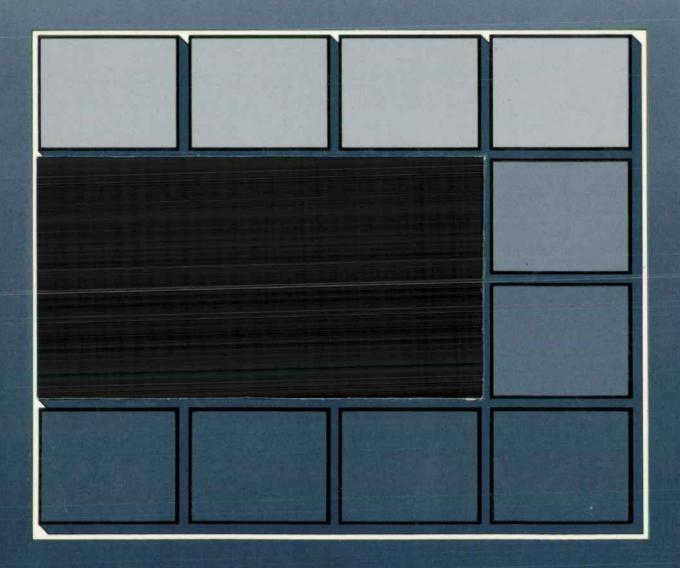


# FRESHWATER BIOLOGICAL ASSOCIATION





The **Freshwater Biological Association** is the leading scientific research organisation for the freshwater environment in the United Kingdom. It was founded in 1929 as an independent organisation to pursue fundamental research into all aspects of freshwater biology and chemistry. The FBA has two main laboratories. The headquarters is at Windermere in the Lake District and the River Laboratory is in the south of England. A small unit has recently been established near Huntingdon to study slow flowing eastern rivers.

The FBAs primary source of funding is the Natural Environment Research Council but, in addition, the Association receives substantial support from the Department of the Environment and the Ministry of Agriculture, Fisheries and Food who commission research projects relevant to their interests and responsibilities. It also carries out contracts for consulting engineers, water authorities, private industry, conservation bodies, local government and international agencies.

The staff includes scientists who are acknowledged experts in all the major disciplines. They regularly attend international meetings and visit laboratories in other countries to extend their experience and keep up to date with new developments. Their own knowledge is backed by a library housing an unrivalled collection of books and periodicals on freshwater science and with access to computerized information retneval services. A range of experimental facilities is available to carry out trials under controlled conditions. These resources can be made available to help solve many types of practical problems. Moreover, as a member of the Terrestrial and Freshwater Sciences Directorate of the Natural Environment Research Council, the FBA is able to link up with other institutes to provide a wider range of environmental expertise as the occasion demands. Thus, the FBA is in a unique position to bring relevant expertise together for problems involving several disciplines.

Recent contracts have involved a wide variety of topics including biological monitoring, environmental impact assessment, fisheries problems, salmon counting, ecological effects of reservoirs and other engineering works, control of water weeds, control of insect pests and effects of chemicals on plants and animals.

#### Windermere Laboratory

The Ferry House
Ambleside
Cumbria LA22 0LP
Telephone: 09662-2468
Telex: 8950511 ONEONE G
REF: 16173001
Facsimile: 09662-6914

#### River Laboratory

East Stoke
Wareham
Dorset BH20 6BB
Telephone 0929-462314
Telex 8950511 ONEONE C
REF 16174001
Facsimile 0929-462180

MITFURSE

FRESHWATER BIOLOGICAL ASSOCIATION River Laboratory, East Stoke, Wareham, Dorset BH20 6BB

Project leader: Report date:

M.T. Furse February 1989

Report to:

Babtie Shaw & Morton

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A30 Okehampton Bypass Control of Pollution **Biological Monitoring** Final Report

A report to Babtie Shaw & Morton, Consulting Engineers

M.T. Furse, R.J.M. Gunn & H.A. Johnson

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The Freshwater Biological Association is part of the Terrestrial and Freshwater Sciences Directorate of the Natural Environment Research Council.



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SECTION 1
INTRODUCTION

## 1. INTRODUCTION

The use of aquatic macro-invertebrates to monitor the environmental quality of streams and rivers is widely practised in Great Britain and other parts of the world.

Whereas chemical sampling gives precise measurements of the conditions pertaining at the time and place of collection, biological communities integrate all the chronic and extreme environmental conditions over the recent past.

The combined acquisition of chemical and biological data provide a greater understanding than either would on their own.

SECTION 2
DATA COLLECTION

# 2. DATA COLLECTION

## Study sites

Study sites on the West and East Okement (Table 1) were selected following consultation between representatives of Devon County Council (DCC), South West Water (SWWA), Babtie, Shaw and Morton (BSM) and the Freshwater Biological Association (FBA).

Two control sites were chosen on the West Okement. One, at Vellake Cottage (W1), was upstream of the influence of Meldon Reservoir and the other, (W2), was downstream of the reservoir. This approach was adopted in case the reservoir itself was having a deleterious impact on the macro-invertebrate communities. Both control sites were upstream of the possible perturbing effects of Meldon Quarry and the bypass construction and crossing point.

Unfortunately the quarry adit is situated only some 50 m upstream of the bypass crossing point. The extent of the construction site is such that it was impossible to have a sampling site between these two potential sources of impact. This has inevitably led to difficulties in distinguishing between the effects of the two influences. Under these circumstances the existence of the environmentally similar East Okement stream, which is also crossed by the bypass but has no quarry workings, provides a form of control situation.

The remaining four sites on the West Okement (W3-W6) were at successive locations downstream of the quarry and bypass in order to examine the spatial persistence of any observed perturbation.

The bypass construction and crossing point was the only identified possible cause of perturbation on the East Okement. Consequently only one control site (E7) was chosen. The three remaining sites (E8-E10) were at successive distances downstream of the bypass.

During the study period the visual appearance of the Railway Stream deteriorated downstream of the point at which the bypass crossed it. In order to examine the macro-invertebrate communities of this stream sampling sites were selected upstream and downstream of the joint bypass and railway crossing point (Table 1). The two sites were well matched for slope, width, depth, substratum characteristics and degree of shading.

#### Sampling programme

The sampling programme was also devised following consultation between the four interested parties (DCC, SWWA, BSM and FBA).

Samples were taken at quarterly intervals between June 1987 and September 1988 (Table 2). By agreement with DCC the December 1987 samples were collected but not analysed. Provisional plans to sample in December 1988 were abandoned following consultations.

The Railway Stream was only sampled in December 1987 and these collections were fully analysed.

The first substantial construction work on the bypass began in late January 1987, prior to the first biological sampling but all major works had been completed immediately prior to the September 1988 sampling.

## Sampling methods

At the suggestion of South West Water, macro-invertebrate samples from the West and East Okement were collected using a box sampler of the type recommended by the Standing Committee of Analysts (1982). The area enclosed by the sampler was 0.05 m<sup>2</sup>.

Three separate samples were collected from each site on each sampling occasion.

A more common method of sampling used by most British Water Authorities and River Purification Boards is timed pond-netting (Furse et al. 1981). In order to compare the effectiveness of pond-netting and box-sampling, collections were made by both methods at each site visited in June 1987. A single pond-net sample, of three minutes duration, was taken at each location. The dimensions of the pond-net were a 900 µm mesh net, with an aperture of 230 x 255 mm and 275 mm bag depth, fitted to a 1.5 m handle.

Collections at the two Railway Stream sites were made by three minute pond-netting because the channel was too narrow and shallow to use the box sampler.

## Sample analysis

Samples were preserved in formalin in the field and taken to the laboratory for examination. In most cases all macro-invertebrates were removed from the sample for identification, but occasionally sub-sampling procedures were adopted. Most taxa, with the exception of Oligochaeta (worms) and Chironomidae (midges) were identified to species where possible.

The following data were recorded:

- 1. Abundance of individual species in each sample.
- 2. Abundance of individual families in each sample.
- 3. Biological Monitoring Working Party (BMWP) scores, number of scoring taxa and Average Score per Taxon (ASPT).

The BMWP score system (Armitage et al. 1983) is the biological index most widely used by Water Authorities for assessing environmental quality of rivers. It was devised for, and used in, the national River Water Quality survey conducted by the Department of the Environment in 1980.

Each taxon (usually family) is ascribed a score reflecting the general pollution tolerance of its component species. The higher the taxon's score the less tolerant it is of pollution. The site BMWP score is the sum of the scores of the individual taxa recorded there. Thus the higher the site score the better its environmental quality is assumed to be. This is because a diverse range of high scoring (pollution intolerant) taxa indicate that a site is substantially unstressed.

The Average Score per Taxon (ASPT) is the average score of the taxa present. It is derived by dividing the site BMWP score by the number of scoring taxa. The higher the ASPT value the better the site's environmental quality is assumed to be.

However the precise BMWP scores and ASPT to be expected at an unpolluted site will depend upon season of sampling, the site's geographical location and its particular physical and chemical characteristics. These characteristics include substratum type, width, depth, current speed, distance from source, site altitude, slope and the unpolluted water chemistry.

The Freshwater Biological Association have developed a computer package (RIVPACS) which enables the BMWP score and ASPT of an unpolluted site in a particular season to be predicted from measured environmental features (Moss et al. 1987). Predictions are accompanied by 95% confidence intervals to allow for statistical variability in biological sampling. The necessary environmental data for the West and East Okement were collected during biological sampling visits or have been subsequently acquired from maps or South West Water (Table 3). In all cases the chemical values used were those from control sites (W2 and E7) since these represent the natural conditions which exist in the river upstream of any potential influence of bypass construction work.

The biological condition of the stream may be assessed by the following ratio

Observed value (score or ASPT): Expected or predicted value (score or ASPT)

This ratio is termed the Environmental Quality Index (EQI). It has a value of one if the site exactly meets its optimal quality standard but falls below unity as quality declines. The values of ASPT acquired by sampling are less effort dependant, and therefore more reliable, than BMWP scores (Armitage et al. 1983). Confidence intervals around score-based EQI's are thus greater than around ASPT-based values of the index.

EQI values may also be computed for the observed and expected number of taxa and these may be applied to the whole community or to selected taxonomic groups.

## Historical data

All known Water Authority data on the biological monitoring of the macro-invertebrate communities of the West and East Okement were made available to the authors by South West Water.

These have been used to compare the biological conditions of the sampling sites during, and immediately after, the bypass construction phase with those pertaining prior to these works.

SECTION 3

RESULTS

## 3. RESULTS

# Comparison of box samples and pond-net samples

Individual pond-net samples collected at each site in June 1987 were compared with the equivalent combined results of the three box samples.

Mean BMWP score, number of scoring taxa and ASPT were usually slightly higher for pond-net samples than combined box samples. However the differences were never statistically significant, as assessed by the Wilcoxon Matched Pair test.

	Mean score	Mean no. taxa	Mean ASPT
Box samples	82.7	13.4	6.05
Pond-net samples	99.5	15.3	6.24
Wilcoxon Z value	-1.60	-1.82	-1.01

The patterns of environmental quality indicated by the two sampling methods were also similar. This was indicated by correlation analysis of the BMWP scores, number of scoring taxa and ASPT's for the 10 sites. In the case of score and number of scoring taxa the r values are highly significant (score p <0.02; taxa p <0.01) whilst ASPT only just fails to be significant.

In view of these analyses it was decided that future sampling should be by the box sampler. This procedure is approved by the Standing Committee of Analysts and may have more credibility in law or public enquiry.

# Environmental quality

BMWP scores, number of scoring taxa and average score per taxon have been calculated for each West and East Okement site for each sampling occasion (Appendices 1 and 2). Quarterly results have been presented to Devon County Council in a series of interim reports (Furse et al. 1988) and are reproduced here in graphical form (Figure 1). Each point is derived from the combined taxon list from the three box samples collected at that site in that season.

These data have subsequently been compared with predicted values for the appropriate site and season (Figure 2). This enables direct temporal and spatial comparison between samples and also allows each site to be assessed against its optimal environmental quality in the absence of perturbation.

The historical samples collected by South West Water have been examined in the same way for comparative purposes. Environmental values used to predict historical indices are the mean of the individual data collected during 1987-88.

Sampling effort for historical data has not been standardised and score values obtained by South West Water may not necessarily be comparable with predicted values. This qualification should not apply to ASPT values which, as noted above, are much less effort dependent.

The two branches of the Okement will be considered separately on a site by site basis.

#### West Okement

Site W1: This control site is approximately 200 m upstream of Meldon Reservoir and approximately 3 km upstream of the quarry adit/bypass crossing point.

All observed scores and ASPT's lay within the 95% confidence intervals around the predicted values (Figure 2). The environmental quality of the site therefore met normal expectations.

Site W2: This control site is approximately 500 m downstream of Meldon Dam. It is approximately 100 m upstream of the quarry adit and 150 m upstream of the bypass crossing point.

All observed ASPT values and all but one of the observed scores fell within the 95% confidence limits around predicted values. The single exception was the score obtained by South West Water in December 1986. No details of the Authority's sampling method are given and the low value may be effort related. The observed ASPT value for this sample almost exactly matched the prediction.

The environmental quality of the site met normal expectations.

Site W3: This site is approximately 300 m downstream of the bypass crossing point and 350 m downstream of the quarry adit.

Historical ASPT values (June 1981 and December 1986) indicate that the environmental quality of the site met normal expectations at that time. The score in 1981 (two minutes pond-netting rather than the standard three) was just within the expected range but in 1986 (effort undefined) lay just below the lower 95% confidence interval.

Samples collected during and immediately after the bypass construction indicate a fall in environmental quality. Only once (March 1988) did the ASPT value fall within the 95% confidence intervals of the prediction. EQI's for score were consistently, and often considerably, below expectation.

The environmental quality of this site fell below normal expectations during 1987-88. This decline appeared to be on-going with poorer quality detected in June and September 1988 than in previous quarters. The EQI values in late 1988 are approximately equivalent to the NWC chemical water quality category 2 (fair).

Site W4: This site is approximately 1 km below the quarry adit and bypass crossing point.

The single historical EQI for ASPT (December 1986) closely matched expectations but the score, which was obtained using undefined effort, fell just below the lower 95% confidence intervals. During 1987-88 the majority of EQI's for ASPT and all EQI's for score were outside the acceptable range.

The environmental quality of this site fell below normal expectations during 1987-88. Again the values for June and September 1988 were noticeably poorer than earlier quarters. The EQI values in these months were approximately equivalent to NWC chemical water quality category 3 (poor).

Site W5: This site lies approximately 1.5 km downstream of the quarry adit and bypass crossing point. It also lies about 100 m downstream of the entry of the Railway Stream.

The average EQI values for this site were lower than for any other sampled. All values were well below expectations with the lowest EQI's again recorded in the last two quarters. Unfortunately no historical data have been found for this site to provide comparison.

The environmental quality of this site was approximately equivalent to NWC chemical classes 2-3 throughout 1987-88.

Site W6: This site is approximately 2 km downstream of the quarry adit and bypass crossing point. It is also about 1 km upstream of the confluence with the East Okement.

Most historical data (June 1981 and December 1986) indicate that the site met normal expectations at those times. Subsequent EQI values have, with one exception, been below the predicted range. Recorded values have been rather more erratic than for the sites upstream but once again the lowest EQI's were obtained in a later sample (September 1988).

The environmental quality of this site fell below normal expectations in 1987-88. Most EQI values were approximately equivalent to NWC chemical class 2 but the September 1988 values were indicative of chemical class 3.

General: Both control sites met normal environmental quality standards and therefore indicated no major perturbation to the fauna of the West Okement river upstream of the Meldon Quarry adit and bypass crossing point.

Historical data generally indicated that sites downstream of the current bypass crossing point also met normal environmental quality standards. This was particularly true of the less effort dependent EQI's derived from ASPT values.

Data collected from sites (W3-W6) downstream of the bypass crossing point show a marked and continuing decline in biologically-indicated environmental quality since construction work started.

Any assumption of a causal relationship between the roadworks and the declining environmental quality of the West Okement ignores another important and simultaneous development.

Drainage water from the adjacent Meldon Quarry has historically entered the West Okement near the new bypass crossing point. This quarry water had consistently low pH, i.e. was very acidic, and had consistently high levels of metal concentrations. These chemical conditions were considerably more extreme than normal levels in the West Okement.

