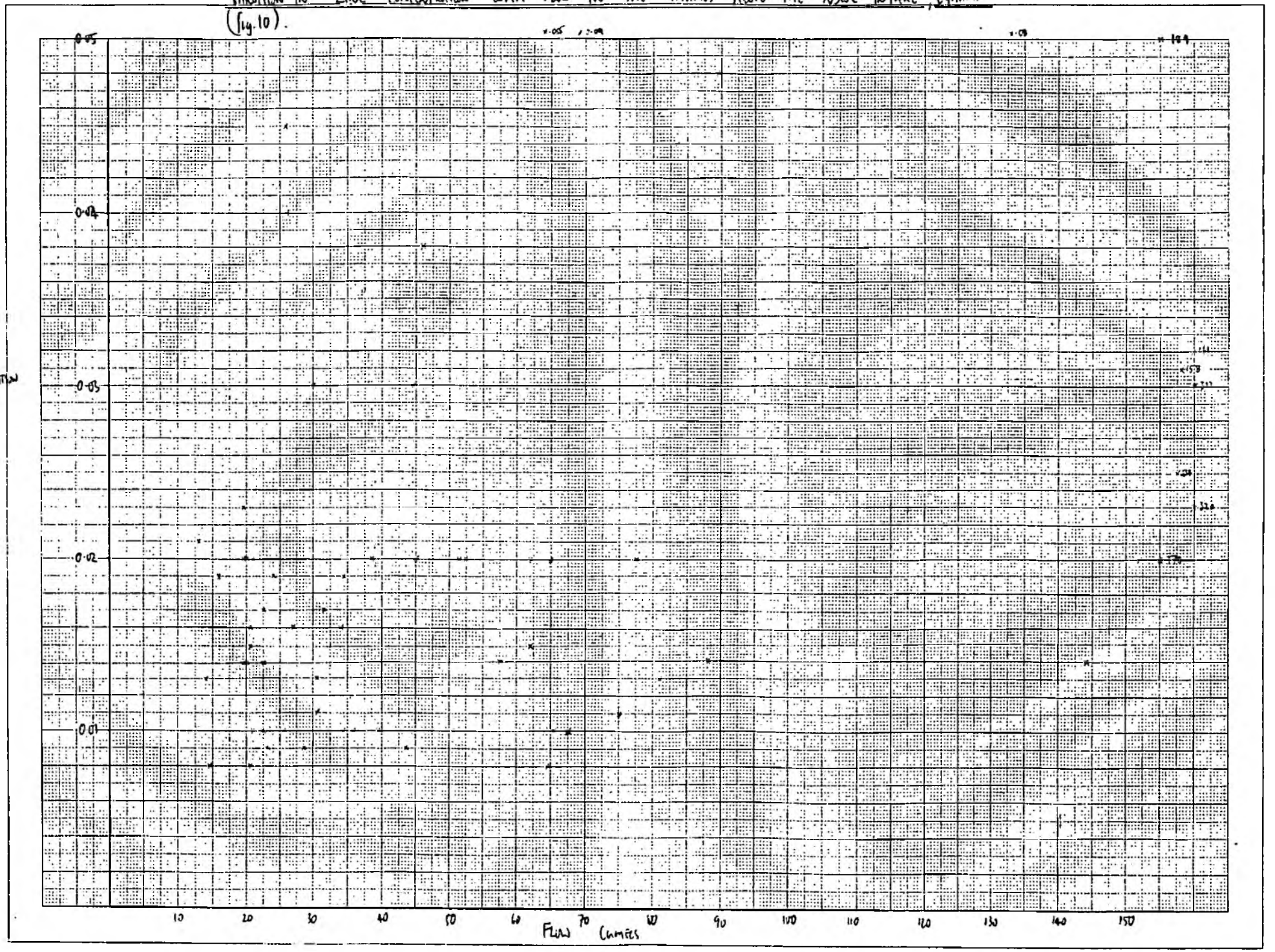


VARIATION IN ZINC CONCENTRATION WITH FLOW RATE IN THE LIFT UPSTREAM OF THE THANES

(Fig. 9)

