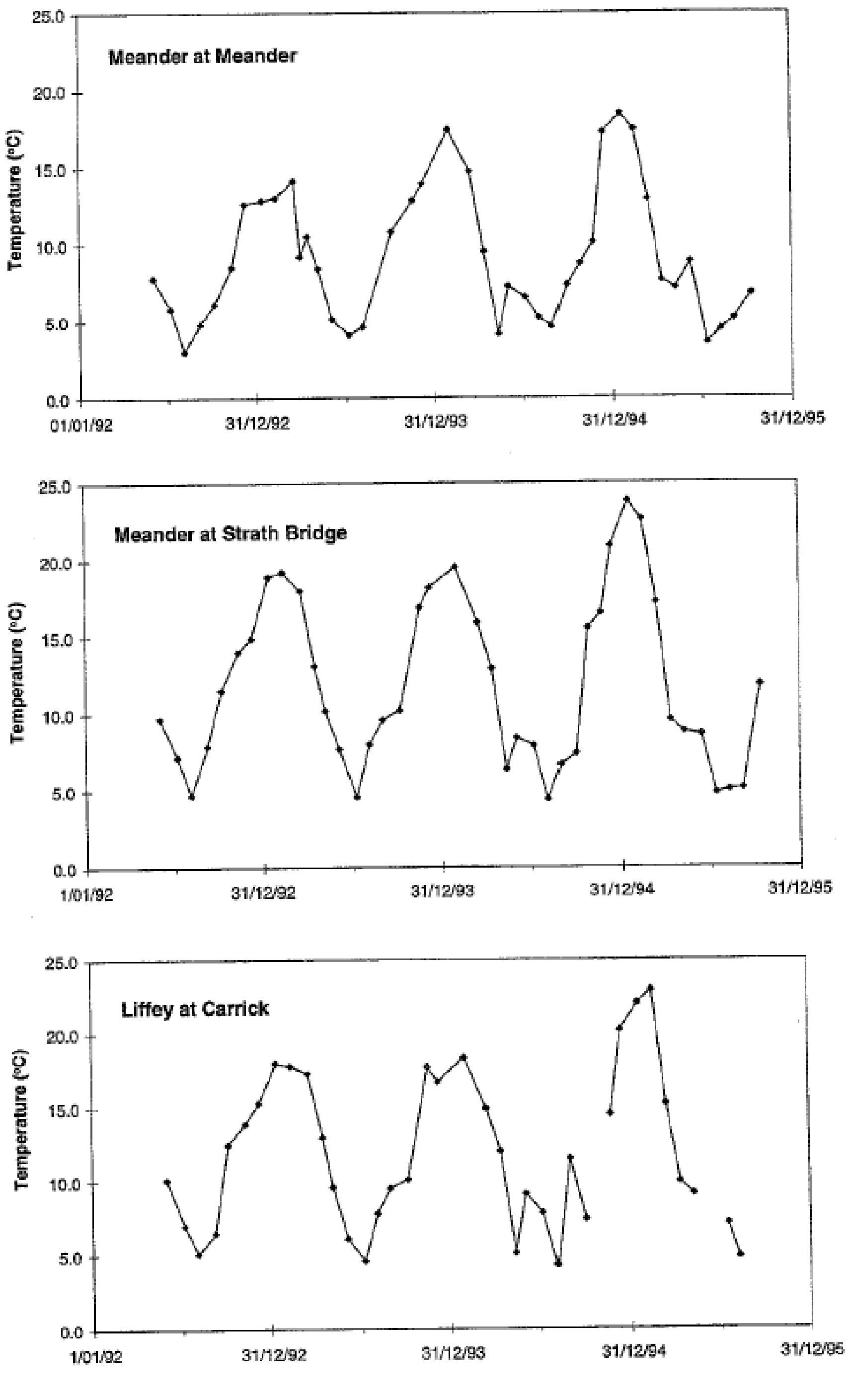

Figure 2.2 Monthly monitoring of temperature at sites in the Meander catchment.

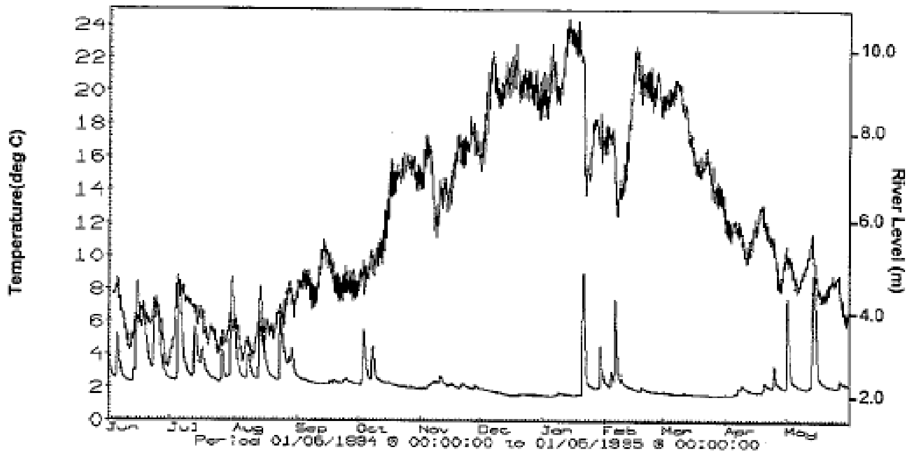

Figure 2.3 Time series of Temperature and River Level at Strath Bridge for the period June, 1994 to June, 1995 (Upper trace shows temperature fluctuations).

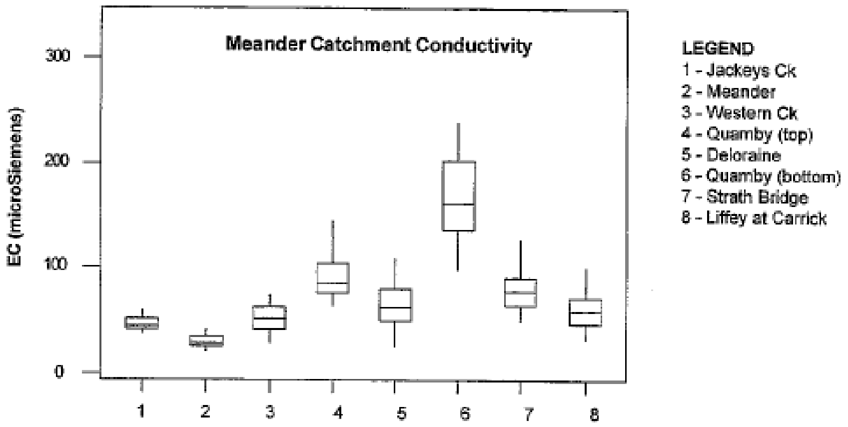

Figure 2.4 Box and whisker plots showing statistics for electrical conductivity from monthly monitoring at sites in the Meander catchment.

During longitudinal transects of Quamby Brook (Figure 2.5c) the relative impact of STP effluent on EC in Quamby Brook was found to be greatest during summer, with higher flows in winter providing considerable dilution.

Transects also carried out along the length of the Meander and Liffey Rivers show a different pattern of EC change (Figure 2.5a and Figure 2.5b). In the Liffey River, the EC transect carried out during summer showed generally lower levels in the lower reaches, while in the winter this trend was reversed. The most likely explanation for this difference may have to do with inflow of low EC water via Main Channel from the Poatina Tailrace during the summer when irrigation demand is high.

In the Meander River the pattern was found to be very unusual. As expected, EC levels in the upper reaches during summer were quite low. However a significant increase was found at Barretts Bridge, indicating a possible pollution source entering the river upstream of this site. EC consequently steadily decreased downstream from Barretts Bridge. In winter, while still present, the increase at Barretts Bridge was relatively less and rather than decreasing progressively downstream, EC actually increased steadily downstream.

Plots of monthly EC changes at all sites show that no significant change in EC is apparent over the study period, and that seasonal change in EC is relatively indistinct.

The trace of continuous EC measured at Strath Bridge for the period June 1994 to June 1995 (Figure 2.6) clearly displays the diluting effect rain events have on river EC. This is especially so for the event of 18 January, 1995 which was a major event which occurred after a long period of low flows. During the low flows, EC climbed to about 155 µS/cm before the rain in January 1995 diluted the river to about 25 µS/cm, a drop of 84 %. Following the series of smaller events in late January and early February, EC shows a rapid increase before falling again in April back to normal winter levels.

A more detailed trace of EC and Water Depth was recorded in Quamby Brook at Westbury in June, 1995 during a moderate flood event (Figure 2.7). The trace shows how EC changes during higher flows, in particular how EC levels peak just prior to the peak in water level. This is commonly the case as runoff early in the event carries the majority of contaminants. This corresponds to peak turbidity levels (Figure in section turbidity and suspended solids) recorded during this event. In this case there are several 'peaks' to the overall event, and in each case the peak in EC occurs just before the water level peak.

Reaction (pH)

pH at all sites in the Meander catchment fall within the normal bounds expected in natural systems. The median field measured pH at all sites is between 6.5 and 7.5 (Figure 2.8), however fluctuations in pH, indicated by the whiskers in the boxplots, were fairly marked.