Prior to 1987 most water was conveyed to the river via a channel known as the Meldon Quarry Stream. A smaller proportion drained across moist woodlands in poorly defined channels. This wetland area acted partially as a sink and partially as a filter and effectively reduced the effects of quarry water on the West Okement.

In 1987 the route of discharge of quarry water to the West Okement was altered to enable Meldon Quarry to be worked deeper (Construction News 1987). The new route was via a 60 m deep, 600 mm diameter drainage borehole in the quarry into a 2.1 m high and 1.6 m wide adit. The adit then gravity fed the collected water into the West Okement at a point approximately 50 m upstream of the bypass crossing point.

The precise date at which the adit became operational is not known but Construction News (1987) suggested that the contract to build the adit would be completed by the end of June 1987.

No data are available on the quantity or quality of water entering the West Okement via the adit. In view of the fact that the drained water receives no treatment it is reasonable to assume that the water entering the river is both very acidic and with high concentrations of dissolved and suspended metals. It is also possible that the increased depth of operation at the quarry and the more efficient drainage system will have led to a corresponding increase in the quantity of water entering the river.

The effects of any reduction in the pH of the waters of the West Okement and of any increase in metal loadings can be expected to be deleterious to many species of macro-invertebrates.

The relative impact of the Meldon Quarry discharge and the bypass construction must remain the subject of speculation on the basis of existing data. This situation is exacerbated by there being no opportunity to sample the river in the stretch between the adit and bypass. However, further circumstantial evidence is available from the East Okement where the detection of any impact of bypass construction would not be complicated by acid quarry drainage.

### East Okement

Site E7: This control site lies approximately 100 m upstream of the bypass crossing point.

Most EQI's lay within the predicted 95% confidence intervals. Indeed two samples (September 1987 and June 1988) indicate a particularly rich fauna. The historical EQI for December 1986 fell below expectation as was the case for many samples taken at this time and whose method of collection is unknown.

The environmental quality of this site meets normal expectations.

Site E8: This site lies approximately 150 m downstream of the bypass crossing point.

All historical samples, and those collected during 1987-88 lay within the predicted 95% confidence intervals.

Environmental quality consistently met normal expectations and no significant environmental impact, of bypass construction work, upon aquatic macro-invertebrate communities was detected.

Site E9: This site is situated approximately 500 m downstream of the bypass crossing point.

No historical data were available but all EQI values for samples collected in 1987-88 lay within or exceeded normal expectations. No significant environmental quality reduction was recorded at this site. Lowest EQI values occurred in March and June 1988 but in all cases they were above the lower 95% confidence interval.

Site E10: This site is approximately 1.5 km downstream of the bypass crossing point. It is also about 400 m upstream of the confluence with the West Okement.

Historical samples indicate very good environmental quality at this site in June 1981 and December 1986. These high standards were maintained in 1987. A noticeable decline was recorded in March and June 1988, although on only one occasion did any EQI value fall below the acceptable range.

The decline in quality in these two months coincided with similar falls at E9. During the March 1988 biological sampling the river was heavily discoloured by a milky suspension of material emanating from construction work at the bypass crossing point. This, probably inorganic, material either in suspension or deposited may have been having slight deleterious efects upon the macro-invertebrate fauna.

Similar, but much less pronounced discolouration of the water, resulting from bypass construction work, was noted in June 1988.

On each occasion the presence and origin of the suspended material was reported to Devon County Council and it is understood that remedial action was taken (Devon County Council, pers. comm.).

EQI values for E10, and for E9, were at their usual high levels in September 1988 and therefore there was no chronic decline in environmental quality over the period of bypass construction.

General: The environmental quality of the East Okement has been maintained at an acceptably high standard. On only one occasion did either environmental quality index fall below the acceptable range. A possible reason for the decline was drawn to the attention of Devon County Council. The biologically-indicated environmental quality of all four sites, at the end of the construction period, was as good as the situation prior to the roadworks and/or predicted standards.

As indicated earlier, these findings provide circumstantial evidence to suggest that bypass construction may not have been the cause of the reduction in environmental quality recorded at sites W3-W6 on the West Okement.

## Railway Stream

Site RS1: This site is situated 100 m upstream of the adjacent bypass and railway crossing point.

Predicted target values could not be obtained because streams of this small size are outside the operating range of RIVPACS. However, the recorded values in December 1987 of score (146) and ASPT (6.35) suggest the site is not perturbed and is of good environmental quality.

Site RS2: This site is approximately 200 m downstream of the adjacent bypass and railway crossing points.

The recorded values in December 1987 of score (6) and ASPT (3.0) suggest the site is severely perturbed and is of very poor environmental quality.

General: The decision to sample these sites was prompted by the oily appearance and diesel-like smell of the stream in September 1987.

Analysis of the samples revealed a major decline in environmental quality over the 300 m distance between sites.

Chemical analyses and information provided by Devon County Council suggest that the decline was most likely due to the release of acid quarry drainage water down the stream.

This water was previously carried by pipeline from Meldon Quarry to the Okehampton Railway Station. This pipeline was fractured near the course of the Railway Stream during highway construction and the released water, which is acidic and has high levels of metals, has subsequently flowed down the Railway Stream (Devon County Council, pers. comm.).

The added volume of acidic water to the West Okement, upstream of sites W5 and W6, may have further contributed to their poor environmental quality.

An alternative route, if economically feasible, would be to direct the pipeline water into a series of small rivulets which previously flowed across Okehampton Golf Course and disappeared into a wetland area adjacent to the West Okement.

New drainage arrangements alongside the bypass are reported to have substantially dried these water courses and this may lead to a consequent loss of wetland (Devon County Council, pers. comm.). Directing the quarry water down these channels would restore both them and the wetlands but the filtering action of the latter should prevent acidic water from entering the main river.

## The fauna

One hundred and four distinct taxa, principally species, have been recorded from the study sites. The numbers found at each study site varied from 56 at site E9 on the lower East Okement to just 2 on the lower Railway Stream site (Table 4). These 104 taxa are distributed amongst 51 families or larger taxonomic groupings. The numbers of "families" at each site have also been counted (Table 4).

The highest number of taxa, both "species" and "families" were generally recorded at the East Okement sites but approximately similar numbers were taken from the two control sites (W1 and W2) on the West Okement. Numbers of species recorded downstream of the West Okement bypass crossing point and quarry adit were approximately half those recorded at the control sites.

Numbers of taxa at the two Railway Stream sites are based on a single season's sampling whereas all other lists are compiled from five separate seasons.

The frequency with which individual "species" were found in the fifteen box samples is given in Table 5. Other taxa recorded from the sites in the June 1987 pond-net samples or in samples collected by South West Water are also indicated to provide the most comprehensive listings for the sites and the river system as a whole. Similar family level data are provided in Table 6.

None of the taxa recorded are particularly rare or of notable conservation status. Full listings of the number of individuals in each species and family in each box sample from each site have already been presented to Devon County Council in a series of interim reports (Furse et al. 1988). These data are reproduced here (Appendices 3-6) whilst full species lists for the two Railway Stream sites are given in Appendix 7.

Scrutiny of these appendices shows that it was the high scoring BMWP families, i.e. those which are least tolerant of pollution, which were principally absent from, or scarce at, sites W3-W6. These taxa are mainly from three orders of insects, the Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddis).

As with BMWP score and ASPT, the Freshwater Biological Association's RIVPACS system enables the number of families of each order which were recorded at each site to be compared with the number expected and the result expressed as Environmental Quality Indices (EQI's).

A simple graphical presentation of the EQI's for each order at each site illustrates the changes occurring in the river (Figure 3). In these examples mean EQI's with standard deviations are plotted for each site.

On the West Okement there are marked declines in the EQI values for Ephemeroptera and Plecoptera downstream of the bypass crossing point and quarry adit, indicating fewer occurrences of these taxa than expected. A similar but less pronounced trend is apparent for Trichoptera which generally occur less frequently than expected throughout the river system. On the East Okement the frequency of occurrence of all three orders meets or exceeds expectation on almost all occasions.

SECTION 4

CONCLUSIONS

# 4. CONCLUSIONS

## West Okement

Control sites on the river immediately upstream and downstream of Meldon Reservoir are of good environmental quality.

Historically, i.e. pre-1987, sites downstream of the Meldon Quarry adit and the Okehampton bypass crossing point were also of good environmental quality.

Environmental quality of the sites downstream of the quarry adit and the bypass crossing point declined markedly during the highway construction work (June 1987-September 1988).

Environmental quality at these sites was particularly poor in the latter half of 1988 when biologically-based environmental quality indices indicated equivalent NWC chemical quality classes 2 (fair) or 3 (poor).

The decline in quality indices resulted from a reduction in the number of taxa occurring at these sites, particularly the pollution intolerant insect groups, mayflies, stoneflies and caddis.

The fall in environmental quality at sites downstream of the bypass crossing point coincided with, but may not have been caused by, highway construction work.

Changes in the manner by which drainage water is discharged from Meldon Quarry into the West Okement were implemented in mid-1987.

The new drainage system may have led to an increase in the quantity of water entering the West Okement from the Meldon Quarry although no direct evidence is available to confirm this theory.

The quarry drainage water is very acidic and carries high levels of dissolved and suspended metals and this may have a deleterious effect on the fauna of the receiving stream, the West Okement.

The close proximity of the inflow adit from the quarry to the river and the highway construction sites precludes a sampling site being established between them and makes it difficult to distinguish between the impact of the two processes.

The absence of significant deterioration in the environmental quality of the East Okement, which is similar in size and character to the West Okement and has a bypass crossing but not quarrying activity, provides circumstantial evidence to suggest that highway construction may not be the cause of the decline in environmental quality on the West Okement.

## East Okement

The control site and all three potential impact sites were of generally high quality throughout the period of highway construction.

Slight loss of quality was noted at the two downstream sites (E9 and E10) in March and June 1988 but even so Environmental Quality Indices were generally at an acceptable level.

The fall in environmental quality noted above coincided with discolouration of the river due to suspended, probably inorganic, material emanating from construction work at the bypass crossing point.

The suspended material, and its deposition, may have been deleterious to the aquatic fauna.

The occurrence of the excessive suspended solids load was reported to Devon County Council and remedial measures were taken.

The values of biologically-based environmental quality indices show that the quality of all four sites is as high at the end of the highway construction work as it was before work began.

## Railway Stream

The Railway Stream, 100 m upstream of the adjacent bypass and railway crossing points, supported an abundant and diverse macro-invertebrate fauna in December 1987.

The same stream 200 m downstream of the crossing points was almost totally devoid of macro-invertebrates and was clearly severely perturbed.

This decline in quality is attributable to the continuous or intermittent release, into the stream, of acid water from Meldon Quarry via a pipeline fractured during highway construction.

This water subsequently enters the West Okement and may contribute to the poor environmental quality of the two sites downstream of the inflow point.

Diversion of the released quarry water into small watercourses that cross Okehampton Golf Course will restore discharge in these channels to pre-bypass levels and will help maintain wetlands adjacent to the West Okement.

Directing water onto these wetlands should lead to it percolating into the ground and not flowing directly into the West Okement.

### General

South West Water are advised to obtain further information on the quantity and quality of water entering the West Okement from Meldon Quarry to ensure that it is not having an unacceptably deleterious effect on the environmental quality of the river.

SECTION 5
ACKNOWLEDGEMENTS

# 5. ACKNOWLEDGEMENTS

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The text of this report was typed by Diana Morton.

SECTION 6

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SECTION 7

TABLES

Table 1. Location of study sites, with equivalent chemical sampling site codes.

Code	Site name	NGR	Chemical sampling point
West	Okement		
W1 W2 W3 W4 W5 W6	Vellake Cottage U/S of Meldon Quarry adit and bypass D/S of bypass U/S of Wigney Okehampton Golf Course Okehampton Castle	SX 555 906 SX 565 928 SX 566 932 SX 568 935 SX 575 939 SX 585 944	SB1 SB2 SB3 SB4 SB5 SB6
East (	Okement		
E7 E8 E9 E10	U/S of bypass D/S of bypass Ball Hill Okehampton Grammar School	SX 604 947 SX 602 948 SX 597 946 SX 589 949	SB7 SB8 SB9 SB10
Railw	ay Stream		
RS1 RS2	100 m U/S bypass 200 m D/S bypass	SX 575 937 SX 576 935	-

Table 2. Sampling dates.

June 1987	8. 6.87	W1-W6, E7-E10
September 1987	10. 9.87	W1-W6, E7-E10
December 1987	30.11.87 1.12.87	W3-W4, W6, E7-E10, RS1-RS2 W1-W2, W5
March 1988	2. 3.88	W1-W6, E7-E10
June 1988	13. 6.88	W1-W6, E7-E10
September 1988	13. 9.88	W1-W6, E7-E10

Table 3. Environmental data used to predict expected BMWP scores, ASPT's and numbers of selected taxa.

3a West Okement

Variable	W1 1987 19	W1 1988	V 1987	W2 1988	W 1987	W3 1988	V 1987	W4 1988	V 1987	W5 1988	V 1987	w6 1988
Water width (m) Mean depth (cm) Surface velocity (category)*	6.2 34.8 4	6. 1 23.8 4	9.0 30.2 4	8.4 20.4 4	9.7 22.7 4	7.8 15.7 4	7.7 28.3 4	7.1 17.6 3	8.3 21.4	8.7 15.4 4	15.0 35.6 3	12.7 17.0 3
Substitution (%) Boulders & cobbles Pebbles & gravel	79.7	82.7 14.7	20.3	84.7 14.7	80.3	81.7	83.3	78.3 20.3	83.3	78.3	67.7 26.0	86.6 11.0
Silt & clay Altitude of site (m) Longitude (°-' W)	280 4-02	280 4-02	2.0 200 4-01	0.3 200 4-01	0.7 190 4-01	1.0 190 4-01	1.3 185 4-01	0.7 185 4-01	1.0 175 4-00	0.7 175 4-00	3.3 160 4-00	1.7 160 4-00
Latitude (°-' N) Distance from source (km) Slope (m km <sup>-1</sup> ) Discharge category+	50-42 7.4 19 2	50-42 7.4 19 2	50-43 10.0 25	50-43 10.0 25	50-43 10.5 20 2	50-43 10.5 20 2	50-43 10.9 16.5	50-43 10.9 16.5	50-43 11.7 10.2 2	50-43 11.7 10.2 2	50-44 12.1 12.7	50-44 12.1 12.7 2
Total alkalinity (mg 1 <sup>-1</sup> CaCO 3) 5.1 Chloride (mg 1 <sup>-1</sup> Cl <sup>-</sup> ) 8.1	5.1 8.1	5.1 8.1	5.1 8.1	8.1	5.1 8.1	8.1	8.1	5.1 8.1	5.1 8.1	5.1 8.1	5.1 8.1	8.1

\*Surface velocity categories: 3 = 25-50 cm sec<sup>1</sup>. 4 = 50-100 cm sec<sup>-1</sup> +Discharge category: 2 = 0.31-0.62 cubic metres sec<sup>-1</sup>

3b East Okement

	щ	1.7	'n	φQ	Ш	Ō,	1	210
Variable	1987	1987 1988	1987	1987 1988	1987 1988	1988	1987	1987 1988
Water width (m) Mean depth (cm) Surface velocity (category)* Substratum cover (%) Boulders & cobbles Pebbles & gravel Sand Silt & clay Altitude of site (m) Longitude (°-' W) Latitude (°-' N) Distance from source (km) Slope (m km-')	8.7 29.4 4 4 78.7 18.0 3.0 0.3 195 4-58 50-44 6.8	8.8 24.3 4 70.0 28.3 11.7 0 195 4-58 50-44 6.8	7.0 41.6 5 73.3 20.3 5.7 0.7 185 4-58 50-44 7.0	7.8 27.7 4 76.0 20.3 1.3 2.3 185 4-58 50-44 7.0	7.5 23.2 4 4 73.3 19.7 6.0 1.0 1.75 4-59 50-44 7.4	7.0 19.7 4 65.3 30.3 3.3 1.0 175 4-59 50-44 7.4	9.0 24.6 3 69.3 24.7 4.7 1.3 157 4-59 50-44 8.4	9.3 17.3 3 74.0 22.7 2.7 0.7 157 4-59 50-44 8.4
Discharge category+ Total alkalinity (mg l <sup>-1</sup> CaCO <sub>3</sub> ) Chloride (mg l <sup>-1</sup> Cl <sup>-</sup> )	8.6	5.7 8.6	7.2 8.6	2 5.7 8.6	2.2 8.6	2 5.7 8.6	2.2 5.7 8.6	5.7 8.6

\*Surface velocity categories: 3 and 4 see table 3a. 5 = 100 cm sec<sup>-1</sup> +Discharge category: 2 = 10.31 -0.31 cubic metres sec<sup>-1</sup>

Table 4. The number of distinct "species" and "families" recorded at each study site during 1987-88.