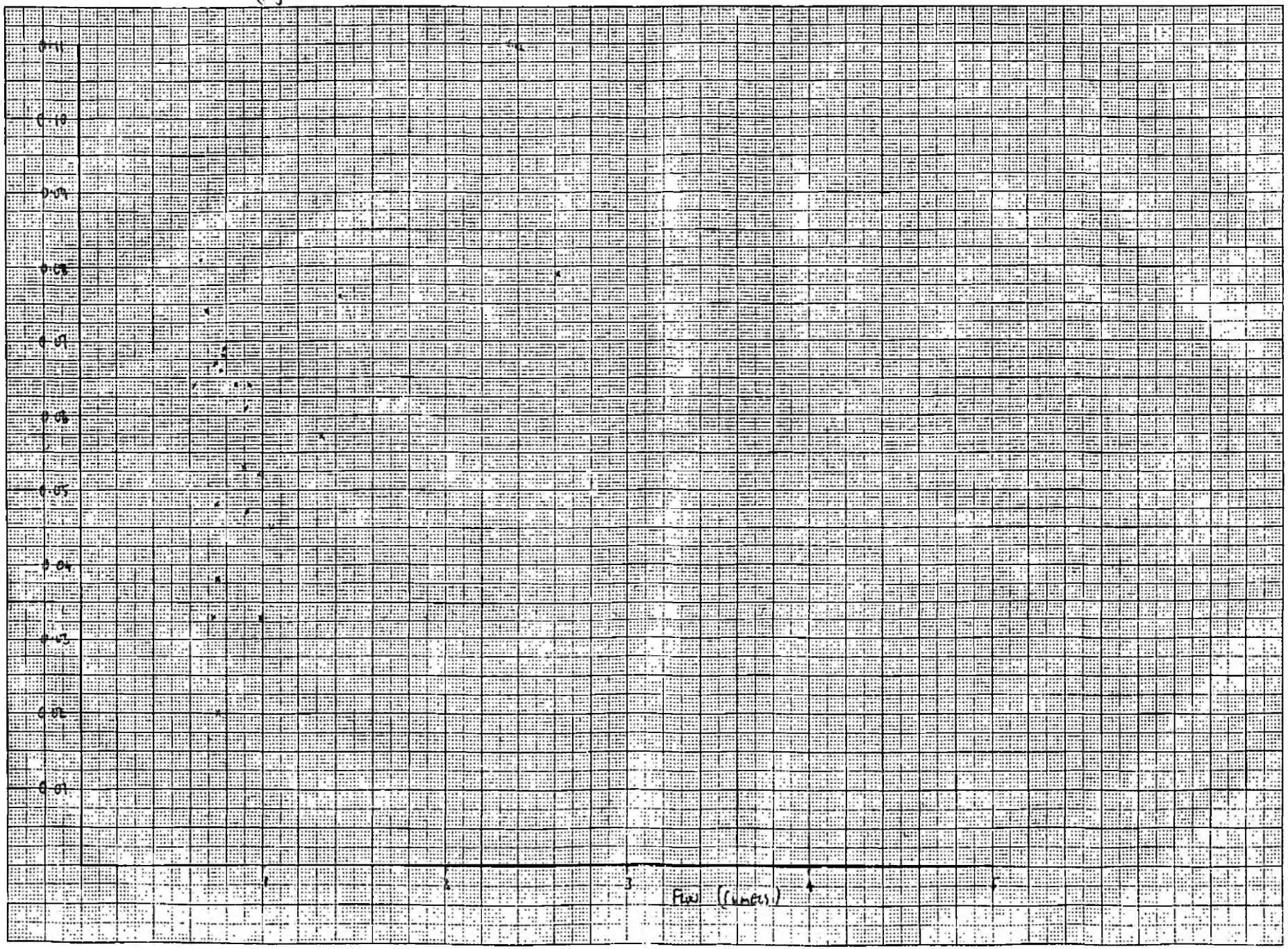


Variation in Zinc Concentration with Flow in the Thames Above the NSWC Intake, Egham (Fig. 10).