The lowest pH of 5.8 was recorded at Jackeys Creek and the highest, at 7.9, was measured at Western Creek. This variation is to be expected in waters such as those of the Meander catchment, which are moderately dilute. As will be discussed in a following section, dilute waters with low alkalinity (<25 mg/L) have a low buffering capacity. As a consequence they are very susceptible to alterations in pH from many sources (atmospheric, biological, geochemical). It is also very difficult to accurately measure pH in dilute waters such as these.

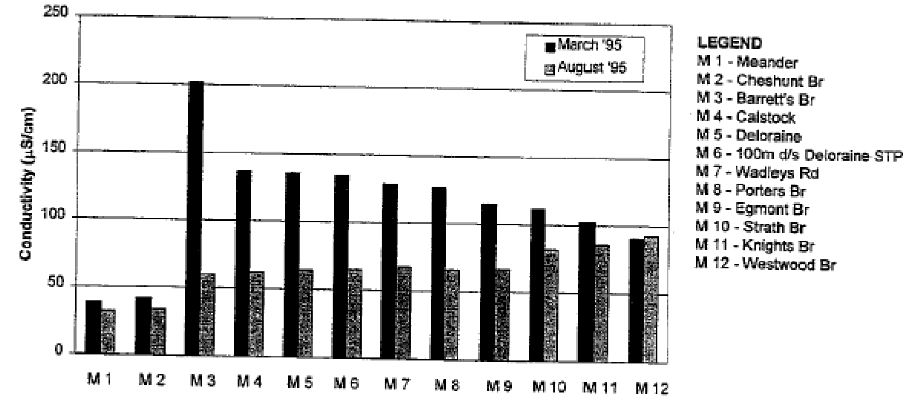

Figure 2.5a Longitudinal transects of electrical conductivity along the length of the Meander River during 1995.

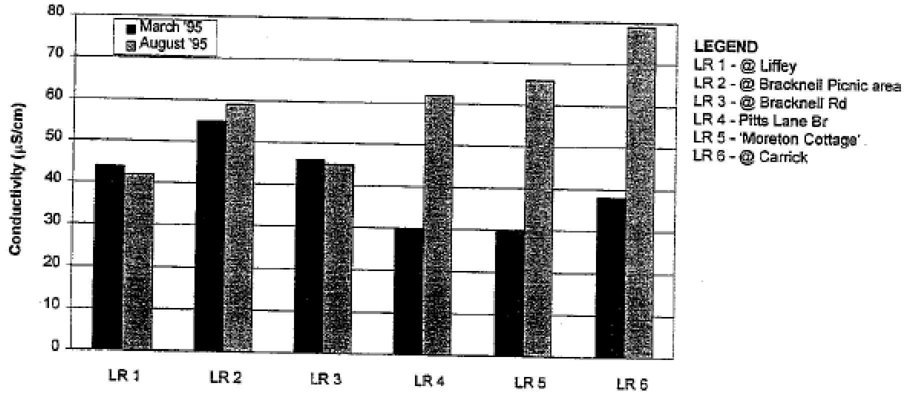

Figure 2.5b Longitudinal transects of electrical conductivity along the length of the Liffey River during 1995.

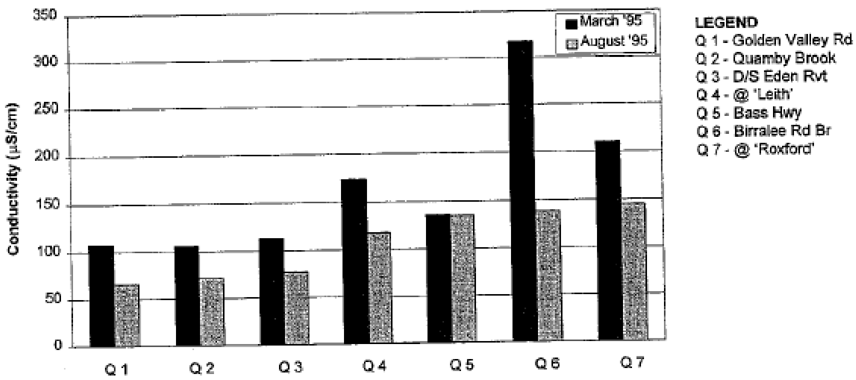

Figure 2.5c Longitudinal transects of electrical conductivity along the length of Quamby Brook during 1995.

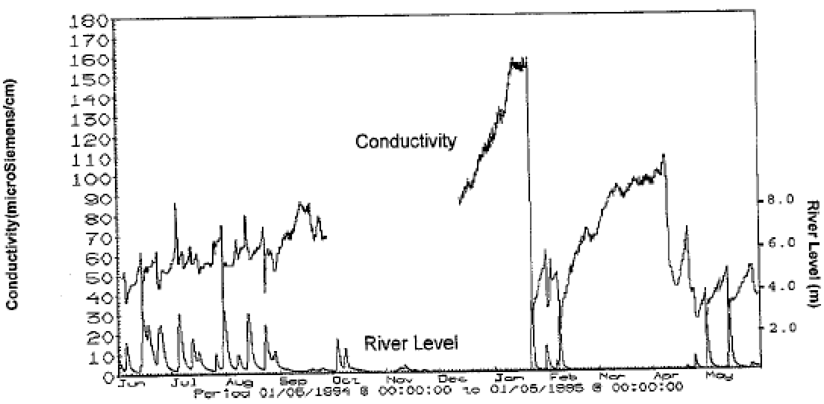

Figure 2.6 Time series of Electrical Conductivity and River Level at Strath Bridge for the period June, 1994 to June, 1995. (The gap in the record during Oct - Nov. 1994 was due to equipment malfunction).

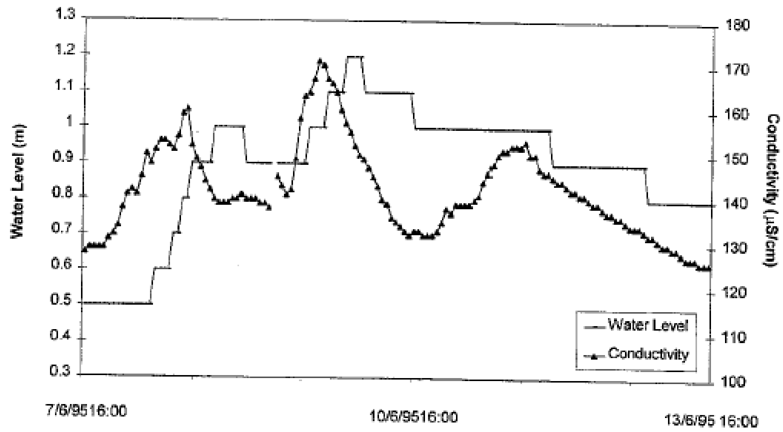

Figure 2.7 Changes in Electrical Conductivity in lower Quamby Brook during a flood event recorded during June, 1995.

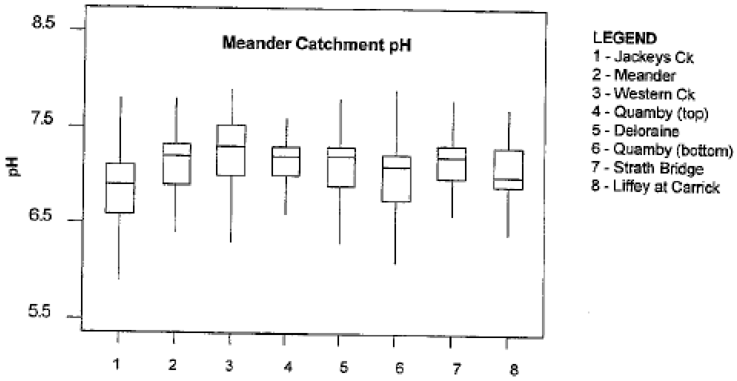

Figure 2.8 Box and whisker plots showing statistics for field pH from monthly monitoring mat sites in the Meander catchment.

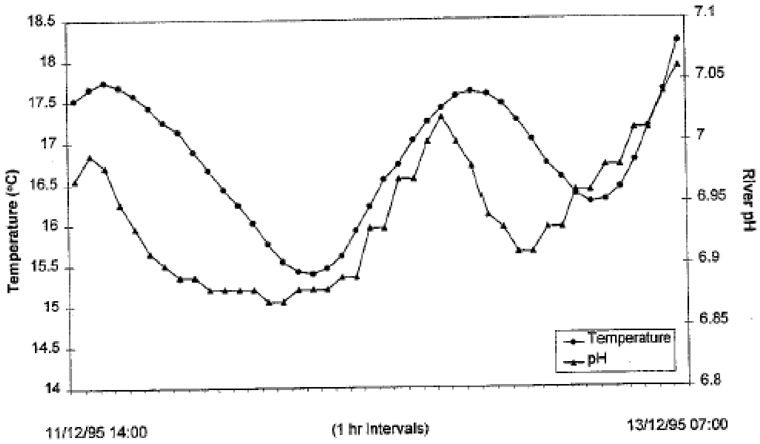

Figure 2.9a Time series of changes in Field pH measured during over a 43 hour period at Quamby Brook at Westbury in December, 1995.