	W1	W2	w3	W4	W5	Site W6	RSI	RS2	E7	E8	E9	E10
Species	40	50	29	29	29	27	26	2	54	48	56	52
Families	24	30	19	22	21	20	23	2	31	30	35	34

Table 5. The frequency of occurrence of "species" in the 15 box samples collected during 1987-88.

West Okement (W1-W6). Railway Stream U/S Bypass (RS1), D/S Bypass (RS2). East Okement (E7-E10).

N = absent from box samples, present in pond-net samples. H = Historical, pre-1987, only.

TAXON	WI	<b>W</b> 2	W3	W4	W5	SITE W6	RS1	RS2	F7	E8	E9	E10
TRICLADIDA (FLATWORMS)			•			***		****				210
Planariidae												
Polycelis felina	5	5	5	7	1	1	+	-	4	7	3	5
Phagocata vitta	В	2	1	7	4	2	-	-	2	3	6	-
Crenobia alpina Dendrocoelidae	1	-	-	-	-	-	-	-	-	-	-	-
Dendrocoelum lacteum												
neugration ractem	-	-	-	-	-	-	-	-		-	1	-
NEMATODA (NEMATODES)												
Nematoda	1	-	-	1	-	-	-	-	1	1	2	1
									•	•	_	_
GASTRODA (SNAILS)												
Hydrobiidae												
Potamopyrgus jenkinsi	-	-	-	-	-	-	-	-	3	3	3	1
Ancylidae										_		_
Ancylus fluviatilis Zonitidae	-	-	_	-	-	-	+	-	1	3	2	3
Zonitoides nitidus		_	_	_	-	_	_	_	_	_	_	1
												1
BIVALVIA (BIVALVE SNAILS)												
Sphaeriidae	-	1	-	-	2	6	÷	-	-	1	-	-
OLIGOCHAETA (TRUE WORMS)												
Oligochaeta	15	14	15	15	15	15	+	+	15	15	15	15
		• •				••	•	•	.,	10	15	10
HIRUDINEA (LEECHES)												
Glossiphoniidae												
Glossiphonia complanata	-	-	-	-	1	-	-	-	-	-	-	-
Helobdella stagnalis	-	1	-	-	1	-	-	-	-	-	-	-
ARACHNIDA (SPIDERS & NITES)												
Hydracarina	8	7	3	1	3	2	_	_	3	8	9	11
,,	-	•	•	•	·	•			٠	٠	•	••
AMPHIPODA												
Gammaridae												
Gammarus pulex	-	i	-	1	-	-	+	-	1	7	3	3
EPHEMEROPTERA (MAYFLIES)												
Baetidae												
Baetis scambus	_	5	N	1	1	Н	-	_	6	6	9	11
Baetis vernus	9	7	4	5	3	2	-	-	3	2	_	-
Baetis rhodani	3	7	6	2	2	i	+	-	11	14	15	8
Baetis muticus	-	-	-	-	-	-	÷	-	4	N	-	N
Centroptilum luteolum	-	-	-	-	-	-	-	-	-	-	1	1
Heptageniidae												
Rhithrogena semicolorata	-	2	-	-	-	H	+	-	9	5	6	2
Heptagenia lateralis	H	8 8	1 2	2	-	1 1	-	-	5	1	2	5
Ecdyonurus sp. Leptophlebiidae	1	8	2	2	-	1	-	-	11	8	10	10
Leptophlebia marginata	1	_	_		_	_	_	_	_	_	_	_
Paraleptophlebia submarginata	1	1	-	-	_	_	-	_	_	_	2	1
Habrophlebia fusca	-	-	_	-	_	_	_	_	-	i	-	-
Ephemerellidae										•		
Ephemerella ignita	5	-	N	-	2	Н	-	-	5	6	6	9
Epheaeridae	_				-					-	-	-
Ephemera sp.	-	-	-	-	-	-	-	-	-	-	-	N
Caenidae												
Caenis rivulorum	-	1	-	-	-	-	-	-	-	-	N	1

TAXON	M1	W2	W3	W4	W5	SITE W6	RS1	RS2	<b>E7</b>	E8	E9	E10
PLECOPTERA (STONEFLIES)												
Taeniopterygidae												
Brachyptera risi	3	1	-	_	_	_	-	-	_	1	1	_
Nemouridae	•	-								•	•	
Protonemura meyeri	В	2	_	_	2	1	+	_	3	2	2	N
Amphinemura sulcicollis	7	4	4	3	3	ī	-	_	3	4	2	2
Nemurella picteti	-	-	-	_	_	_	-	_	-	_	ī	-
Nemoura avicularis	_	1	-	-	-	-	_	-	_	1	1	3
Nemoura cambrica group	-	-	-	-	-	-	+	-	_	-	-	-
Leuctridae												
Leuctra geniculata	-	-	i	-	-	-	-	-	-	-	-	-
Leuctra inermis	10	10	4	3	2	H	-	-	7	4	2	-
Leuctra hippopus	3	3	2	1	1	-	-	-	1	-	· -	1
Leuctra nigra	-	-	-	-	-	-	-	-	1	-	-	-
Leuctra fusca	7	8	2	i	-	3	-	-	8	6	6	5
Perlodidae												
Perlodes microcephala	5	6	-	-	-	-	-	-	3	4	4	2
Isoperla grammatica	9	8	1	3	-	Н	-	-	3	1	2	-
Perlidae												
Dinocras cephalotes	•	2	-	-	-	-	-	-	-	-	-	-
Chloroperlidae												
Chloroperla torrentium	8	10	2	2	-	2	+	-	12	4	4	2
Chloroperla tripunctata	4	9	1	1	3	Ħ	-	-	12	8	7	8
ODONATA (DRAGON/DAMSELFLIES)												
Cordulegasteridae												
Cordulegaster boltonii	-	-	-	-	-	-	-	-	-	N	-	-
COLEOPTERA (BEETLES)												
Dytiscidae												
Oreodytes sanmarkii	_	2	_	_	1	_	-	-	_	-	2	1
Oreodytes septentrionalis	-	-	-	-	_	N	-	-	_	-	_	-
Hydroporus tessellatus	-	N	N	-	-	-	-	-	_	-	_	_
<b>Gyrinidae</b>												
Orectochilus villosus	H?	4	-	-	-	_	-	_	_	N	-	i
Hydrophilidae (incl.Hydraenidae)												
Hydraena gracilis	2	3	-	-	-	-	-	-	9	1	-	1
Helophorus brevipalpis	-	-	-	-	-	-	-	-	1	-	-	-
Anacaena globulus	-	-	-	-	-	N	-	-	-	-	-	-
Scirtidae (=Helodidae)												
Elodes (=Helodes) sp.	-	1	-	-	-	-	+	-	-	-	-	-
Elnidae												
Elais aenea	14	4	1	-	-	2	+	-	6	6	13	
Esolus parallelepipedus		-	-	-	-	-	-	-	-	3	13	
Limnius volckmari	15	5	7	3	5	2 - 12 -	-	-	12	10	15	14
Dulimnius troglodytes	1	-	-	-	-	- 1	-	-	-	-	-	-
Ouli <b>a</b> nius tuberculatus	4	-	-	-	-	1	-	-	-	-	3	-
SIALIDAE (ALDERFLIES)												
Sialidae									•			
Sialis lutaria	-	-	-	-	-	-	-	-	-	-	1	-
Sialis fuliginosa	-	t	-	i	N	1	-	-	N	-	-	-

Table 5 (cont.)

						SITE						
TAXON	W1	<b>N2</b>	<b>H</b> 3	W4	W5	Wá	RS1	RS2	<b>E</b> 7	€8	E9	E10
TRICHOPTERA (CADDISFLIES)												
Rhyacophilidae (incl.6lossosomatidae)		7										
Rhyacophila dorsalis	5	3	2	-	-	-	+	-	4	9	8	2
Rhyacophila munda	-	-	_	-	-	-	•	-	-	N	-	-
Agapetus sp.	-	-	-	-	-	-	+	-	-	4	-	1
Philopotamidae												
Philopotamus montanus	-	-	-	-	-	-	+	-	1	-	-	-
Normaldia sp.	-	-	1	-	-	-	-	-		-	-	H
Polycentropodidae												
Plectrocnemia conspersa	-	-	-	-	-	-	-	-	1	-	1	1
Plectrocnesia geniculata	1	1	×	-	N	-	-	-	1	-	1	-
Polycentropus flavomaculatus	1 H	11	1	1 4	1	3	-	-	4	2	3	1
Polycentropus kingi	и	5	N	4	1	5	-	-	3	4	4	6
Psychomyiidae												
Tinodes waeneri	N	-	-	-	-	-	-	-	-	-	-	-
Lype sp.	~	-	-	-	-	-	+	-	-	-	-	-
Hydropsychidae												
Hydropsyche pellucidula	-	4	-	-	-	-	-	-	<u>-</u>	-	-	-
Hydropsyche siltalai	2	6	2	1	2	H	-	-	8	4	4	4
Diplectrona felix	-	-	1	-	-	-	+	-	-	-	-	-
Hydroptilidae												
Hydroptila sp.	Н	-	-	-	-	-	-	-	-	-	-	-
Lianephilidae												
Drusus annulatus	H	-	-	-	-	-	-	-	-	-	-	-
Potamophylax cingulatus	-	-	-	-	1	-	-	-	1	-	-	-
Micropterna sequax	-	-	-	-	-	-	+	-	-	-	-	-
Beraeidae												
Beraea maurus	-	-	-	-	-	-	+	-	-	•	-	-
Odontoceridae												
Ddontocerum albicorne	-	-	-	-	-	-	-	-	1	N	-	1
Leptoceridae												
Athripsodes sp.	-	-	-	-	-	-	-	-	-	-	1	3
Nystacides azurea	-	-	-	-	-	-	-	-	-	-	1	1
Decetis sp.	-	-	-	-	-	•	-	-	-	-	-	1
Goeridae												
Silo pallipes	-	-	-	-	-	-	-	-	4	1	N	2
Lepidostomatidae												
Lepidostoma hirtum	-	-	-	-	-	-	-	-	1	-	2	2
Sericostomatidae												
Sericostoma personatum	-	5	K	N	N	5	+	-	9	7	8	11
LEPIDOPTERA (AQUATIC MOTHS)												
Pyralidae	1	N	-	-	N	-	-	-	-	-	-	-

Table 5 (cont.)

	SITE												
TAXON	W1	W2	M2	<b>¥4</b>	<b>¥5</b>	#6	RSI	RS2	E7	83	E9	E10	
DIPTERA (TRUE FLIES)													
Tipulidae													
Dolichopeza albipes	N	-	-	-	-	-	-	-	-	_	-	-	
Tipula sp.	-	-	-	-	-	-	+	-	-	-	-	-	
Pedicia rivosa	-	-	-	-	-	-	-	+	1	-	_	-	
Dicranota sp.	11	3	N	2	6	2	+	-	11	8	4	6	
Lianophila (Eloeophila) sp.	2	2	-	2	1	2	-	-	2	3	2	3	
Ceratopogonidae	-	-	1	2	3	4	-	-	1	2	2	2	
Chironomidae	15	15	14	13	15	15	+	_	14 .	15	15	15	
Simuliidae													
Simulium vernum gp.	4	2	-	-	-	-	-	-	3	2	4	-	
Simulium cryophilum gp.	5	2	-	-	-	-	+	-	В	N	1	-	
Simulium variegatum gp.	7	6	3	-	_	-	-	-	9	7	1	_	
Simulium ornatum gp.	6	2	3	-	1	1	+	-	2	2	2	_	
Empididae													
Chelifera gp.	-	2	N	-	-	-	-	-	-	1	3	3	
Hemerodromia gp.	-	-	1	-	-	-	-	-	1	-	1	1	
Wiedemannia gp.	3	6	4	3	5	1	-	-	3	5	5	7	
Dolichopodidae	-	-	-	-	-	-	-	-	-	-	1	-	
Rhagionidae													
Atherix ibis	-	-	-	1	1	2	-	-	4	6	5	3	
Atherix maroinata	_	3	_	1	-	_	_	-	_	-	_	Ī	

Table 6. The frequency of occurrence of "families" in the 15 box samples collected during 1987-88.

West Okement (Wi-W6). Railway Stream U/S Bypass (RS1), D/S Bypass (RS2). East Okement (E7-E10).

N = absent from box samples, present in pond-net samples. H = Historical, pre-1987, only.

						SITE						
TAXON	₩1	W2	#2	W4	W5	#6	RSL	RS2	E7	<b>E8</b>	<b>E9</b>	E10
TOTAL ARTRA (FLATUDDAC)												
TRICLADIDA (FLATWORMS) Planariidae	11		,	10					_		-	_
Dendrocoelidae	- 41	6	6	10	4	4	+	-	5	8	7	5
REURI OCCETTAGE		_	_	_	_	_	-	-	_	_	1	-
NEMATODA (NEMATODES)												
Nesatoda	1	-	-	1	-	-	-	-	1	1	2	1
												•
GASTRODA (SNAILS)												
Hydrobiidae	-	-	-	-	-	-	-	-	3	3	3	1
Ancylidae	-	-	-	-	-	-	+	-	1	3	2	3
Zonitidae	-	-	-	-	-	-	-	-	-	-	. <b>-</b>	1
BIVALVIA (BIVALVE SNAILS)												
Sphaeriidae	_	i	-	_	2	6	+	_	_	1	_	_
		•			-	•	•			•		_
OLIGOCHAETA (TRUE WORMS)												
Oligochaeta	15	14	15	15	15	15	+	+	15	15	15	15
HIRUDINEA (LEECHES)												
6lossiphoniidae	-	1	-	-	1	-	-	-	-	-	-	-
ARACHNIDA (SPIDERS & MITES)												
Hydracarina	8	7	3	1	3	2	-	_	3	8	9	11
,	-	•	-	•	•	-			•	•	•	••
AMPHIPODA												
Gammaridae	-	1	-	1	-	-	+	-	1	7	3	3
EPHEMEROPTERA (MAYFLIES)												
Baetidae	12	11	8	5		7			. 7	4.5		
Heptageniidae	3	15	3	2	6	3 2	+	-	13 14	15 11	15 12	12 13
Leptophlebiidae	6	2	-	_	_	-		_	-	1	3	2
Ephemerellidae	5	-	N	-	2	Н	-	_	5	6	6	9
Ephemeridae	-	-	_	-	-	-	-	-	_	_	-	N
Caenidae	-	i	-	-	-	-	-	-	-	-	N	1
PLECOPTERA (STONEFLIES)												
Taeniopterygidae	3	1	_	_								
Nemouridae	10	10	6	3	4	2	+	-	9	1 7	1 5	- 5
Leuctridae	15	15	В		3	2 3	÷		14	12		
Perlodidae	11	9	1	2	-	H	_	_	5	5	6	2
Perlidae	-	2	-	_	-	-	-	-	_	_	-	-
Chloroperlidae	12	15	4	4	3	2	+	-	15	12	10	11
ORONATA IRRAPONIRAMONISI TORI												
ODONATA (DRASON/DAMSELFLIES) Cordulegasteridae												
roi adredaster 1096	-	-	-	-	-	-	-	-	-	N	-	-
COLEOPTERA (BEETLES)												
Dytiscidae	_	2	N	-	-	N	-	-	_	_	2	1
Gyrinidae	1	3	-	-	1	-	-	-	-	N	-	i
Hydrophilidae	2	2	-	-	-	N	-	- -	9	ï	1	1
Scirtidae (=Helodidae)	-	1	-	-	-	-	+	-	-	-	-	-
Elaidae	15	8	7	4	5	14	+	-	12	14	15	15
SIALIDAE (ALDERFLIES)												
Sialidae	_	1		1	N				91		4	
	-	1	-	1	M	1	-	-	N	-	1	-