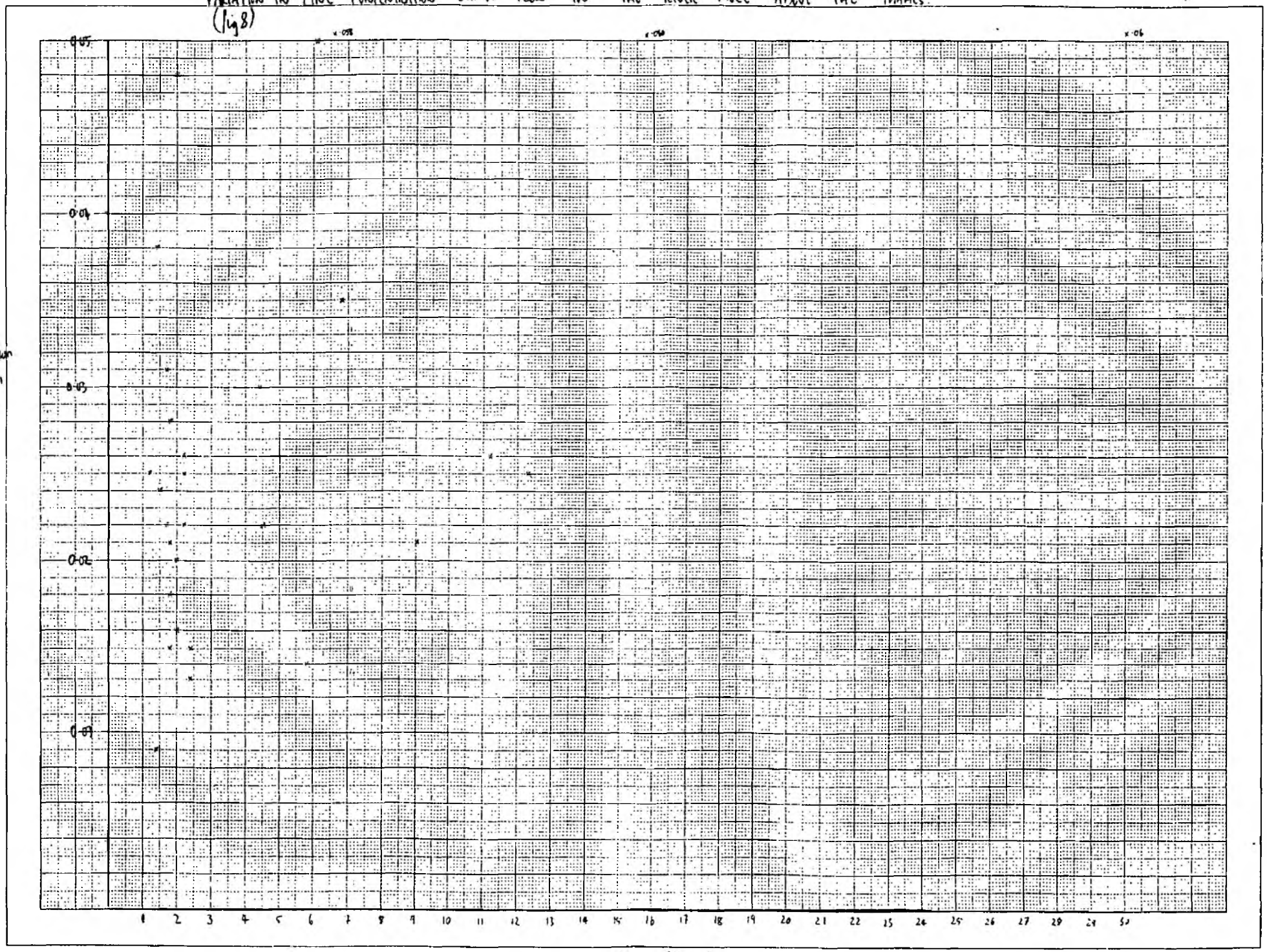
Variation in Zinc Concentration with flow in the Horsmill above the Thames.