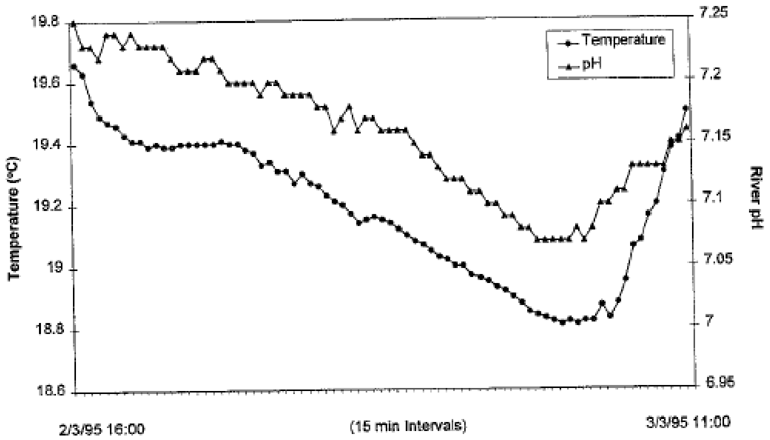

Figure 2.9b Time series of changes in Field pH measured over a 19 hour period in the Meander River at Strath Bridge in March, 1995.

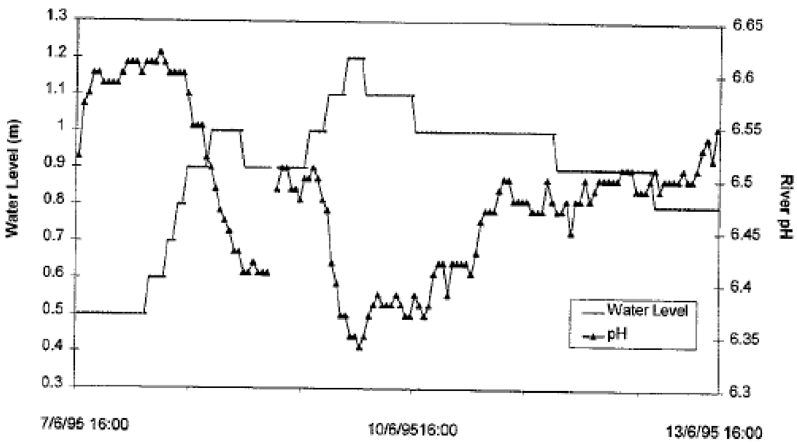

Figure 2.10 Time series of changes in Field pH measured during flooding in lower Quamby Brook in June, 1995.

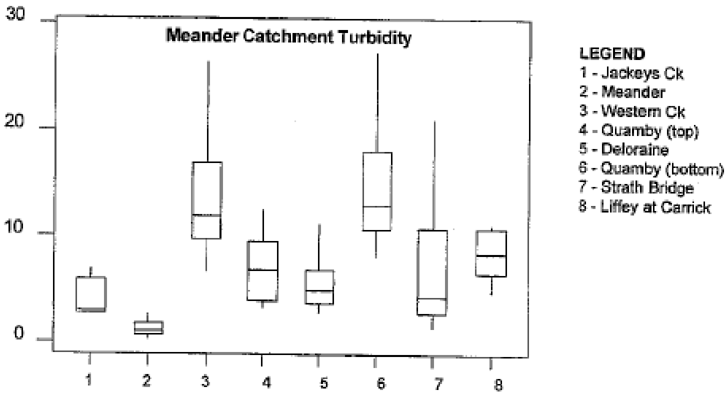

Figure 2.11a Box and whisker plots showing statistics for turbidity from monthly monitoring at sites in the Meander catchment (n = 5 - 27).

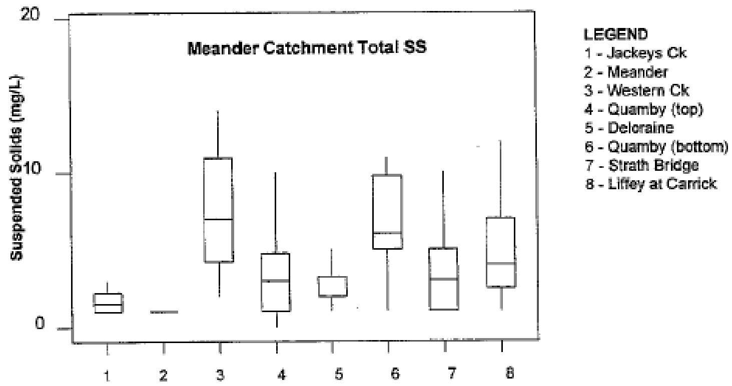

Figure 2.11b Box and whisker plots showing statistics for suspended solids from monthly monitoring at sites in the Meander catchment (n = 16 - 47).

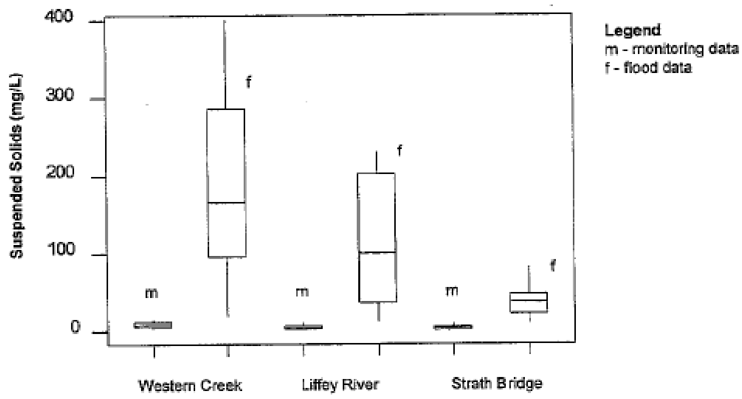

Figure 2.12 Box and whisker plots comparing suspended solids concentrations measured during monthly monitoring and flood events at three sites in the Meander catchment (sample numbers range from 27 - 45).

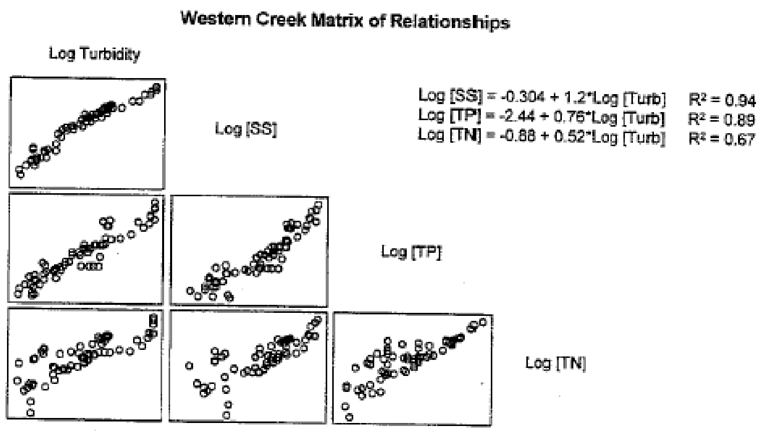

Figure 2.13a Matrix plots which show the relationships between turbidity, suspended solids, total phosphorus and total nitrogen at Western Creek.
*All parameters have been log tranformed to reduce scatter.

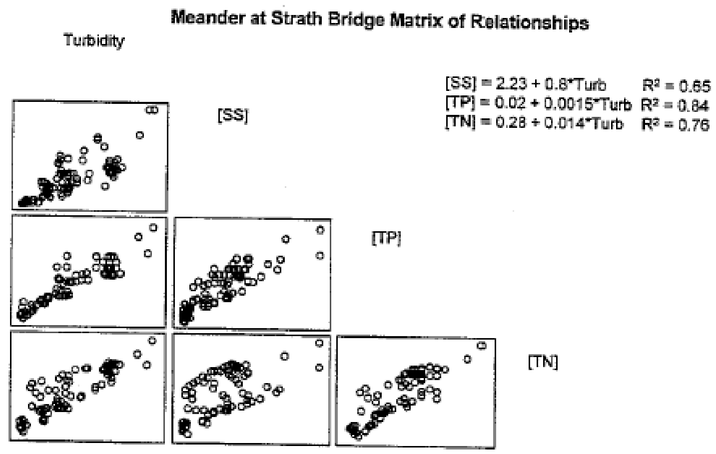

Figure 2.13b Matrix plots which show the relationships between turbidity, suspended solids, total phosphorus and total nitrogen in the Meander River at Strath Bridge.

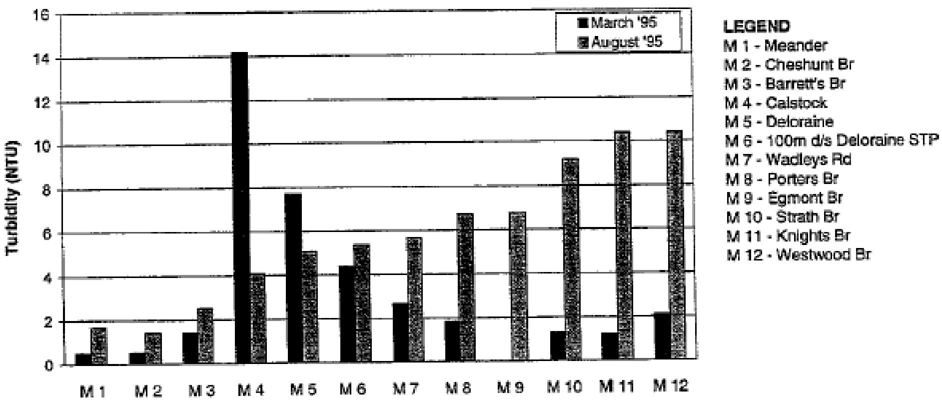

Figure 2.14a Longitudinal transects of turbidity along the length of the Meander River during 1995.