	SITE												
TAXON	WI	W2	M2	N4	#5	Wó	RS1	RS2	E7	€8	E٩	E10	
TRICHOPTERA (CADDISFLIES)													
Rhyacophilidae (incl.Glossosomatidae)	6	5	2	1	-	2	+	-	7	12	9	5	
Philopotamidae	-	-	1	-	-	_	+	-	1	-	-	N	
Polycentropodidae	9	11	3	8	3	10	+	-	10	8	12	12	
Psychomyiidae	N	_	-	-	-	-	+	-	-	-	-	-	
Hydropsychidae	3	9	5	1	3	Н	+	-	10	4	6	4	
Hydroptilidae	H	-	-	_	-	-	-	-	-	_	-	-	
Limnephilidae	Н	-	-	-	1	-	+	-	1	-	1	-	
Beraeidae	-	-	-	-	-	-	+	-	-	-	-	-	
Odontoceridae	-	-	-	-	-	-	-	-	1	N	_	1	
Leptoceridae	-	-	-	_	•	-	-	-	-	-	1	4	
Goeridae	-	-	-	-	-	-	-	-	4	4	N	3	
Lepidostomatidae	-	-	-	-	-	-	-	-	1	-	2	3	
Sericostomatidae	-	5	N	i	N	5	+	-	9	7	9	11	
LEPIDOPTERA (AQUATIC MOTHS)													
Pyralidae	1	N	-	-	N	-	-	-	-	-	-	-	
DIPTERA (TRUE FLIES)									-				
Tipulidae	11	5	N	4	7	3	+	+	11	11	6	7	
Ceratopogonidae	-	-	1	1	3	4	_	-	1	1	2	l	
Chironomidae	15	15	14	13	15	15	+	-	14	15	15	15	
Simuliidae	11	8	5	-	2	ı	+	-	12	10	4	-	
Empididae	3	8	4	3	5	1	_	_	5	6	8	10	
Dolichopodidae	_	_	-	_	-	-	-	-	_	-	1	_	
Rhagionidae	-	3	1	2	1	2	-	-	4	6	5	3	

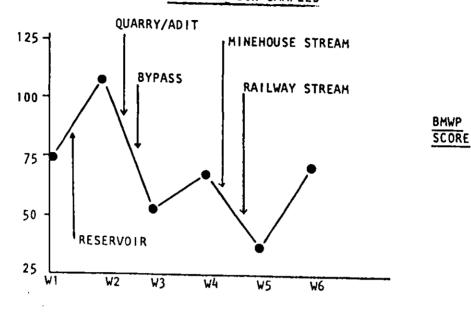
SECTION 8

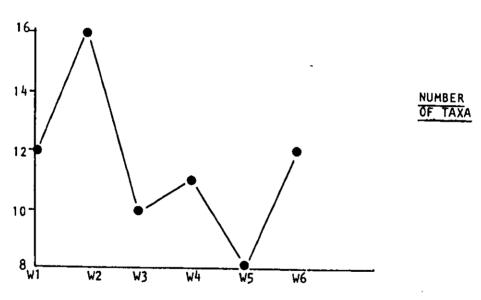
**FIGURES** 

A30 OKEHAMPTON BYPASS SCHEME

MACRO ... IVERTEBRATE SURVEY

### INDICES OF ENVIRONMENTAL QUALITY - WEST OKEMENT, JUNE 8th 1987 COMBINED BOX SAMPLES





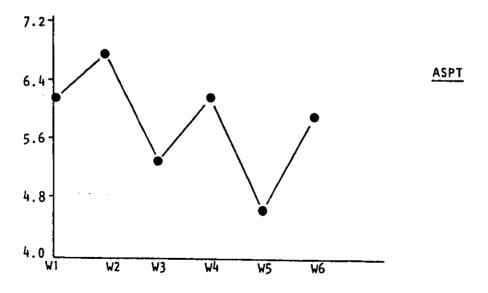
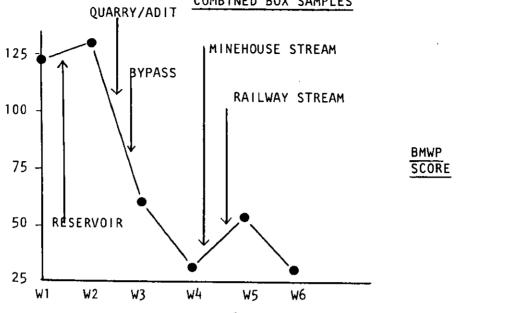
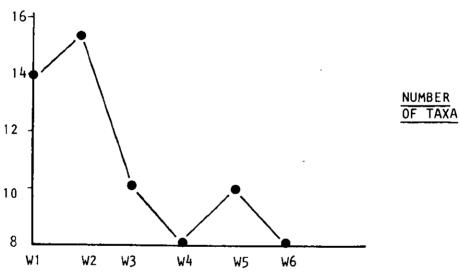
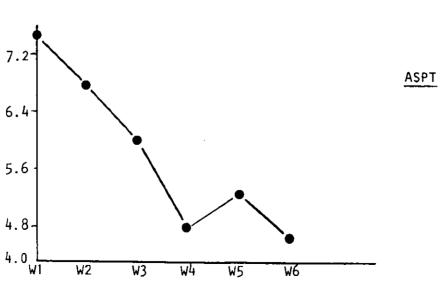


Figure 1 (cont.)

A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY
INDICES OF ENVIRONMENTAL QUALITY - WEST OKEMENT, SEPTEMBER 10th 1987
COMBINED BOX SAMPLES







#### A30 OKEHAMPTON BYPASS SCHEME

#### MACROINVERTEBRATE SURVEY

#### INDICES OF ENVIRONMENTAL QUALITY - WEST OFEMENT, 2nd MARCH 1988

### COMBINED BOX SAMPLES

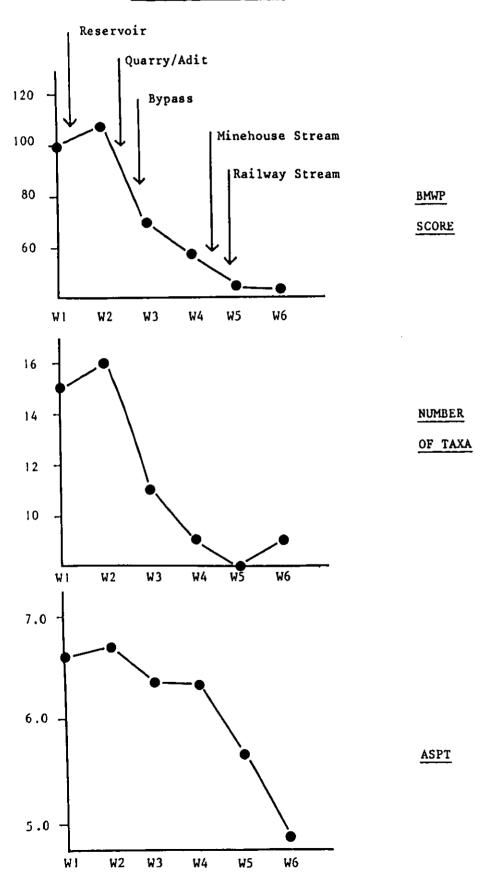


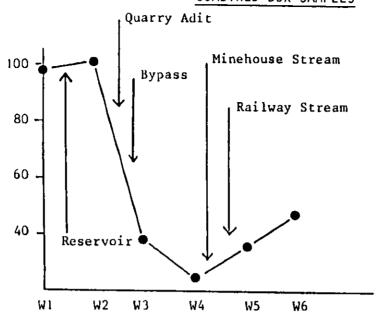
Figure 1 (cont.)

A30 OKEHAMPTON BYPASS SCHEME

MACRO INVERTEBRATE SURVEY

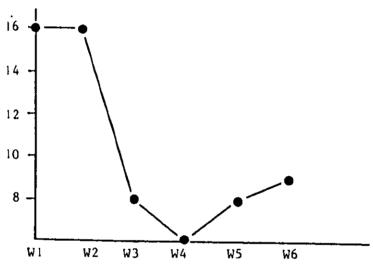
INDICES OF ENVIRONMENTAL QUALITY - WEST OKEMENT, JUNE 13th 1988

COMBINED BOX SAMPLES



BMWP

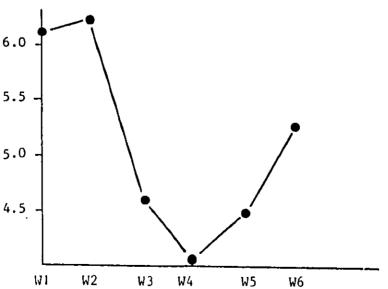
SCORE



NUMBER

<u>of</u>

TAXA



ASPT

A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY

INDICES OF ENVIRONMENTAL QUALITY - WEST OKEMENT, SEPTEMBER 13th 1988

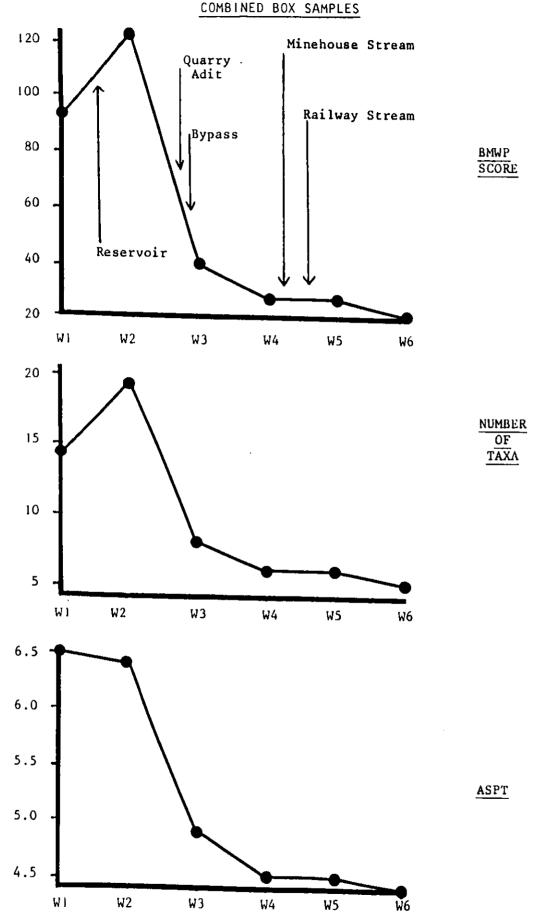
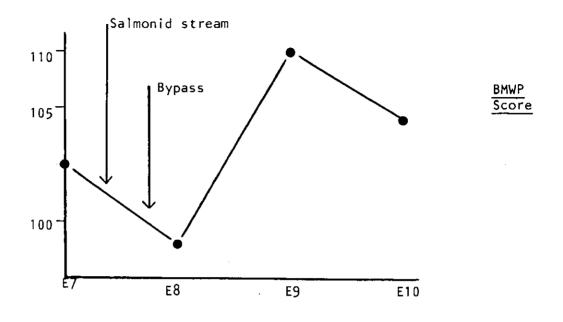


Figure 1 (cont.)

A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY

INDICES OF ENVIRONMENTAL QUALITY - EAST OKEMENT, SEPTEMBER 10th 1987

COMBINED BOX SAMPLES



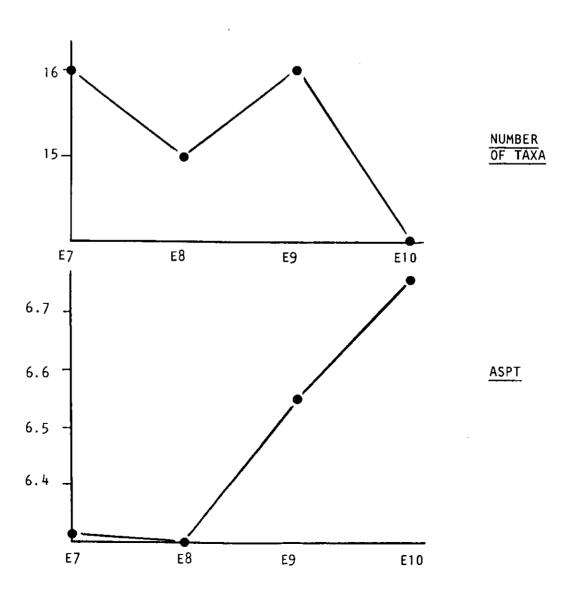


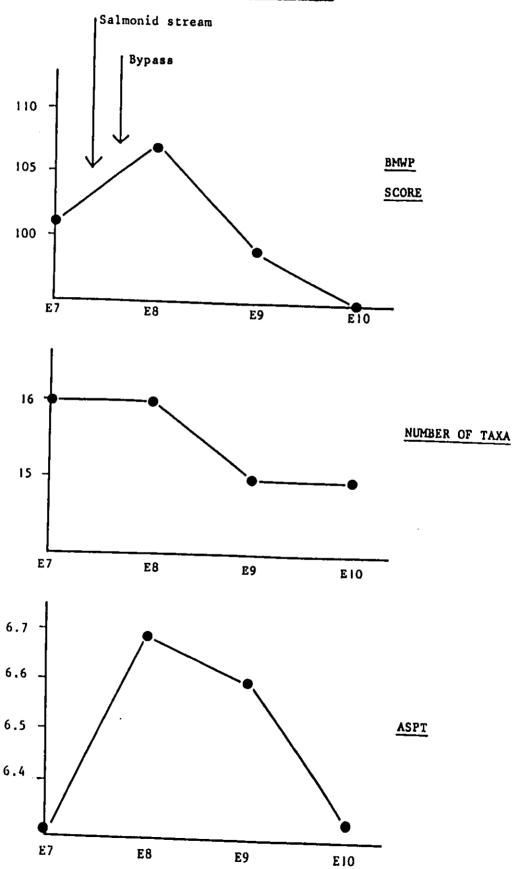
Figure 1 (cont.)

A30 OKEHAMPTON BYPASS SCHEME

MACROINVERTEBRATE SURVEY

INDICES OF ENVIRONMENTAL QUALITY - EAST OKEMENT, 2nd MARCH 1988

### COMBINED BOX SAMPLES



A30 OKEHAMPTON BYPASS SCHEME

MACROINVERTEBRATE SURVEY

INDICES OF ENVIRONMENTAL QUALITY - EAST OKEMENT, JUNE 13th 1988

COMBINED BOX SAMPLES

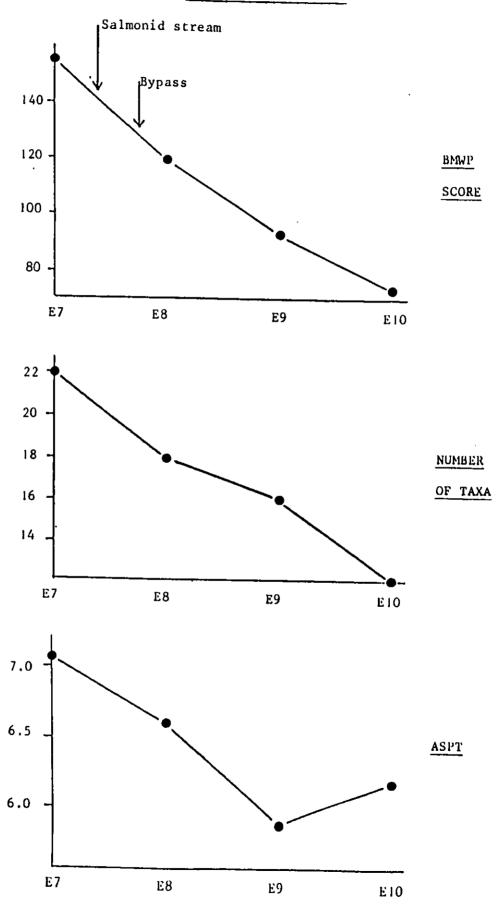


Figure 1 (cont.)