(Fig. 7)

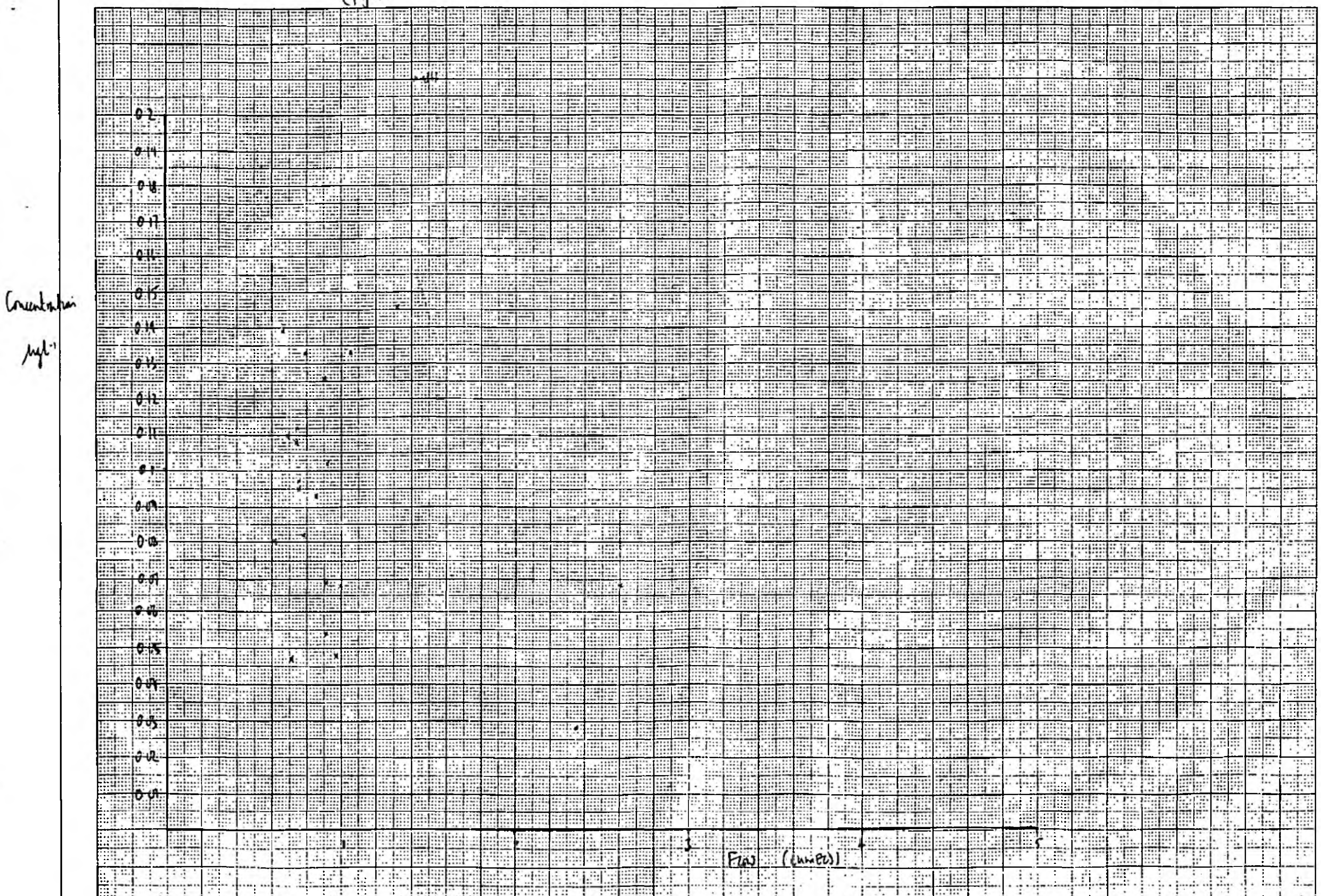


Variation in Zinc Concentration with Flow in the River Lee above the Thames.