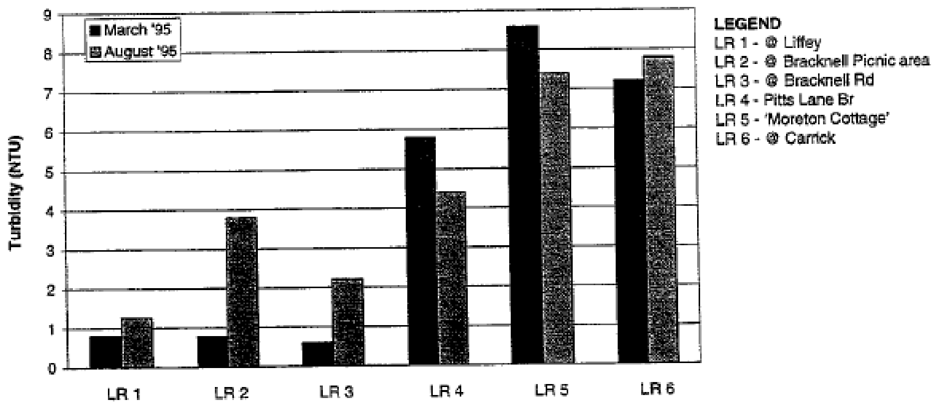

Figure 2.14b Longitudinal transects of turbidity along the length of the Liffey River during 1995.

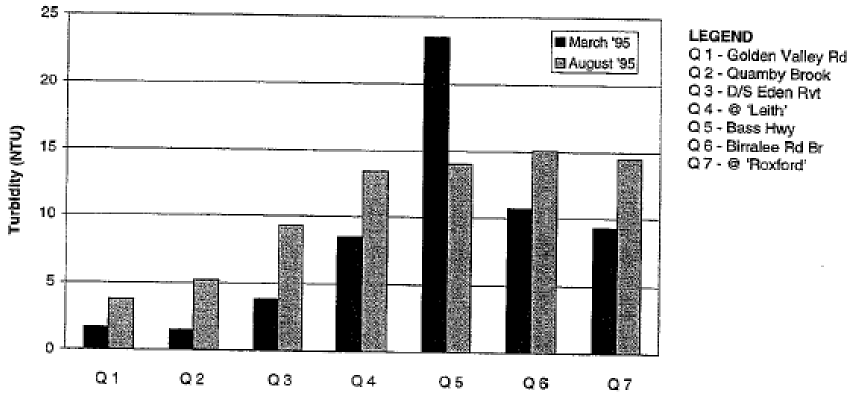

Figure 2.14c Longitudinal transects of turbidity along the length of Quamby Brook during 1995.

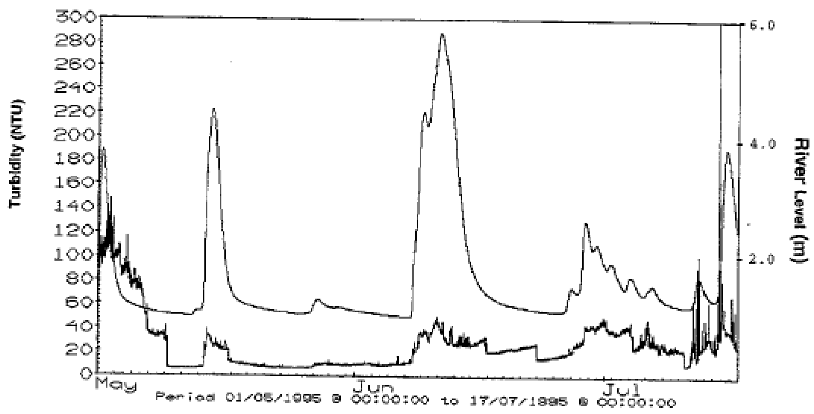

Figure 2.15 Time series traces of Turbidity and River Level between 1 June and 17 July, 1995 (upper trace shows river level changes).

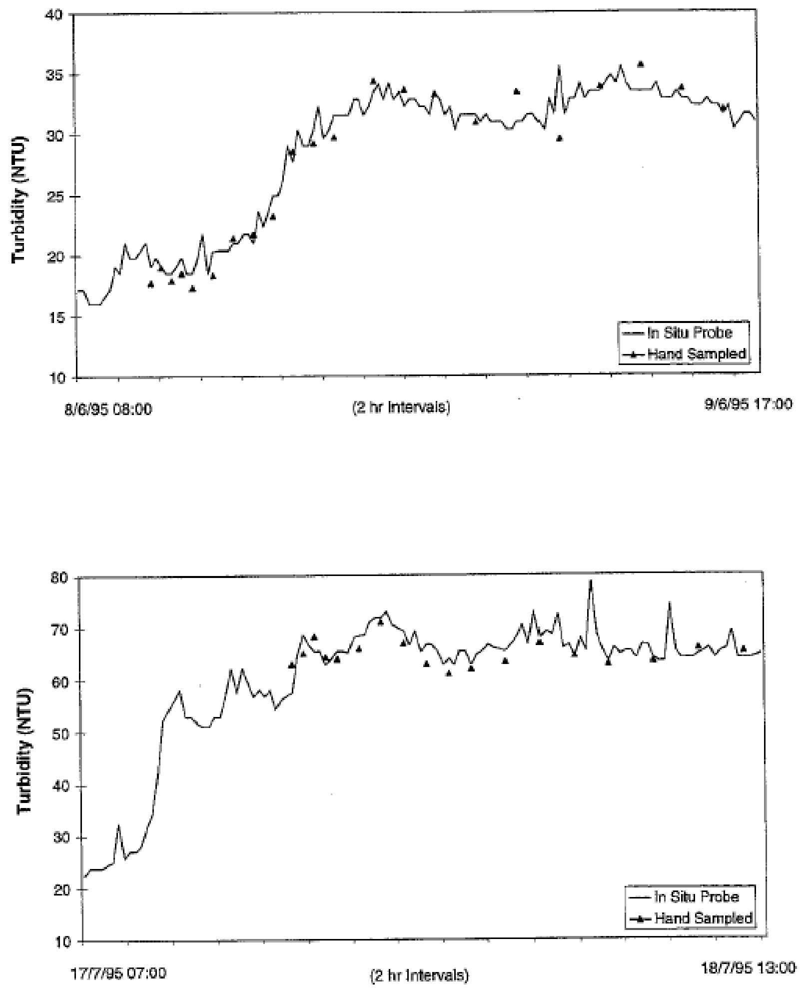

Figure 2.16 Turbidity time series from two flood events measured at Strath Bridge by the 'In situ' probe. Solid triangles show measured turbidity from samples taken mechanically during the corresponding period.

In the Liffey River, turbidity is generally much lower than in Quamby Brook. The transect during March, however does show a significant increase from background levels (at 0.75 NTU) at Pitts Lane (5.8 NTU) clearly showing the influence of irrigation water input from West Channel 200m upstream. During winter, turbidity at the bottom of the Liffey is about the same as summer, but the increase from top to bottom is much more uniform.

Peak turbidity recorded during flooding of rivers in the catchment are presented in the Table below. These are values measured on site and do not include readings from remote monitoring devices (as at Strath Bridge). Values at Barretts Bridge were taken to get some idea of the quality of water emerging from the upper Meander Catchment. No monitoring was routinely carried out at this site.

The table simply shows that throughout the Meander Catchment turbidity during floods can reach very high values, reflecting the impact of land use practices on water quality at this time.

Site	Date of Maximum	Peak Turbidity (NTU)
Meander at Meander	17/7/95	8.07
Meander at Barretts Br.	21/1/95	315
Western Creek	20/1/95	> 1000
Meander at Deloraine	17/7/95	75
Jackeys Creek	9/6/95	24.5
Quamby Top	17/7/95	144
Quamby Bottom	17/7/95	134
Liffey at Carrick	17/7/95	274
Meander at Strath Bridge	20/1/95	93.6

It is evident from this data that the Western Creek catchment is relatively worse off than other areas monitored, indicating that sediment transport in this system is more active. Further data on this catchment is presented in a later section 'Special Studies'.

Continuous Turbidity

Continuous turbidity data collected by the automatic turbidity probe on the Meander River at Strath Bridge was found to be only partially reliable due to interference with the probe from algae during the summer and suspended solids during the winter. However a sample trace of turbidity and river level between May 1and July 17, 1995 is shown in Figure 2.15. The record covers a period during which several high flow events occurred. It shows how turbidity readings tend to creep up during steady flows (14 - 26 June). The sudden drops occur when the probe is cleaned manually.

Records from two of these events at Strath Bridge were verified using an automatic sampler with water samples from the sampler being tested for turbidity 24 hours later (Figure 2.16).

The plot shows that data collected by the turbidity probe from these two events was very comparable to that from samples collected by the autosampler. The continuous turbidity data for these two events was then used to calculate the load of suspended solids exported during the periods shown using the relationship for Turbidity and SS established earlier in the Matrix Plot. The regression for this relationship is;

$$\text{Log}_{10}\,[\text{Suspended Solids}] = 1.10 * \text{Log}_{10}\,\text{Turbidity} - 0.239 \qquad (R^2 = 0.854)$$

The estimated loads for each event give some idea of the amount of solids leaving the catchment of the Meander during moderate and large flood events.