A30 OKEHAMPTON BYPASS SCHEME

INDICES OF ENVIRONMENTAL QUALITY - EAST OKEMENT, SEPTEMBER 13th 1988

COMBINED BOX SAMPLES

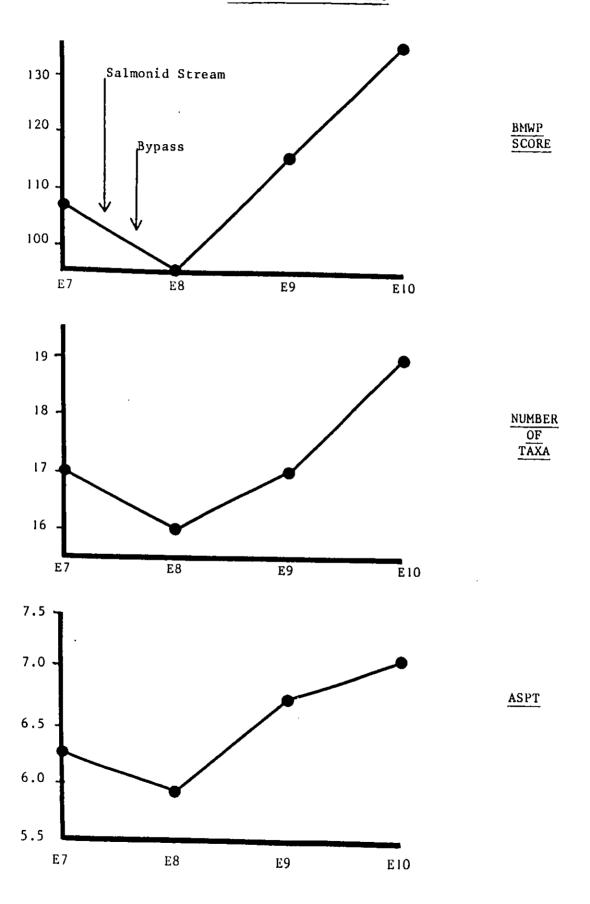


Figure 2. Environmental Quality Indices based on BMWP scores and ASPT.

Squares historical data. Circles data collected by box sampler 1987-88. M = March, J = June, S = September, D = December.

Solid horizontal line, EQI = 1. Broken horizontal lines are 95% confidence limits.

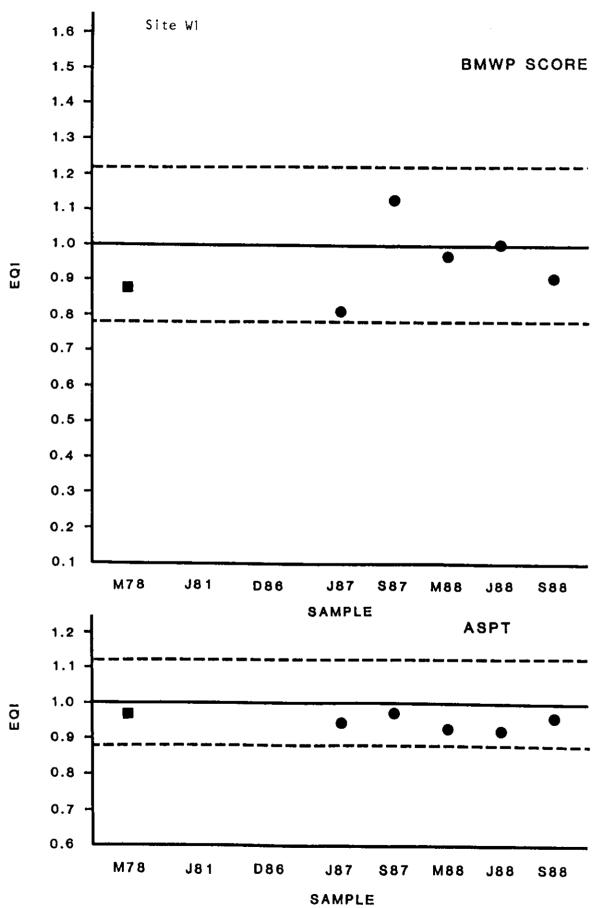
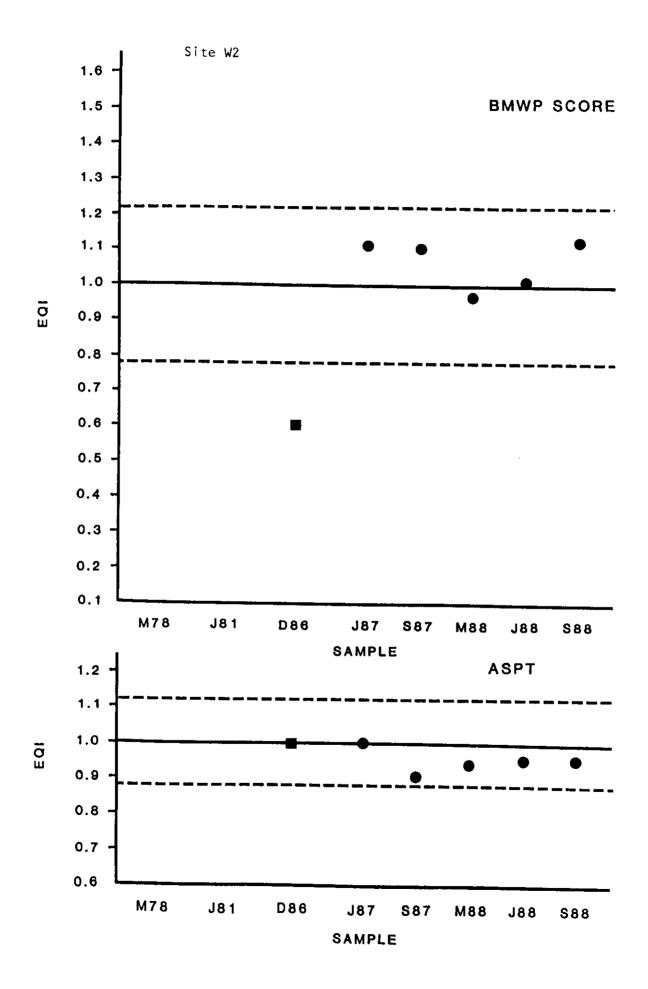
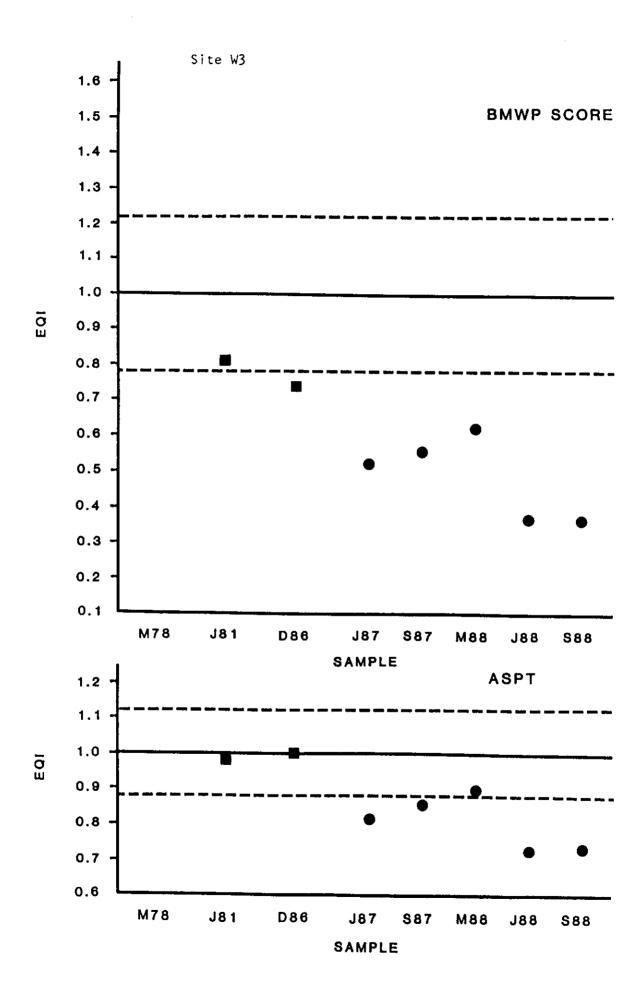
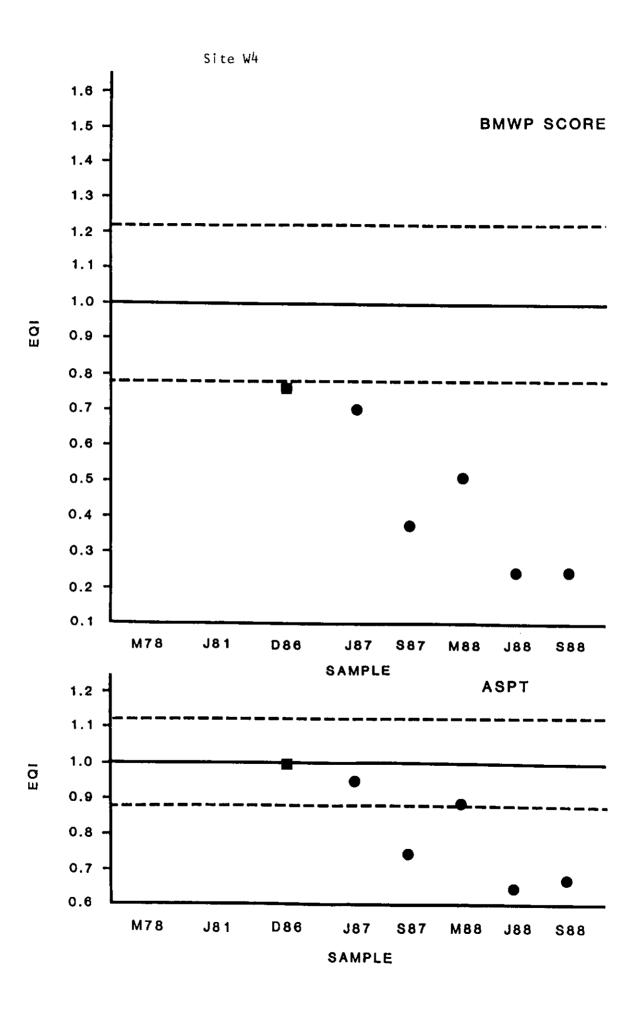
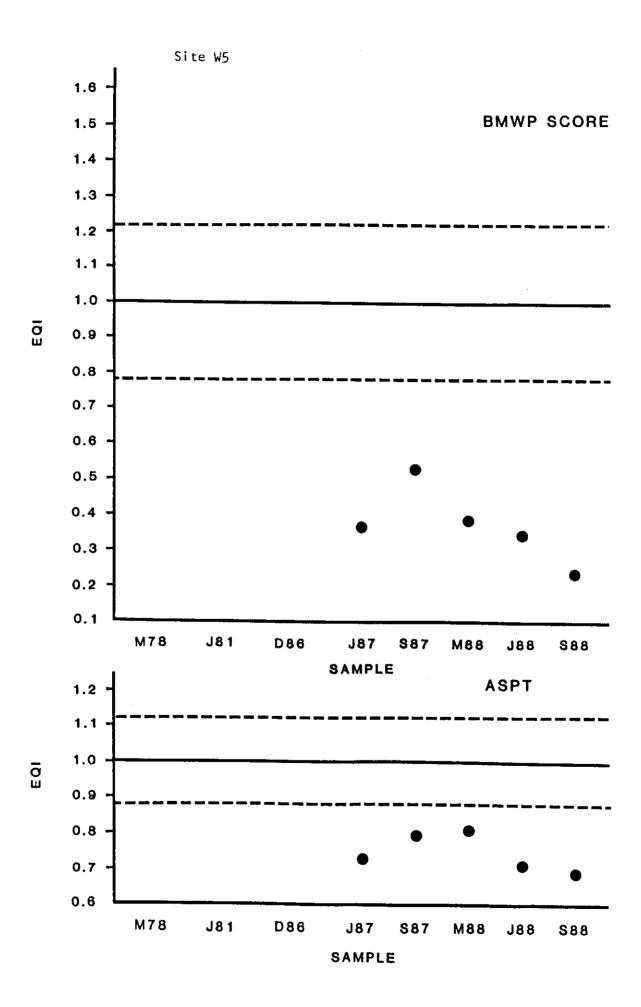


Figure 2 (cont.)









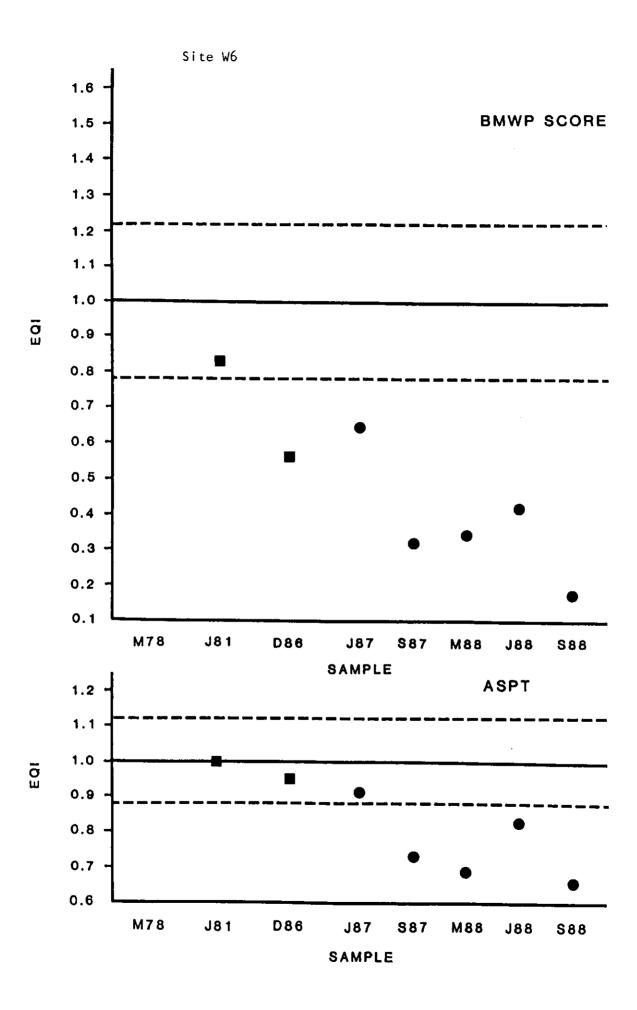
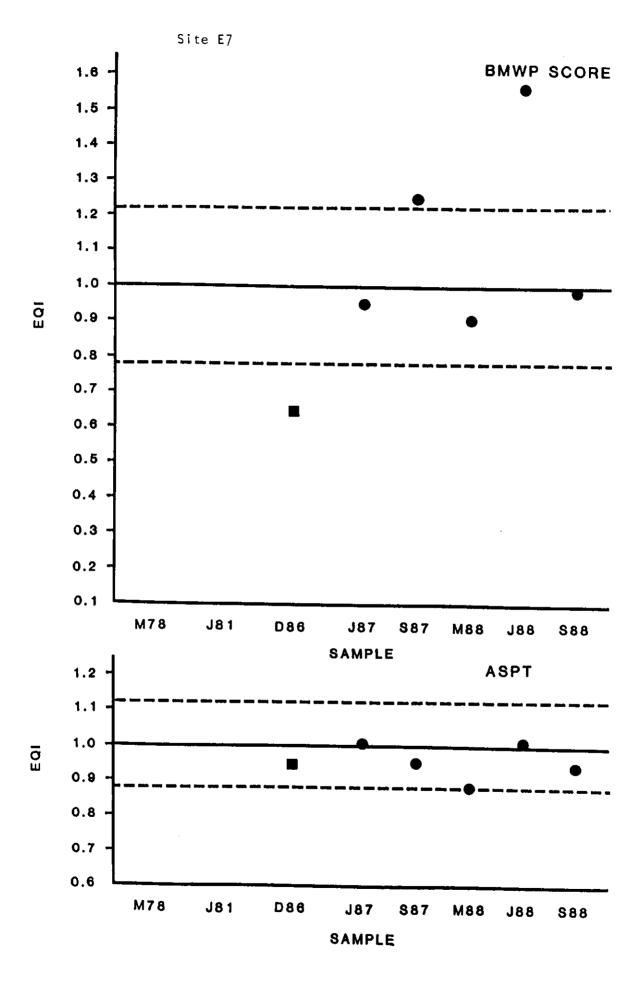
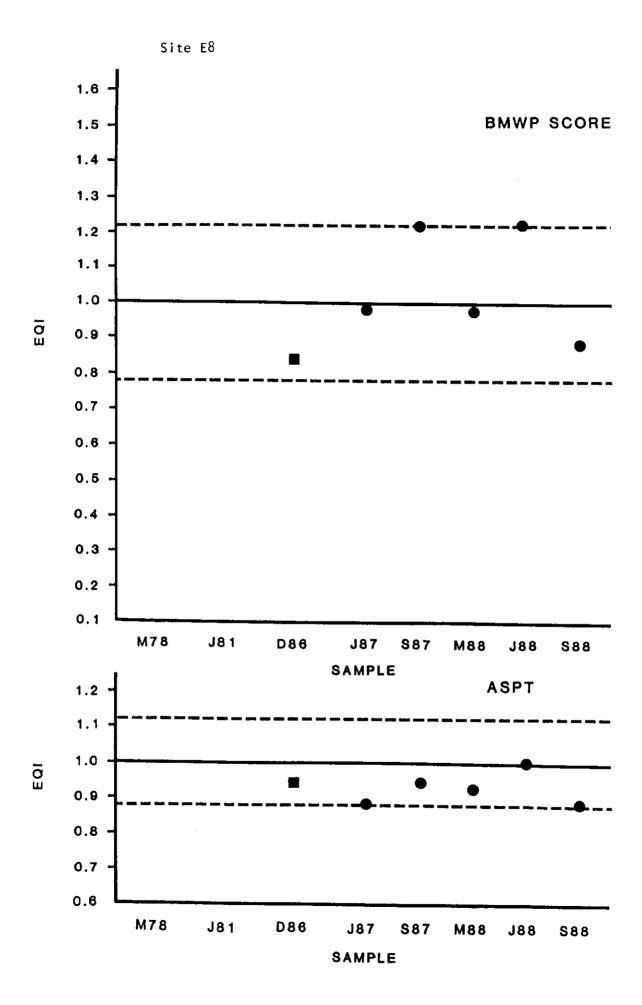


Figure 2 (cont.)