(Fig 8)

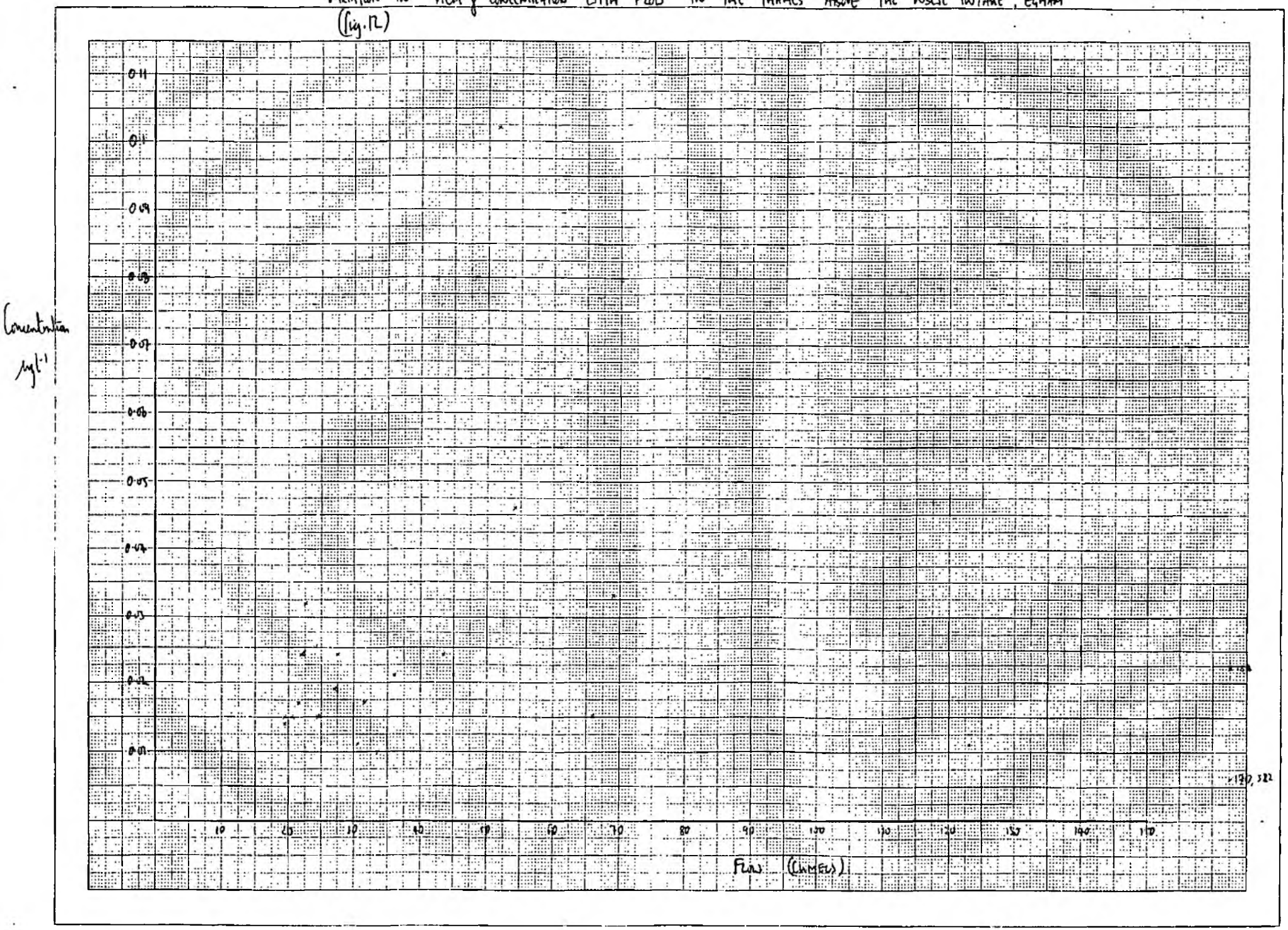


Variation in HCH γ Concentration With Flow For The Horsmill Above The Thames.
(Fig. 11)