Monitored Period	**Time Period** (Hrs)	**Peak Flow** (Cumecs)	**Total Volume Discharge** (ML)	**Maximum Turbidity** (NTU)	**Estimated Load SS** (kg)
8/6/95 to 9/6/95	28	54	5298	35.4	83,547
17/7/95 to 18/7/95	20	147	6669	78.5	320,210

Although some percentage of the suspended solids will be made up of organic material and debris, if it is assumed that most of the suspended matter is soil being actively eroded or resuspended from the stream, these figures convert to a total soil volume of 70 and 267 cubic meters of soil for the smaller and larger event respectively. During wet years such events occur fairly frequently and would amount to a substantial loss of soil from the catchment. More accurate and detailed monitoring of turbidity at this site will better quantify the loads in future.

Dissolved Oxygen

Dissolved oxygen collected during the latter 18 months. Generally, dissolved oxygen throughout the Meander catchment are normal with levels at all stations showing a strong seasonal variation (Figure 2.17). During the majority of the year, dissolved oxygen concentrations at most sites was above 9 mg/L, with Meander River site at Meander recording the highest reading of 12.7 mg/L. The ANZECC (1992) guideline for the protection of aquatic health is 6 mg/L. Levels below 5 mg/L are known to cause stress to fish, though little is known of the effects on invertebrates.

In general, dissolved oxygen levels were found to be slightly greater at more elevated sites, which is to be expected due to the greater turbulence of rivers higher in the catchment. Lowest dissolved oxygen concentrations were measured at most sites during Dec-Jan. However the site on Quamby Brook at Westbury showed evidence of chronic oxygen depletion for a much greater period, with levels dropping below 6 mg/L from about the beginning of October, 1994 and not recovering until about the end of April, 1995 as river flows picked up (Figure 2.19).

This site receives wastewater from the Westbury sewage treatment plant and it is well known that such oxygen 'sagging' occurs downstream of effluent discharge (Goldman and Horne, 1983). In addition, Quamby Brook at this site receives a great deal of organic material in the form of dead leaves from dense stands of willows at this site and animal excreta from cattle in the area. Further investigation of DO levels elsewhere in Quamby Brook however, showed that oxygen depletion existed where willow growth in the stream was particularly heavy. The results of this investigation is discussed in a later section.

2.3 General Ionic characterisation

The chemical constituents which determine the ionic character of water in the Meander catchment were measured on a quarterly basis at all monitoring sites during the latter 18 months of the study. These are commonly referred to as the 'dissolved salts' of water and together make up the "Total Dissolved Salts" of the water.

The ionic character of the water generally reflects the soil and parent rock type through which the water flows. Water which flows through limestone rich land will have relatively higher concentrations of Calcium and Magnesium and will have correspondingly greater Hardness (which is a measure of the capacity of water to precipitate soap) and Alkalinity (which is a measure of the capacity of the water to resist pH changes). Water which flows through a doleritic landscape will have generally lower concentrations of these salts,

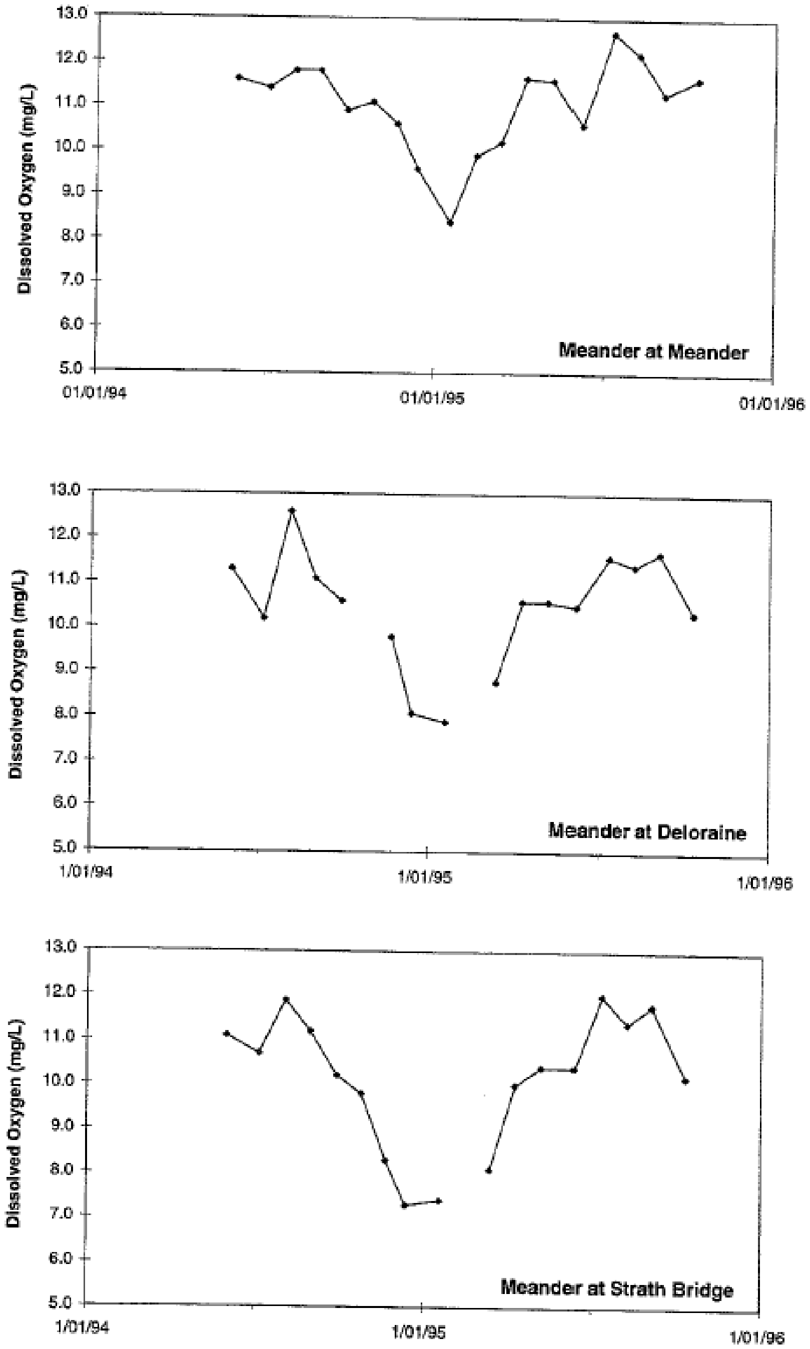

Figure 2.17 Monthly monitoring of dissolved oxygen at sites in the Mender catchment.

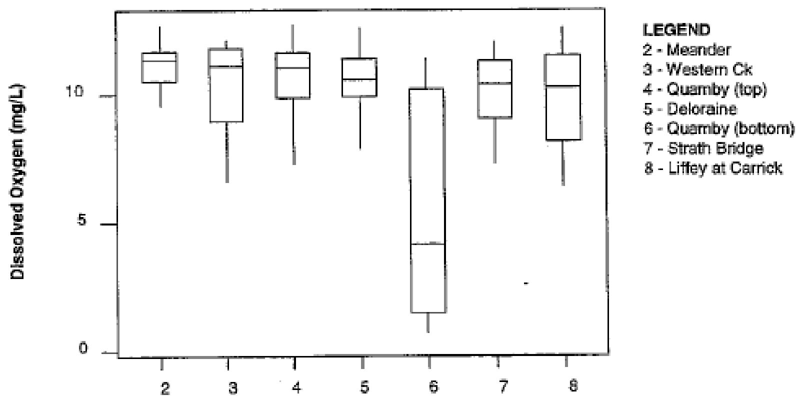

Figure 2.18 Box and whisker plots showing statistics for dissolved oxygen concentrations from monthly monitoring at sites in the Meander Catchment (n ranges between 15 and 21).

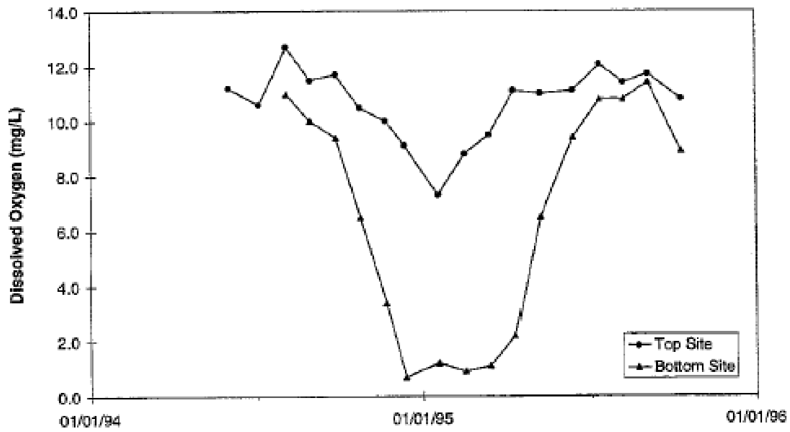

Figure 2.19 Monitoring of dissolved oxygen at sites in the upper and lower reaches of Quamby Brook between June, 1994 and October, 1995.

resulting in lower Hardness and Alkalinity but may have higher levels of such elements and silica and iron. Typical ranges for some of the major ions in natural flowing freshwater are;

Mg	1 - 100 mg/L
Ca	<15 mg/L
Cl	< 10 mg/L
Na	< 10 mg/L
K	<10 mg/L
Si	1 - 30 mg/L
Sulphate	2 - 80 mg/L

The median values of some of the main parameters contributing to the ionic character of rivers in the Meander catchment are presented in the table below. They reflect the very dilute nature of the waters throughout the Meander. The only outstanding site is the bottom site on Quamby Brook, which has a relatively higher concentration of all parameters. This is most likely a result of the sewage treatment effluent entering the brook upstream of that site.