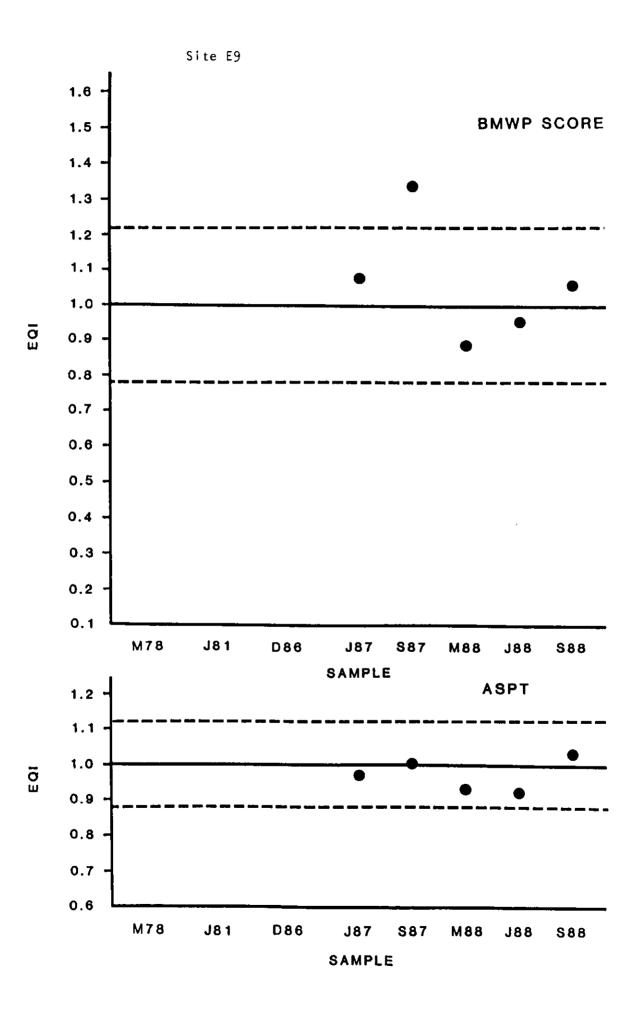


Figure 2 (cont.)

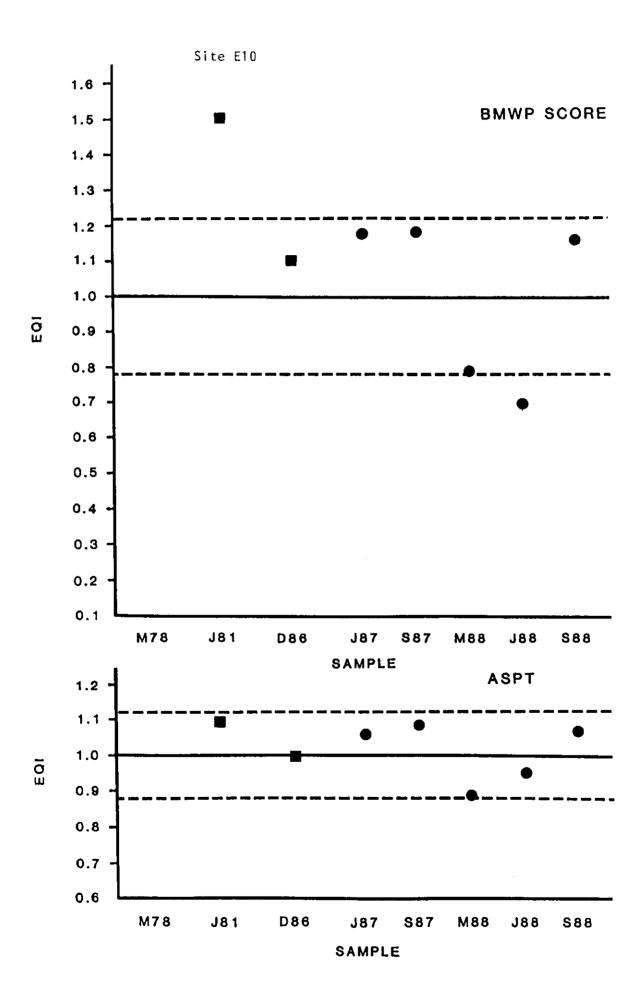
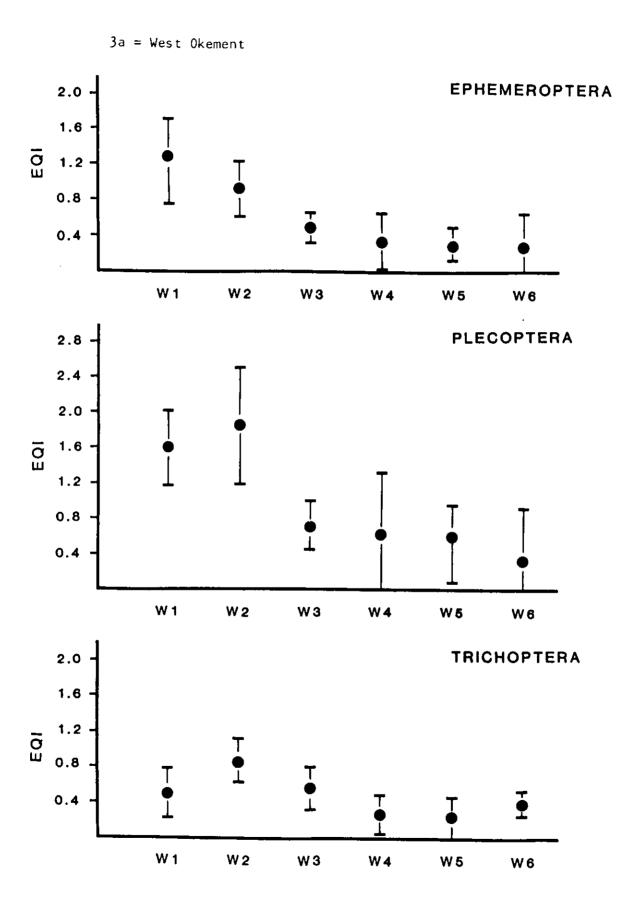
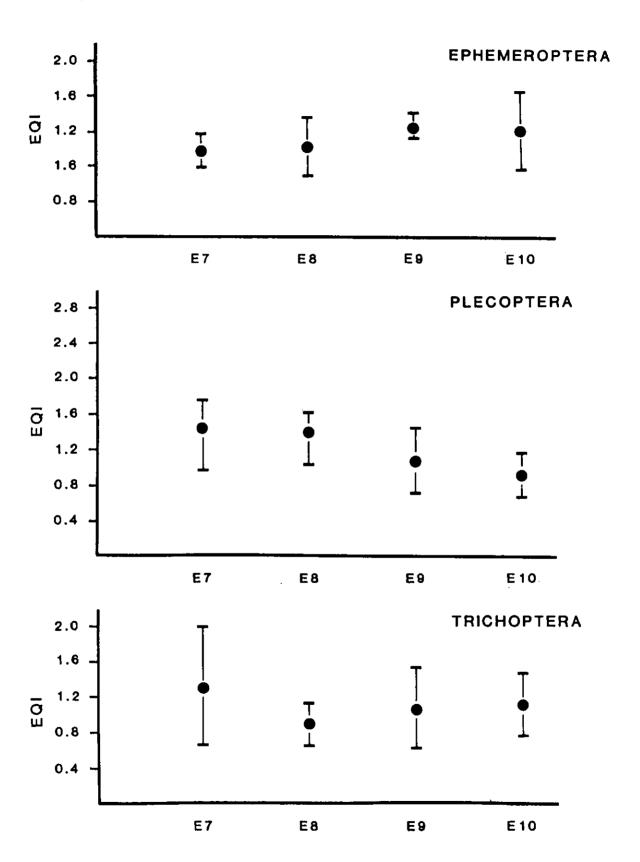


Figure 3. Environmental Quality Indices based on the number of selected orders of insects occurring at each site. Values are means of five separate sampling occasions with standard deviations.



3b = East Okement



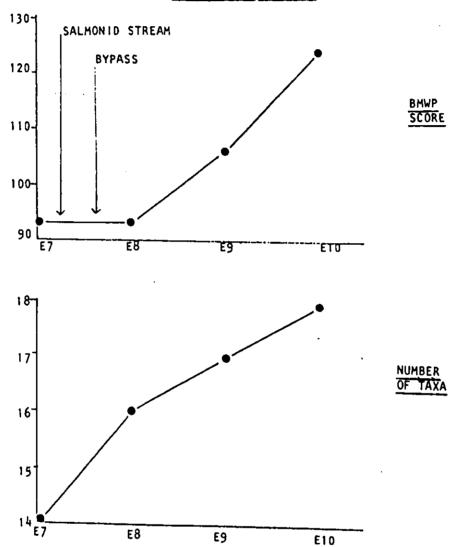
SECTION 9
APPENDICES

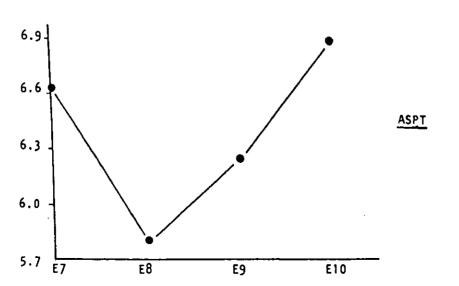
Figure 1 (cont.)

A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY

INDICES OF ENVIRONMENTAL QUALITY - EAST OKEMENT, JUNE 8th 1987

COMBINED BOX SAMPLES





Appendix 1. West Okement. BMWP scores, number of scoring taxa and ASPT's for each individual box-sample.

### A30 QKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS. WEST OKEMENT - JUNE 8th 1987 (BS=BOX SAMPLE) BIOLOGICAL MONITORING WORKING PARTY (BMMP) SCORES AND AVERAGE SCORES PER TAXON (ASPT)

<u>INDEX</u>									SITE	NAME								
		AKE CO SITE N			ADIT/E SITE W		D/S BYPASS SITE W3			U/S WIGNEY SITE W4		GOLF COURSE SITE W5			OKEHAMPTON CASTLE SITE W6			
<del></del>	BS1	BS2	883	BS1	B52	BS3	BS1	BS2	853	BS1	952	BS3	BS1	BS2	BS3	BS1	BS2	BS3
BMWP SCORE COMB. SCORE	27	64 74	47	65	44 108	103	25	27 53	36	19	31 68	56	6	34 37	20	25	64 71	44
No. TAXA COMB. No. TAX	6 IA	11 12	8	9	7 16	!5	5	6 10	7	5	6 11	9	3	7 8	5	5	11 12	8
ASPT COMB. ASPT	4.50	5.82 6.17		7.22	6.29 6.75		5.00	4.50 5.30	5.14	3.80	5.17 6.18		2.00	4.86 4.63		5.00	5.82 5.92	5.50

8.62 6.14 6.50

6.65

COMB. ASPT

6.57 6.14 6.20

6.21

### A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS. WEST OKEMENT - SEPT. 10th 1987 (BS=BOX SAMPLE) B10L0B1CAL HOMITORING WORKING PARTY (BHWP) SCORES AND AVERAGE SCORES PER TAIDN (ASPT)

3.00 4.83 2.67

5.00

4.20 4.33 5.50

5.27

3.60 3.67 5.00

4.88

INDEX SITE NAME VELLAKE COTTAGE U/S ADIT/BYPASS D/S BYPASS U/S WIGNEY **BOLF COURSE** OKEHAMPTON CASTLE SITE WI SITE W2 SITE W3 SITE W4 SITE W5 SITE WA 851 852 BS3 851 852 B53 BS2 BS3 BS1 852 853 BS2 BS3 BS1 BS2 BS3 BHWP SCORE 86 86 46 29 21 26 22 18 35 COMB. SCORE 113 118 63 40 58 39 No. TAIA 13 14 14 15 3 3 6 3 5 7 6 10 5 6 COMB. No. TAXA 17 19 11 11

5.87 5.11 2.67

5.73

# A30 OKEHAMPION BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS. WEST OKEHENT - MARCH 2nd 1988 (BS-BOX SAMPLE) Blological monitoring working party (BMMP) scores and average scores per tatom (ASPT)

TADET									ŞII	E NAME								
	VELLAKE COTTAGE U/S ADIT/BYPASS SITE WI SITE W2 BSI BS2 BS3 BS1 BS2 BS1					D/S BYPASS Size W3			U/S WEGNEY Sete W4			GOLF COURSE SITE WS			OKEHAMPTON CASTLE SITE W6			
	<b>BS</b> 1	BS2	<u> 853</u>	<u> </u>	BS2	<u>853</u>	PS1	B52	853	951	BS2	BSJ	BS1	852		651		853
BHWP SCORE COMB. SCORE	17	79 99	87	102	55 107	47	45	33 70	55	16	52 57	47	25	30 45	3	33	8	37
No. TATA COMB. No. TA	12 IA	12 15	13	15	8 16	8	7	5 11	9	3	8 7	0	5	é	2	1	3	8
ASPT COMB. ASPT	6.42	6.58 6.60		6.80	6.89 6.69		6.43	6.60 6.36		5.33	6.50 6.33		5.00	5.00 5.43		4.71	2. 67 4. 89	4.63

### A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE MEST AND EAST OKEMENT RIVERS. WEST OKEMENT - JUNE 13th 1988 (BS-BOX SAMPLE) BIOLOGICAL MONITORING MORKING PARTY (BNNP) SCORES AND AVERAGE SCORES PER TATON (ASPT)

INDET SITE NAME VELLAKE COTTAGE U/S ADIT/BYPASS D/S BYPASS N/B MIGNEA BOLF COURSE OKEHAMPTON CASTLE SITE WI SITE W2 BITE W3 SITE W4 SITE WS SITE NA 892 B\$2 **881 892 893** DSI 892 B93 **852** 853 BS1 BS2 BS3 BAMP SCORE 93 76 68 12 17 13 20 15 30 25 . 22 COMB. SCORE 98 100 37 25 34 48 No. TATA 15 13 13 11 5 7 5 COMB. No. TAXA 16 6.29 6.20 5.85 4.08 4.18 4.75 4.50 3.00 3.40 3.25 4.00 3.75 3.80 3.75 4.00 5.00 5.00 4.71 COMB. ASPT 6.13 6.25 4.63 4.17 4.50 5.33

# A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEHENT RIVERS. MEST OKEMENT - SEPTEMBER 13th 1988 (BS-BOX SAMPLE) BIOLOGICAL MONITORING MORKING PARTY (BMMP) SCORES AND AVERAGE SCORES PER TAYON (ASFT)

INDEX

#### SITE NAME

	VELLAKE COTTAGE U/S ADIT/BYF SITE W1 SITE W2 BS1 BS2 BS3 BS1 BS2			12		/S BYPA SITE W BS2	3		U/9 WIENEY SITE W4 BSI BS2 BS3			BOLF COURSE SITE W5			OKEHAMPTON CASI			
								445	- 644	631	- 136	893	DS!_	BS2	BSI	<u> </u>	\$52	ne i
BAWP SCORE COMB. SCORE	49	59 91	74	82	74 122	78	39	27 39	12	15	27 27	23	27	7 27	12	8	22 22	8
No. TAXA COMB. No. TAX	9 A	10 14	11	14	11 19	13	0	8 8	4	4	6 6	5	6	3 6	4	3	5	3
ASPT COMB. ASPT	5.44	5.90 6.50		5.93	6.73 6.42		4.88	4.50 4.88	3.00	3.75	4.50 4.50		4.50	2.33 4.50		2.67	4, 40 4, 40	

Appendix 2. East Okement. BMWP scores, number of scoring taxa and ASPT's for each individual box-sample.