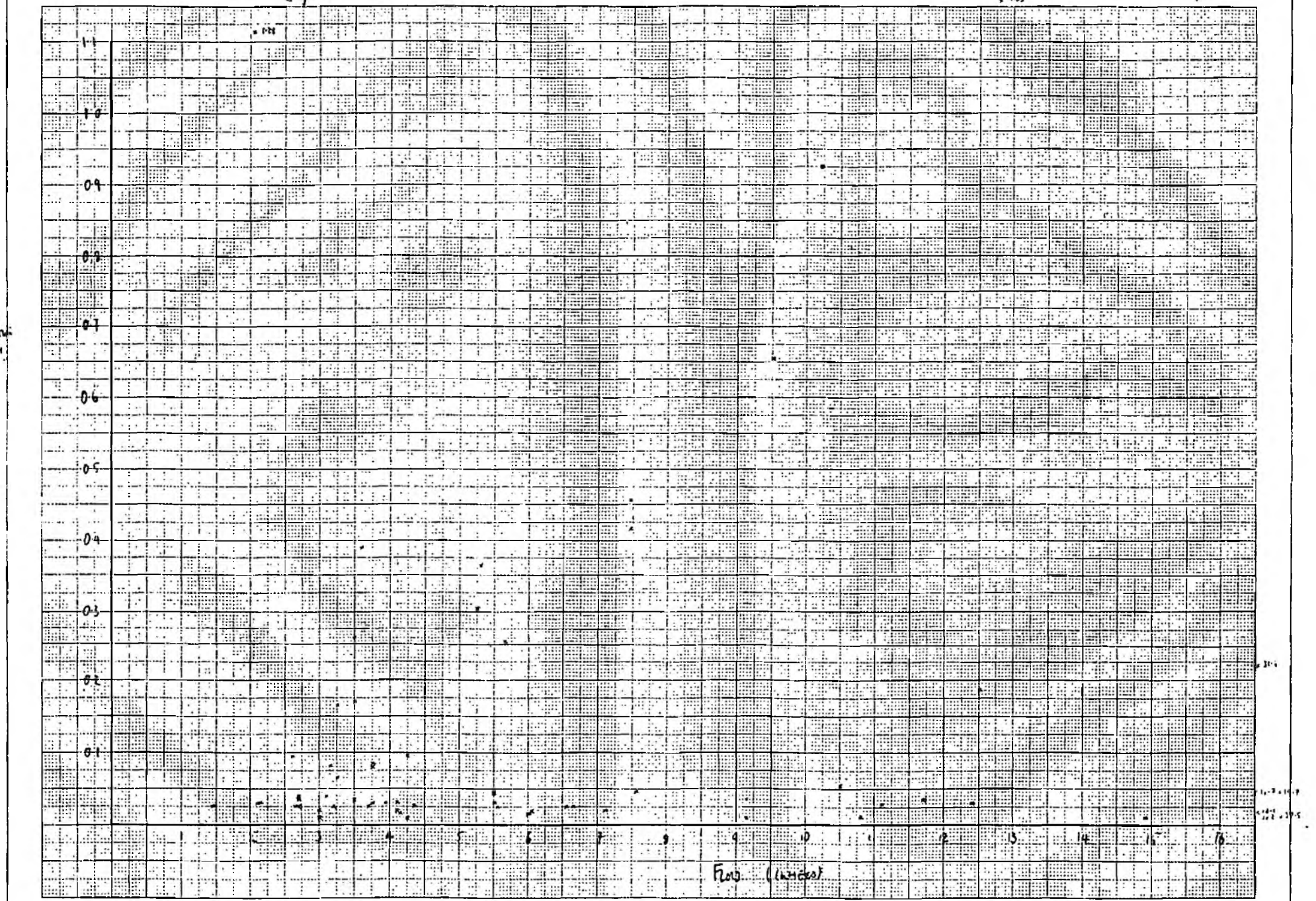
Variation in HCH γ Concentration with flow in the Thames above the Ashlic intake, Egham

(Fig. 12)



VARIATION IN HCH CONCENTRATION WITH FLOW RATE IN THE UEY UPSTREAM OF THE THAMES

(Fig. 13)



Variation in HCH γ concentration with flow rate in the river mile upstream of the Thames.

(fig. 14)