	Alkalinity (mg/L)	**Hardness** (mg/L)	**Chloride** (mg/L)	**Calcium** (mg/L)	**Potassium** (mg/L)
Jackeys Creek	9.8	10	4.85	2.3	0.8
Meander	9.3	8.3	2.9	1.8	0.27
Western Creek	9.1	19.5	5.05	4.15	0.91
Deloraine	18	22.5	4.85	4.85	0.62
Quamby - Top	17.5	29.5	9.25	5.5	0.7
Quamby - Bot.	27	60	19	10	1.5
Strath Bridge	20	25	9.2	5	0.7
Liffey River	6.1	19	9.4	3.95	0.75

Values are medians of dataset. A summary of all ionic parameters is presented in Appendix A.

Colour

The visible colour of water is the result of the amount and character of the dissolved and fine particulate matter present. Naturally occurring minerals such as iron hydroxides and organic compounds such as humic acids give water what is called 'true' colour. 'Apparent' colour, measured in Hazen Units, includes not only colour due to dissolved substances but also that caused by suspended material (APHA, 1992). Natural waters can range from < 5 in very clear waters to over 300 in dark, peaty water. In rivers in the Meander Catchment, colour ranges from as low as 5 in the upper catchment at Meander to as high as 175 in the lower catchment at sites such as Strath Bridge and Liffey at Carrick. Colour is generally related to flow, with highest values being recorded during floods. During stable base flows however, colour at all sites is normally below 50.

2.4 Nutrients

In this report, 'nutrients' includes the forms of nitrogen and phosphorus most commonly associated with plant growth and productivity. The forms of nitrogen are ammonia-N, nitrite-N, nitrate-N and Total Kjeldahl-N (TKN). The first three forms were measured at sites in the Meander for the entire study period. However TKN (the equivalent of organic plus ammoniacal nitrogen) was only measured during the latter 15 months of the study.

Discussion in this report will be limited to nitrate-N, which makes up the largest portion of dissolved nitrogen, and Total N which is derived by calculation (as TKN + nitrate-N + nitrite-N). As nitrite-N and ammonia-N were generally only present at very low levels relative to nitrate-N and TKN, these forms of nitrogen will not be discussed.

The analysis of total phosphorus (TP) includes all phosphorus both bound to particulates and dissolved in the water. The dissolved phosphorus, measured as dissolved reactive phosphorus (DRP), is generally considered as largely free and available to aquatic plants and algae. In natural waters DRP generally makes up only a very small fraction of TP. Therefore, unless higher levels of DRP have been detected, the following discussion will fucus on TP only.

2.4.1 Station conditions and Trends

Nitrate-N

As has been found in other catchments in the South Esk Basin, Nitrate-N (NO_3-N) shows a noticeable seasonal variation in concentration at most sites in the Meander Catchment, with higher concentrations evident during the higher flows of winter. This pattern was most noticeable at the Liffey River site (Figure 2.20a), where there was a tenfold increase in NO_3-N from a low in mid-summer of around 0.03 mg/L to mid-winter highs of 0.35 mg/L.

The lower sites on the Meander River also show a similar seasonal pattern, however the site at Meander does not follow this trend (Figure 2.20b). The reason for this lack of seasonal behaviour is most probably due to the short period during which flows are high (i.e. lack of sustained high baseflow). This is demonstrated in the plot of river levels recorded during each monthly sampling trip. No seasonal change in flow is apparent. Nitrate-N leaching to rivers is known to vary seasonally (Wright, et al., 1991) and is generally dependent on the water balance in the catchment, the quantity of nitrogen in the soil and the degree to which nitrogen is removed by vegetation cover in the area. Increased leaching of Nitrate-N due to land disturbance and clearing have been recorded.

Median NO_3-N concentrations throughout the Meander catchment are within the range 0.05 - 0.225 mg/L, with the highest NO_3-N levels at the Westbury site on Quamby Brook (below the sewage treatment plant) and the lowest median NO_3-N in the Liffey at Carrick (Figure 2.21). The largest range in NO_3-N concentrations was found at Western Creek where NO_3-N levels up to 1 mg/L were recorded. It is very likely that the degree of intensive dairy farming in this catchment is responsible for this large range in NO_3-N concentrations (15 dairys are located in this catchment - see section ‘Special Studies’).

As will be shown in a following section, NO_3-N concentrations also increase markedly during flooding.

Total N

As previously mentioned, TKN was only measured at sites in the Meander Catchment for the latter 18 months of the program. Therefore median levels of Total N at all sites is calculated from fewer samples than for other nutrients. The ANZECC (1992) guidelines for the protection of freshwaters in Australia is 0.1 - 0.75 mg/L and it is suggested that concentrations of N generally above this may cause deleterious effects on the aquatic ecosystem (i.e. algal blooms). Total N concentrations in the Meander catchment (Figure 2.22) are mainly within the lower end of this range (0.14 - 0.47 mg/L) with the exception of Quamby Brook at Westbury which has a median TN concentration of 0.75 mg/L. Although a proportion of this higher concentration may be due to discharge from the Westbury STP, TN levels measured just upstream of the discharge showed that TN concentrations in Quamby Brook are generally higher in the lower section of the brook (Figure 2.23c).
This increase is most notable during summer low flows, as seen in the transect taken during March 1995. Sites in the lower part of the brook are above 0.6 mg/L while concentrations in

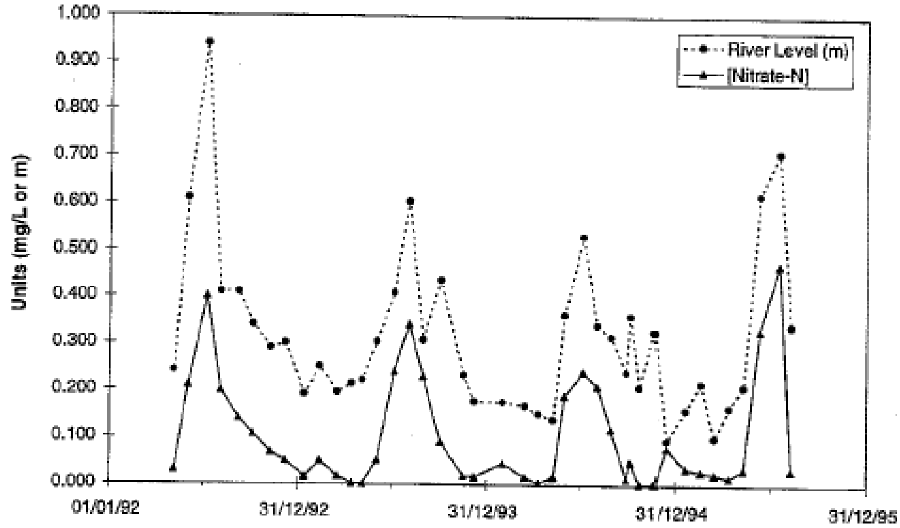

Figure 2.20a Monthly changes in Nitrate-N concentration and River Level in the Liffey River at Carrick.

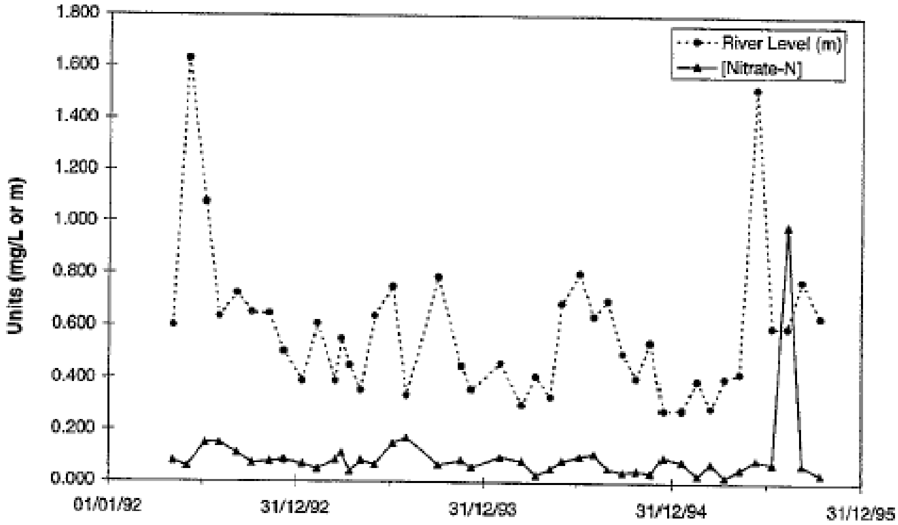

Figure 2.20b Monthly changes in Nitrate-N concentration and River Level in the Meander River at Meander.