### A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS. EAST OKEMENT - JUNE 8th 1987 (BS=BDX SAMPLE) BIOLOGICAL HONITORING WORKING PARTY (BMMP) SCORES AND AVERAGE SCORES PER TAXON (ASPT)

INDEX SITE NAME U/S BYPASS D/S BYPASS **GRAMMAR SCHOOL** BALL HILL SITE E7 SITE E8 SITE E9 SITE E10 BS2 BS3 BS1 BS2 BS1 BS2 BS3 BHMP SCORE 96 57 71 119 COMB. SCORE 93 93 106 124 No. TAXA 7 11 11 10 14 15 10 11 17 12 COMB. No. TAXA 14 16 17 18 ASPT 6.29 6.00 6.33 6.40 5.70 6.13 5.64 5.30 6.00 6.45 7.00 7.00 COMB. ASPT 6.64 5.81 6.24 6.89

# A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS. EAST OKEMENT - SEPT. 10th 1987 (BS=80X SAMPLE) BIOLOGICAL MONITORING WORKING PARTY (BMMP) SCORES AND AVERAGE SCORES PER TAXON (ASPT)

INDEX

#### SITE NAME

	U/S BYPASS Site e7				D/S BYPASS SITE EB			BALL HI SITE E		SRAMMAR SCHOOL SITE E10			
	BS1	BS2	BS3	BS1	BS2	BS3	DS1	BS2	BS3	BS1		BSJ	
BNWP SCORE COMB. SCORE	114	106 135	105	115	100 128	105	122	121 145	102	116	90 139	<del>9</del> 8	
No. TAXA COMB. No. TAXA	18	17 21	17	17	15 20	16	18	17 21	15	16	13 19	14	
ASPT COMB. ASPT	6.33	6.24 6.43	6.18	6.76	6.67 6.40	6.56	6.78	7.12 6.90	6.80	7.25	6.92 7.32	7.00	

# A30 OKEHAMPION BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS. EAST OKEMENT - MARCH 2nd 1988 (BS=BQI SAMPLE) BIOLOGICAL MONITORING WORKING PARTY (BMMP) SCORES AND AVERAGE SCORES PER TAXON (ASPT)

INDEX						<u>\$1</u>	TE NAME						
	U/S BYPASS SITE E7			D/S BYPASS Site E8			1	BALL HI SITE 6		GRAMMAR SCHOOL SITE E10			
	BSI	B\$2	<b>B</b> 53	<u> </u>	<u> 952</u>	<u> 0\$3</u>	BSI	952	853	DŞI	852	8\$3	
BAMP SCORE COMB. SCORE	72	80 101	84	90	76 107	77	64	73 99	67	58	50 95	62	
No. TAXA COMB. No. TAXA	li	13 16	13	10	11 16	13	10	12 15	11	10	8 15	10	
ASPI COMB. ASPI	4.55	6.15 6.31	6.46	6.00	6.91 6.69	5.92	6.40	4.08 6.60	6.09	5.60	6.25 6.33	4.20	

## A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE MEST AND EAST OKEMENT RIVERS. EAST OKEMENT - JUNE 13th 1988 (B5=BOX SAMPLE) BIOLOGICAL MONITORING MORKING PARTY (BMMP) SCORES AND AVERAGE SCORES PER TAXON (ASPT)

INDET SITE NAME U/8 BYPASS D/8 BYPASE BALL HILL BRAMMAR SCHOOL GITE E7 81 TE E8 SITE EP SITE E10 891 892 883 B92 B93 091 052 BS3 851 BS2 BS3 BMWP SCORE 108 121 103 89 81 71 81 34 59 49 COMB. SCORE 155 119 94 74 No. TAIA 17 17 15 14 13 12 12 13 10 7 10 8 COMB. No. TAXA 22 18 16 18 ASPT 6.35 7.12 6.87 6.36 6.23 5.92 15.33 6.23 6.10 4.86 5.90 6.13 COMB. ASPT 7.05 6.61 5.88 6.17

## A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE NEST AND EAST OKEMENT RIVERS. EAST OKEMENT - SEPTEMBER 13th 1988 (BS=BOX SAMPLE) B10L08[CAL MONITORING WORKING PARTY (BMWP) SCORES AND AVERAGE SCORES PER TAXON (ASPT)

INDEX

	ι	J/S BYF SITE E		I	/8 BYF SITE E		1	ALL HI SITE I			MAR SO SITE E	
<del></del>	<u>B51</u>	B52	B53	BSI	<u>BS2</u>	<u> </u>	851	BS2	853	BS1	B52	853
BHNP SCORE COMB. SCORE	62	7 <del>9</del> 107	87	80	84 95	59	74	58 115	78	75	71 135	87
No. TAXA COMB. No. TAXA	10	13 17	14	13	14 16	10	11	10 17	13	12	11 19	13
ASPT COMB. ASPT	6.20	6.08 6.29	6.21	6.15	6.00 5.94	5.90	6.73	5.80 6.76	4.00	6.25	6.45 7.11	6.69

Appendix 3. West Okement. Abundance of each individual "species" in each box-sample for each month of sampling.

### A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS. WEST OKEMENT - JUNE 8th 1987 (BS=BQX SAMPLE) ABUNDANCES OF INDIVIDUAL SPECIES IN EACH SAMPLE

TAXON NAME

	S	ITE I	COTT 81 BS3	S	ITE I	BYPASS W2 BS3	S	BYPA	13	U/S SI BS1	TE	W4	SI	COL TE N BS2	15	SI	ITE I	CASTLI N6 BS3
TRICLADIDA (FLATWORMS)				7.2			201	202	200	201	202	500	031	002	D2-3	001	DOL	533
Planariidae																		
Polycelis felina	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0
Phagocata vitta	0	2	0	0	0		0		0	0	0		0	0	0	0	3	0
NEMATODA (NEMATODES)	0	0	0	0			0		0	0	0		0	0	0	0	0	0
OLIGOCHAETA (TRUE WORMS)	1			0			7	7	21	15		100	43	1000	13		34	
HIRUDINEA (LEECHES)		-	-		_			"	**	10		100	73	20	13	2	34	'
Glossiphoniidae																		
Glossiphonia complanata	0	0	0	0	0	0	0	0	0	^	^	^						
Helobdella stagnalis	0	0	0	0			0		0	0	0	0	1	0	0	0	0	0
ARACHNIDA (SPIDERS & MITES)	V		V	v	v	v	V	V	0	0	0	0	1	0	0	0	0	0
Hydracarina	0	•	7		^	^										13		
Oribatidae	0	0	3	1 0	0		0	0	0	0	0	0	. 0	0	0	0	0	0
EPHEMEROPTERA (MAYFLIES)	V		v	U	U	U	0	0	0	0	0	0	0	0	0	0	1	0
Baetidae																		
Baetis sp.	^	0	^											3		7.53		
Baetis scambus	0	0	0	0	0		0	0	0	0	0	1	0	1	0	0	0	0
Baetis vernus	2	4					0	0	0	0	0		0	1	0	0	0	0
Baetis rhodani	0	0	7	8	7		0	2	0	1	1	1	0	0	0	0	1	1
Heptageniidae	0	U	U	0	0	.0	0	0	1	0	0	0	0	1	0	0	0	0
Heptagenia lateralis	0	^	^												119			
Ecdyonurus sp.	0	0	0	1 0	1	4	0	0	0	0	0	0	0	0	0	0	0	0
Ephemerellidae	0	0	U	0	1	0	0	0	0	0	0	0 .	0	0	0	0	1	0
Ephemerella ignita	^																	
PLECOPTERA (STONEFLIES)	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nemouridae																		
Amphinemura sulcicollis	0	1	0	0	0	4	0	0	2	0	0	1	0	1	1	0	1	0
Leuctridae																		
Leuctra sp.	0	4	2	0	4	17	5	0	1	0	0	2	0	0	0	0	8	23
Leuctra geniculata	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Leuctra inermis	7	18	8	6	2	32	1	0	0	0	0	1	0	1	0	0	0	0
Leuctra fusca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	3
Perlodidae																		
Isoperla grammatica	0	0	1	3	0	1	0	0	0	0	0	2	0	0	0	0	0	0
Perlidae		2.0																
Dinocras cephalotes	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Chloroperlidae																		
Chloroperla torrentium	0	1	0	1	14	17	0	0	0	0	1	1	0	0	0	0	4	2
COLEOPTERA (BEETLES)																		
Hydrophilidae																		
Hydraena gracilis	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Elmididae																		
Elmis aenea	0	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limnius volckmari	2	12	10	0	0	0	0	0	0	0	0	0	0	0	0	3	1	1
Oulimnius sp.	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oulimnius troglodytes	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oulimnius tuberculatus	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

### A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS. MEST OKEMENT - JUNE 8th 1987 (BS-BOX SAMPLE) ABUNDANCES OF INDIVIDUAL SPECIES IN EACH SAMPLE

TAXON NAME

#### SITE NAME

		SITE	#L	U/S AC Si BSi E	TE	W2	D/S B SIT BS1 B	E N	3		TE W	4		E WS	i		TE N	6
TRICHOPTERA (CADDISFLIES)	741	<u> </u>	000	031 [	732	22.7	691 0	34 1	723	BS1	) J.Z.	127	<u> 851 B</u>	<b>54</b> B	53	B\$1 (	352	453
Rhyacophilidae																		
Rhyacophila sp.	0	0	Ô	1	0	0	0	0	Ó	0	ţ	. 0	0	0	0	0	0	0
Rhyacophila dorsalis	ò	Ò	0	ō	Ŏ	i	Ŏ	Ŏ	í	ŏ	ò	. 0	Ó	0	0	Û	o	0
Polycentropodidae	Ó	Ö	Ŏ	Ö	ō	2	ŏ	ŏ	ò	Ŏ	Ŏ	Ŏ	0	Ö	0	0	0	0
Polycentropus sp.	Ö	ò	ò	Ŏ	ō	ō	Q	Ŏ	ă	ŏ	0	1	0	0	0	0	0	•
Polycentropus flavomaculatus	Ō	0	Ó	4	i	2	3	ō	ů	Ŏ	Ŏ	ò	Ŏ	ŏ	Ó	0	0	0
Polycentropus kingi	0	Ò	Ö	1	4	ō	0	0	Õ	1	3	Ó	Ö	Ö	0	2	0	4
Kydropsychidae	•	-	•	_	•	•	•	٠	•	•	•	٧	٧	٧	٧	4	٧	•
Hydropsyche siltalai	0	0	Ů	3	0	0	0	2	0	0	0	٥	0	1	ŧ	0	0	0
Sericostomatidae			-	-	•	•	•	_	•	•	•	٠	•	٠	•	•	٠	v
Sericostoma personatum	0	0	0	0	0	1	0	0	Ô	0	ß	0	0	0	٥	0	0	0
DIPTERA (TRUE FLIES)				-	-	_	•	•	•	•	•	•	•	٧	•	•	٧	٠
Diptera indet.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		ð
Tipulidae							•	•	•	•	•	•	•	٧	•	•	•	٠
Eloeophila sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
Dicranota sp.	0	4	2	0	0	0	0	0	Ò	Ö	Ō	i	ŏ	i	ĭ	Ö	i	i
Ceratopogonidae	0	0	Ô	0	0	0	0-	0	0	Ó	Ō	i	Ŏ	Ô	ō	ĭ	ò	i
Simuliidae												_	•	•	·	-	•	•
Simulium sp.	0	0	0	0	0	0	0	1	0	0	٥	0	0	0	Ô	0	0	0
Simulium cryophilum group	0	6	0	0	0	0	0	0	Ó	0	0	Ó	Ġ	Ô	Ŏ	ō	Õ	Ŏ
Simulium vernum group	1	0	0	0	0	0	0	0	0	Ó	Ó	0	Ö	ō	Ò	ŏ	Ŏ	Ö
Simulium ornatum group	G	1	0	0	Q	t	0	1	Ò	Ō	Ó	Ö	ŏ	Ŏ	Õ	ŏ	ì	Ŏ
Simulium variegatum group	0	1	0	0	0	i	0	Ō	Ò	Ö	ò	Ŏ	ŏ	ō	0	Ŏ	ò	Ó
Chironomidae	5	2	4	74	37	48	11	9	12	37	53	36	7	2	3	12	16	13
ANURA (FROGS & TOADS) #				•			••	•		Ψ,		**	,	•	٧		10	10
Tadpoles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	7

\* \* VERTEBRATES

### A30 OKEHAMPION BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS. WEST DKEMENT - SEPT LOCK 1987 (BS=80X SAMPLE) ABUNDANCES OF INDIVIDUAL SPECIES IN EACH SAMPLE