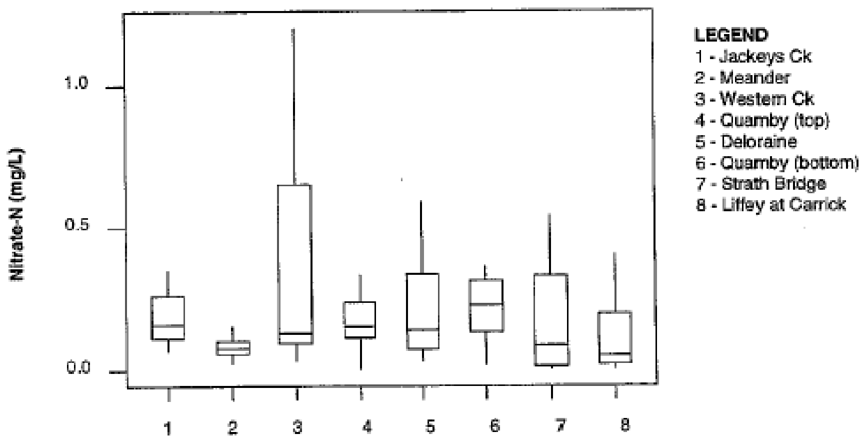

Figure 2.21 Box and whisker plots showing statistics of Nitrate-N concentrations monitored monthly at sites in the Meander catchment (n = 18 - 48).

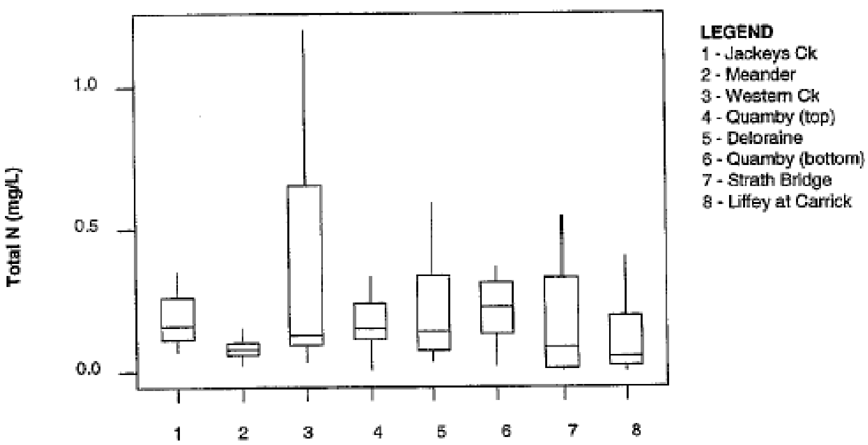

Figure 2.22 Box and whisker plots showing statistics of Total N concentrations monitored monthly at sites in the Meander catchment (n = 5 - 23). [* TN derived by calculation].

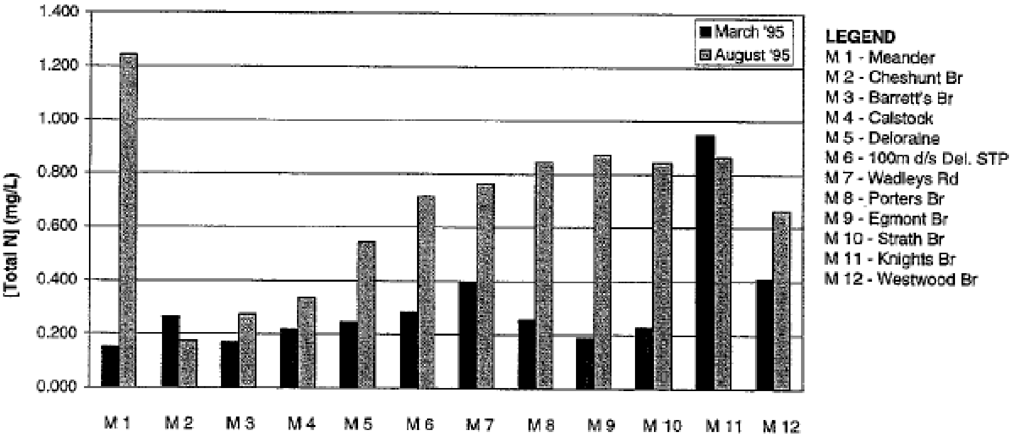

Figure 2.23a Longitudinal transects of Total Nitrogen along the length of the Meander River during surveys performed in 1995.

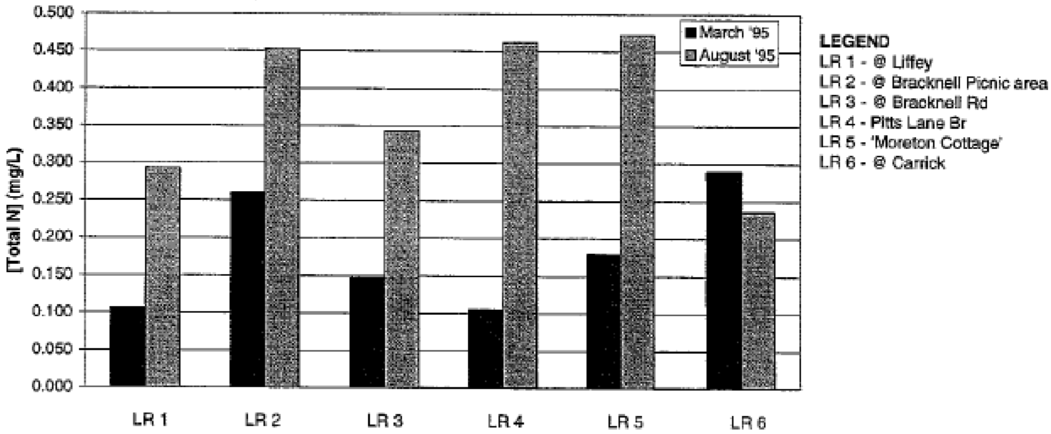

Figure 2.23b Longitudinal transects of Total Nitrogen along the length of the Liffey River during surveys performed in 1995.

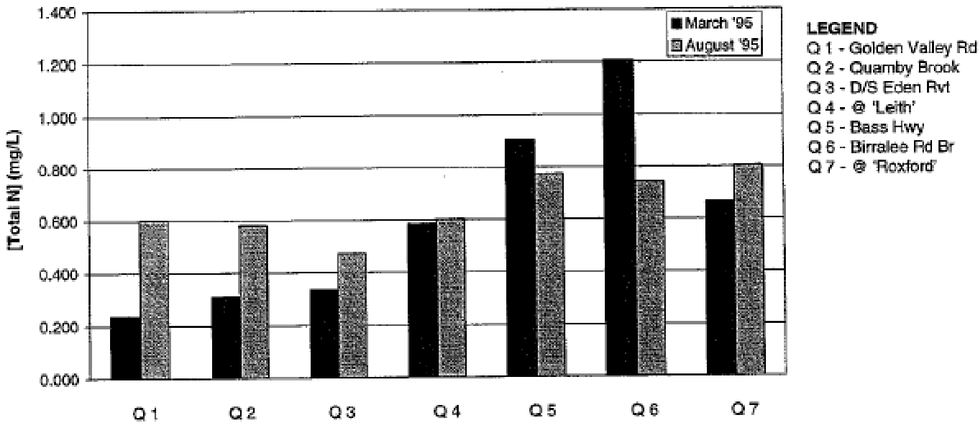

Figure 2.23c Longitudinal transects of Total Nitrogen along the length of Quamby Brook during surveys performed in 1995.

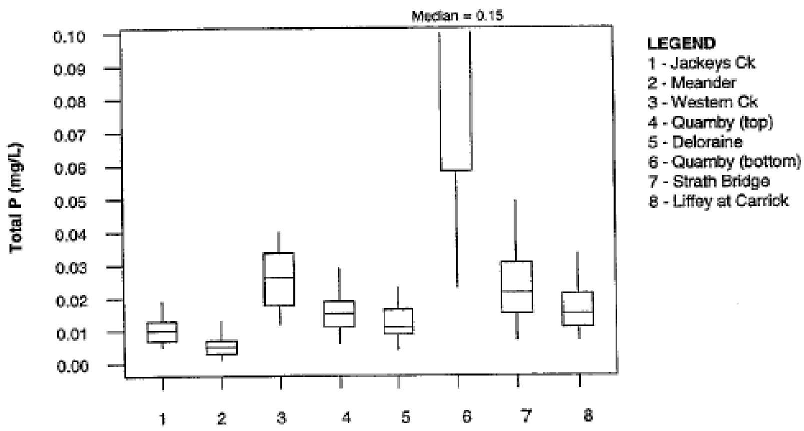

Figure 2.24 Box and whisker plots showing statistics of Total P concentrations monitored monthly at sites in the Meander catchment (n = 18 - 48).

the upper sites are below about 0.4 mg/L. During winter TN concentration throughout Quamby Brook is more uniform (between 0.5 and 0.8 mg/L)

Like Quamby Brook, TN concentrations in the Liffey River are higher during the winter(Figure 2.23b), when NO_3-N concentrations are higher. During the summer no distinct pattern in concentration change is seen, though TN levels do increase nearer the river mouth. A small peak at Bracknell may be a result of inflow of irrigation water from Main Channel (part of the Cressy-Longford Irrigation Scheme) 100m upstream of this site.

In the Meander River (Figure 2.23a), the winter pattern is for a progressive increase in TN from the top of the river to Porters Bridge. Downstream of this site TN concentrations seem to stabilise at about 0.85 mg/L. A significant spike in TN at the Meander township defies this pattern and is due largely to high NO_3-N at this site (0.99 mg/L) at the time. Relatively high TP also measured at the time suggest that there may have been some activities or disturbance upstream causing localised nutrient enrichment.

During the summer, TN is lower but more variable throughout the river with two apparent peaks found, one minor peak downstream of Deloraine and another more significant peak at Knights Bridge. During low summer flows, the river at Knights Bridge act as a large pond and the high TN measured at this is a result of high TKN (organic N) most likely due to greater biological activity at this site.

Total P

The Box plot for Total P at sites in the Meander catchment (Figure 2.24) shows that TP generally increases towards the bottom of the catchment. The two sites with greatest median TP levels are Western Creek and Lower Quamby Brook both of which also have elevated levels of turbidity. Western Creek has a substantial level of intensive animal industry and significant drainage activity both of which contribute to the higher phosphorus in waters leaving this catchment. At the lower Quamby Brook site, in addition to intensive animal industry, treated sewage effluent is also discharged to the stream. While not turbid, the discharge contains high concentrations of phosphorus largely in the dissolved form, resulting in very high TP concentrations at this site (median of 0.15 mg/L).

No seasonal pattern in TP change was apparent at any of the Meander monitoring sites. However, as was mentioned earlier, significant relationships were found between turbidity and TP at sites where enough turbidity readings were made.

Transects of Quamby Brook, Liffey River and the Meander River (Figures 2.25a - c) show that in all rivers higher TP concentrations can be found in summer. In the Meander River, the March '95 transect shows two peaks in TP, the first downstream of the Deloraine STP and the other at the very bottom of the river at Westwood Bridge. The mid-river peak was not found immediately downstream of the Deloraine STP, but TP levels in the area were elevated indicating that other factors may also be contributing to the higher TP concentrations in this section of river. Winter TP was lower than for summer, with higher TP towards the bottom of the river (as was found for TN). However, as was also found for TN, a spike was found at Meander township, indicating localised enrichment in this area at the time. Dairy cattle are known to have unregulated access to the river in this area and are the most likely cause of this enrichment.

The transects carried out in Quamby Brook show the significant impact catchment activity in the Westbury area has on the river, with very high readings of TP throughout the lower section of Quamby Brook both upstream and downstream of the Westbury STP during the

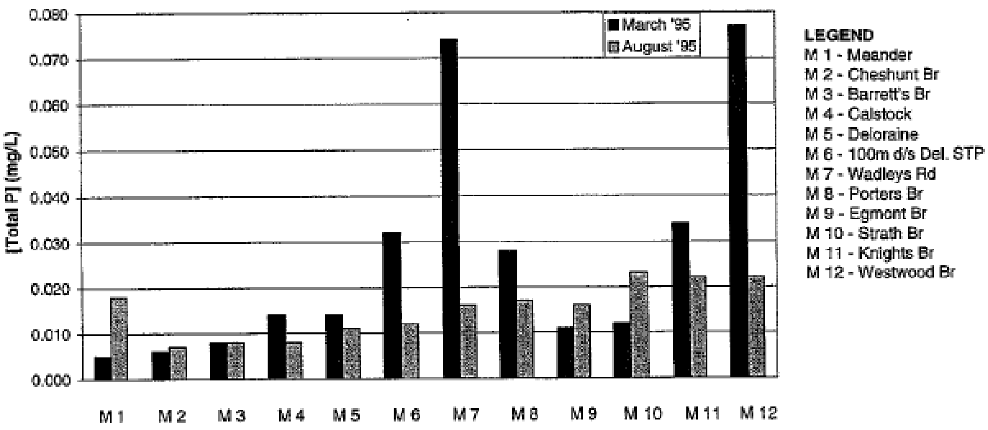

Figure 2.25a Longitudinal transects of Total Phosphorus along the length of the Meander River during surveys performed in 1995.

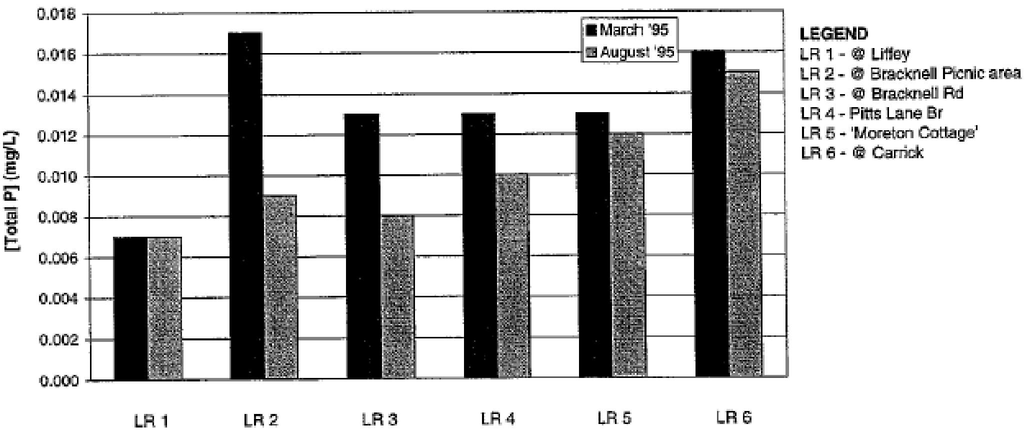

Figure 2.25b Longitudinal transects of Total Phosphorus along the length of the Liffey River during surveys performed in 1995.

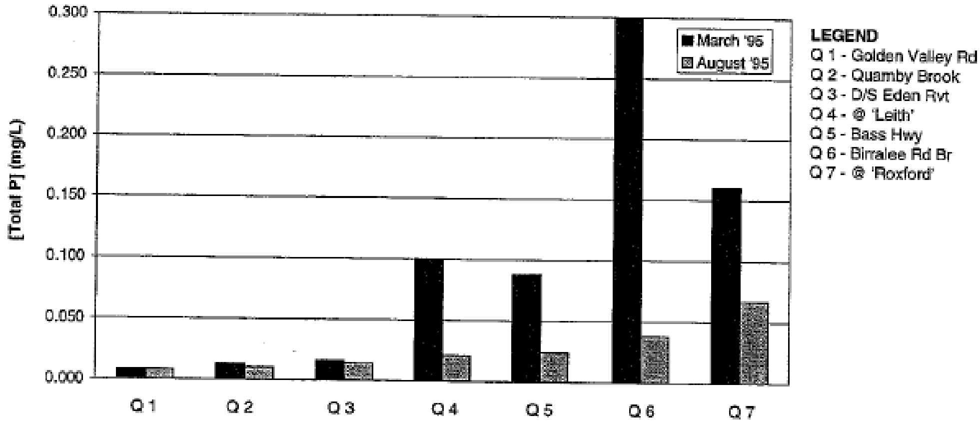

Figure 2.25c Longitudinal transects of Total Phosphorus along the length of Quamby Brook during surveys performed in 1995.

March '95 survey. Both summer and winter surveys show that TP levels in Quamby Brook are higher than either the Meander or Liffey rivers.

In the Liffey River, while summer TP levels are generally higher, the gradual increase in TP from headwaters downstream seen in the winter survey is less clear. As was found for TN concentrations, the slight peak in TP at Bracknell during summer is likely to be due to the inflow of irrigation water from Main Channel, 100 m upstream of this site.

The summary statistics for data on physico-chemical parameters, general ions and nutrients collected monthly from all sites is given in Appendix A.

2.4.2 Catchment Budget + Point Inputs

The following section outlines phosphorus and nitrogen export from various areas of the catchment. The estimation of these loads is heavily reliant on flood concentration measurements of TP and TN. In general, monthly monitoring provides a good measure of baseflow nutrient loads, but as most nitrogen and phosphorus is carried attached to suspended matter during high flow events and floods, it is paramount that samples for nutirents be taken from several of these events.

To the considerable data for TP collected from monthly monitoring was added high flow sample data collected by automatic sampling machines and grab sampling by hand. The resulting dataset for TP at most sites was considered more than adequate for estimating TP loads.

Although data on TN was only routinely collected during the latter 12 - 14 months of the study, the added information on TN concentrations collected by flood sampling was considered adequate to allow load estimates to also be made for TN.

Standard regression analysis was used to estimate nutrient loads the sites where river flow was monitored. As explained earlier, modelled flow was used to estimate loads at the lower site on Quamby Brook. Relationships between P & N concentration and Flow were established using either normal or log transformed data, and the resulting relationship was then used to convert the flow record to a concentration time series. After visual inspection to compare modelled concentration with actual measured concentration, hourly loads were then calculated as a function of concentration and mean hourly river flow. Load estimates made in this way are known to have no greater accuracy than about +/- 15% (Cosser, 1989) and the following figures should be viewed with this in mind. Some of the sources of error associated with this estimation method are related to the accuracy of flow records as well as those associated with sampling (Dolan, et al., 1981). Other errors associated with the regression model will also occur.

Flood Concentrations

During flooding in rivers of the Meander catchment, nutrient concentrations can increase by up to 100-fold. This was especially so for the parameters affected by the mobilization of sediments, such as Turbidity, TN and TP. The following table shows the range of peak concentrations of nutrients measured during flood events in rivers of the Meander catchment. These concentrations will decrease considerably later in flood events, as most of the mobile material is removed during the early stages of flooding. Highest concentrations of nutrients are generally measured in smaller rivers where river energy is greater and overland flow tends to contribute more to river flow.