TATON NAME

EDANG MOIL									511 <u>E</u>	MARE								
	5	ITE		S	ITE	W2	S	BYP: ITE	M2		TE	14	S	ITE			ITE I	16
TRICLADIDA (FLATWORMS)	851	157	BS3	951	852	853	951	852	053	B51	992	953	951	<u> 952</u>	<b>853</b>	851	852	<u>BS3</u>
Planariidae	0	1	1	0	0	٥	0	٥	0	0	٥	٥	0	٥	0	0	0	
Polycelis felina	Ŏ	-		٥	٥	ů	Ŏ		-	0	0	٥	0	٥	-	0	0	0
Phagocata vitta	Ö	_	-	ŏ	ō	ŏ	ŏ		Ŏ	0	ĭ	Ď	ŏ	0		Ŏ	0	Ö
NEMATODA (NEMATODES)	0	Ò	_	ò	ò	Ŏ	ŏ		Ŏ	٥	ò	ŏ	ŏ	ŏ		Ŏ	٥	Ô
BIVALVIA (MUSSELS)			_	_	·	•	•	•	•	•	٠	•	•	•	•	•	•	٧
Sphaeriidae	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	3	1	7
OLIGOCHAETA (TRUE WORMS)	140	260	228	90	39	52	104	191	56	53	29	46	158	123	272	5	10	7
ARACHNIDA (SPIDERS & MITES)																		
Hydracarina	2		1	2	2	1	1	0	0	0	0	1	ı	0	0	0	0	0
Oribatidae	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	٥	0	0
AMPHIPODA (SHRIMPS)																		
Gammaridae																		
Gammarus pulex	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
EPHENEROPTERA (MAYFLIES)																		
Baetidae		_																
Baetis sp.	1	-	0	. 0	6	0	0	0	0	0	0	0	0	0	0	0	0	0
Baetis vernus	3	_	_	0	0	2	0	6	0	Q	0	0	0	0	0	0	0	0
Baetis rhodani	0		_	0	i	2	0	9	0	0	0	0	0	0	0	0	0	0
Heptageniidae	0	-	_	8	11		0	-	0	0	0	0	0	0	-	0	0	0
Rhithrogena semicolorata	0		•	0	0	2	0	0	0	0	0	0	0	Q	•	0	0	0
Ecdyonurus sp. Leptophlebiidae	-	-	0	9	13	á	0		0	0	0	0	0	0	0	0	0	0
Paraleptophlebia submarginata	2		1	0 1	0	0	0	0	0	0	0	0	0	0	-	0	0	0
Ephenerellidae	v	٧			۷	0	U	0	0	¢	0	0	0	0	0	0	0	0
Ephemerella ignita	1	0	٥	0	٥	0	٥	٥	٥								_	
PLECOPTERA (STONEFLIES)	•	٧	٠	٠	٧	v	V	U	V	Ç	0	0	ı	0	1	0	0	0
Nemouridae																		
Protonemura sp.	1	0	0	6	8	13	0	i	0	0	0	0	0	0	0	0	0	0
Protonemura meyeri	i		ŏ	Ō	ō	0	Ŏ	ò	ŏ	Ŏ	ŏ	Õ	ŏ	0	Ŏ	0	0	0
Neaoura avicularis	ō		Ŏ	ĭ	Ö	Ŏ	ŏ	ō	ó	ŏ	Ŏ	ŏ	ů	٥	Ŏ	Ů	û	0
Leuctridae				_	·	•	•	•	•	•	٠	٠	•	٠	•	•	٧	٧
Leuctra sp.	26	16	29	18	20	18	0	0	0	¢	0	0	0	0	0	0	0	0
Leuctra fusca	1		1	2	10	7	2	1	Ō	Ó	i	ò	à	Ŏ	Ŏ	ŏ	ŏ	Ŏ
Perlodidae										•	-	-	•	٠	•	•	•	•
Perlodes microcephala	1	L	2	3	2	1	0	0	0	0	0	٥	0	0	0	0	0	0
Isoperla grammatica	0	1	1	1	1	0	0	0	0	0	0	0	0	Ó	ā	Ö	ō	ò
Chloroperlidae																		
Chloroperla sp.	0		2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chloroperla tripunctata	l	i	2	13	9	15	Ŀ	0	0	0	0	0	0	2	3	0	0	0
COLEOPTERA (BEETLES)																		
Dyticidae																		
Greodytes sanmarki	0	0	0	1	0	0	0	0	0	0	0	0	0	0	l	0	0	0
Gyrinidae																		
Orectochilus villosus	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Hydrophilidae		_		_														
Hydraena gracilis	0	0	0	2	0	0	0	0	0	0	0	0	0	Q	0	0	0	0
Helodidae																		
Helodes sp.	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Eleididae				_	_	_			_									
Elmis annea	13			0	3	3	0	1	0	0	0	0	0	0	0	0	¢	ı
Limnius volckmari Oulimnius es	. 6	28	15	1	0	1	2	3	1	0	0	0	0	3	5	2	2	2
Oulimnius sp.	14		4	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1
Oulimnius tuberculatus	0	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

### A30 OKEHAMPION BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS. MEST OKEMENT - SEPT. LOCH 1987 (85-BOX SAMPLE) ABUNDANCES OF INDIVIDUAL SPECIES IN EACH SAMPLE

TAXON NAME

	VEL		COTT. E Wi	U/S AT						U/\$ 1			6QLF			OKEHANI	-	
	301		D\$3		TE			EW	_		E M		- •	E N			TE N	-
MEGALOPTERA (ALDERFLIES)	801	994	993	PS1 E	144	<u> </u>	BS1 I	104	527	B\$1_1	13.4	#53	BS1 I	352	153	851	9\$Z	B\$3
Sialidae																		
Sialis fulicinosa	0	0	0	0	0	0	0	٥	0	0		٥	٥	0	٥	0		
TRICHOPTERA (CADDISFLIES)	•	•	•	•	٧	•	•	٠	٧	۰	٠	٧	V	V	v	Ų	1	0
Rhyacophilidae	0	0	Ô	0	0	0	0	Ó	0	0	0	Ó	0	0	0	Ó	0	
Rhyacophila dorsalis	0	2	2	Ŏ	Ò	_	Ŏ	i	Ŏ	Ó	ō	Ô	Ŏ	Ó	0	0	0	•
Polycentropodidae	Ó	ō	1	Ò	Ô	•	i	ò	•	Ŏ	0	Ď	8	ŏ	0	i	0	0
Plectrocnemia geniculata	Ô	Ó	ō	1	ă	•	i	٥	•	Ŏ	٥	å	0	G	٥	0	0	•
Polycentropus flavomaculatus	9	Ò	ō	5	5	•	Ŏ	Ô	•	Ů	ĭ	ò	0	Û	1	0	2	-
Polycentropus kingi	Ó	Ò	Ŏ	0	0	-	Ŏ	0	•	0	1	Ŏ	Ô	٥	1	0	0	
Hydropsychidae	0	1	Ö	Ŏ	0	•	ō	ů	Ô	Ö	ò	Ô	Ö	Ó	1	0	0	•
Hydropsyche sp.	0	٥	ò	Ò	3		Ó	4	Ó	Ŏ	ă	ŏ	Ŏ	٥	0	0	Ô	
Hydropsyche pellucidula	Ó	Ō	ò	1	2		Ŏ	Ô	Ŏ	Ō	Ŏ	Ŏ	0	Ó	Ò	Ô	Ó	0
Sericostomatidae	•	•	•	•	-	•	•	٠	•	٧	•	٧	٠	٠	v	٧	v	٧
Sericostoma personatum	0	0	0	Ó	٥	ů	0	ð	٥	٥	Ô	0	Ó	٥	٥	0	Û	2
DIPTERA (TRUE FLIES)			-	•	٠	•	•	•	•	•	•	•	•	٧	٠	•	٧	4
Diptera indet.																		
Tipulidae	0	0	0	0	٥	0	Ô	0	٥	0	0	1	0	0	٥	0	0	0
Eloeophila sp.	1	0	0	0	Ò	-	0	ā	ò	Ŏ	ŏ	Ò	Ŏ	Ŏ	Ŏ	Ŏ	Õ	ŏ
Dicranota sp.	2	7	ı	3	3		Ö	Ö	Ò	Ŏ	Ô	i	1	i	1	Ŏ	Ó	0
Ceratopogonidae	0	0	Ó	0	Ó	-	i	Ŏ	ò	ŏ	ō	à	i	i	i	ŏ	ō	Ó
Simuliidae	0	2	0	ō	Ō		ò	Ó	Ŏ	ŏ	Ö	Ď	i	ō	Ô	Ŏ	0	Ŏ
Simulium cryophilum group	0	6	1	0	3	Ò	Ò	Ŏ	ò	Ŏ	ŏ	Ŏ	Ŏ	Ŏ	ŏ	Ö	٥	٥
Simulium armoricanum	0	2	1	ō	0	Õ	Ö	٥	Ŏ	Ŏ	ō	ò	Ō	ů	Õ	0	0	Ď
Simulium ornatum group	1	0	ō	ò	ō	Ó	Ŏ	Ō	Ŏ	Ó	٥	Ó	ů	٥	2	Ó	0	0
Simulium varimgatum group	0	6	4	0	2	1	Ó	Ö	Ò	ŏ	ō	Ô	Ò	٥	ā	Ŏ	0	٥
Chironomidae	171	57	27	65		153	13	17	14	34	30	31	22	46	31	11	16	90
Empididae					•••	•••	•••	•	• •	• •	•	٧.	••	70	٠.	11	16	10
Hemerodromia group	0	0	0	0	Ô	0	0	1	Ò	0	0	0	0	0	0	0	0	0
Wiedemannia group	Ö	i	Ŏ	2	Ŏ	i	ť	3	Ŏ	Ó	Ŏ	Ô	Ó	3	4	0	٥	0
Rhagionidae	•	•	•	•	٠	•	•	•	•	•	٧	٧	•	•	7	v	U	v
Atherix marginata	0	0	0	3	0	٥	Ó	0	Ô	0	٥	Ô	1	0	٥	0	0	0

## A30 OVERAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKENEM! RIVERS. WEST OKEMENT - MARCH 2nd 1988 (BS=BQI SAMPLE) ABUNDANCES OF INDIVIDUAL SPECIES IN EACH SAMPLE

TAXON NAME

										****	TOTAL								
	S	ITE		5	ĦΕ	¥2			TE	N3		ITE I	14	60LF \$1	' COI		OKEHA!	Φ.Ci ITE 1	
TRICLADIDA (FLATHORMS)	651	15	2 053	151	057		1		157	153	<b>3</b> 51	152	151	ISI	152	153	0\$1	152	757
Planariidae	0	. ,																	-
Polycelis felina	-		-	0	-		0	0	0		0	0	0	0	0	0	0	٥	- 1
Phagocata vitta	0		-	ļ			0	Į.	0		1	2	3	0	0	0	2	0	0
BIVALVIA (MUSSELS)	3	1	0	1	0	,	2	0	0	0	0	1	7	ı	0	0	0	0	0
Sphaeriidae		. ,						_											
OLIGOCHAETA (TRUE WORKS)	0	-	_	0			0	0	0	0	0	0	0	0	0	0	l	0	2
HIRUDINEA	10	1/1	119	23	3	i	3	48	93	132	7	50	84	55	57	H	31	5	4
Glossiphoniidae																			
Helobdella stagnalis								_											
ARACHNIDA (SPIDERS & MITES)	0	0	0	ı	0		0	0	0	0	0	0	0	0	Û	0	0	0	0
Hydracarina	٥						_												
EPHEMEROPTERA (MAYFLIES)	V	!	. 0	ı	0	'	0	0	0	0	0	٥	٥	0	0	٥	0	0	0
Baetidae																			
Baetis chodani	٥	0								_									
Keptageniidae	v	٧	0	0	0	'	0	0	0	0	0	0	0	0	0	0	0	0	2
Heptagenia lateralis	٨		۸							_	_								
Ecdyanurus sp.	0			3 1			0	l	0	0	0	0	0	0	0	0	0	0	0
Leptophlebiidae	v	٧	·	1	0		0	0	0	0	0	0	0	0	0	0	0	0	0
Leptophiebia marginata	0	0	•							_									
PLECOFIERA (STONEFLIES)	V	V	2	0	0	•	0	0	0	0	0	٥	0	0	0	0	0	0	0
Taenopterygidae																			
Brachyptera risi	39	5								_									
Neaouridae	31	J	ı	ı	0	•	)	0	0	0	0	0	0	0	0	0	0	0	0
Protonemura sp.	24	16	0			,					_								
Protoneaura meyeri	8	2		0	0		) )	0	0	0	0	0	0	0	0	0	0	٥	0
Amphinemura sulcicollis	11	22		20	28	(		0 i	5	0	0	0	0	l.	1	0	1	¢	0
Leuctridae	••	••	••	40	10	•	•	ı	J	1	V	1	4	0	1	0	0	0	0
Leuctra inerais	271	184	109	43	31	10			4	•	4		_			_			
Leuctra hippopus	2			"	2			l o	1	2	1	1	2	ı	0	0	0	0	0
Perlodidae	-	•	•	•	•	٠	•	٧	J	•	V	ı	V	1	0	0	0	0	0
Perlodes microcephala	٥	2	0	0	٥	0	,	0	0	0					_				
Isoperla grammatica	i	4	37	i	i	Č		٥	٥	ů	0	0	0	0	0	0	0	0	0
Chloroperlidae	-	-	• • •	•	•	•	,	•	٧	٧	٧	٠		V	V	0	٥	0	0
Chloroperla sp.	0	٥	0	0	0	0	1	ı	0	0	0	0	0						
Chloroperia torrentium	45	26		11	3	i		ò	Ĭ	ĭ	Ŏ	٥		0	0	0	0	0	0
Chloroperla tripunctata	Ō	0	0	ä	ĭ	Ò		٥	٥	Ò	٥	ĭ	0	0	0	0	0	0	0
COLEOPTERA (BEETLES)			•	•	•	•		٧	٧	4	٧	1	U	Ų	ı	0	0	0	0
Gyrinidae																			
Orectochilus villosus	0	0	0	ı	٥	٥	ı	Ó	٥	0	ô	٥	0						
Kydrophilidae			•	•	•	•		٧	٧	٧	٠	٧	V	0	0	0	0	0	0
Hydraena gracilis	0	0	1	٥	0	0	ı	0	0	0	0	٨	٨						
Elmidae		-	•	•	٧	*		٧	4	•	V	0	0	0	0	0	0	0	0
Elmis aenea	5	34	18	0	٥	ı		0	٥	0	٥	٥	٥			4			_
Lianius volckaari	17	34	34	Ŏ	0	0		ŏ	0	2	0	0	0	0	0	Ú	0	0	0
Oulimnius sp.	0	0	2	ŏ	ō	ō		ŏ	Ŏ	٥	Ŏ	٥	ŏ	0	0	0	•	3	;
				_	•	•		-	•	•	•	•	٧	٧	v	v		u	u

### A30 OKEHAMPION BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OFEMENT RIVERS. WEST OKEHEMT - MARCH 2nd 1988 (BS=BOX SAMPLE) ABUNDANCES OF INDIVIDUAL SPECIES IN EACH SAMPLE

TAXON NAME

	-	AKE Site		U/S AD	IT/B Te w		0/8 9' SIT	YPAS E W3	-	U/S W. S11(	IGNE E W4	-	60LF (	OUR!		OKEHAMP SIT	, CA E WA	
	BS1	BS2	BS3	851 B	<u> 52 9</u>	53	BS1 B	52 B	<b>\$</b> 3.	851 B	52 B	53	851 BS			B51_B		
TRICHOPTERA (CADDISFLIES)																		
Rhyacophilidae																		
Rhyacophila dorsalis	0	ı	0	1	0	0	0	0	0	0	٥	0	0	0	٥	0	٥	ô
Philopotamidae																		
Wormaldia sp.	0	0	0	0	0	0	0	0	1	0	0	0	0	0	٥	٥	Û	٥
Polycentropodidae	0	1	t	0	0	0	0	0	Ō	0	1	1	0	Ò	Ó	ò	Ô	i
Plectrocnemia sp.	٥	0	1	0	0	ı	0	0	0	0	0	٥	Ó	Ó	Ó	Ó	0	ō
Polycentropus sp.	2	0	0	0	0	0	0	0	1	ō	à	٥	ò	Ŏ	٥	Ō	0	٥
Polycentropus flavomaculatus	0	0	0	3	٥	1	0	0	Ô	ò	٥	۵	ō	0	Ö	Ŏ	Ö	٥
Hydropsychidae								•	•	•	٠	•	•	·	•	•	•	•
Hydropsyche siltalai	0	٥	0	1	Å	0	0	٥	0	0	٥	1	0	0	0	0	0	0
Diplectrona felix	0	0	Ó	Ó	Ď	Ò	Ó	i	ŏ	ó	ō	ò	Ŏ	Ŏ	٥	ő	ő	٥
Sericostomatidae	-	·	•	•	•	•	•	•	•	•	•	•	•	٧	٧	•	٧	٧
Sericostoma personatum	0	0	0	16	Ó	Ô	0	0	0	0	0	٥	0	0	0	2	0	
DIPTERA (TRUE FLIES)	Ò	ò	0	0	Ŏ	Ŏ	Õ	ŏ	Ŏ	Ŏ	ŏ	٥	0	0	٥	0	0	
Dicrangta sp.	9	Ō	2	Ŏ	ŏ	Ŏ	Ō	Ŏ	Ŏ	ŏ	٨	ŏ	Ů,	٠	0	0	0	0
Ceratopogonidae	'n	Ò	ò	ŏ	۸	٥	۸	ō	0	Ŏ	٥	Ÿ	ů	0	٥		2	
Siauliidae	•	•	•	•	٠	٧	٧	٧	٧	٧	٧	٠	٧	٧	v	•	4	V
Simulium sp.	0	1	0	0	0	0	0	٥	0	0	٥	٥	٥					
Simulium armoricanum	•	i	Ö	ŏ	0	Ŏ	0	0	•		-	-	-	1	0	0	0	0
Chironomidae	,	,	2	2	2	2		٥	0 2	Q O	9	3	0	0	0	0	0	0
Espididae	,	•	4	4	4	2	1	V	4	U	3	3	•	5	2	8	3	13
Wiedemannia group	٥	Ó										_		_		_		
Rhagionidae	v	٧	1		0	ı	0	4	0	1	Ô	2	ı	2	ł	ı	0	0
•																		
Atherix sp.	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Atherix marginata	0	0	٥	1	0	0	0	0	0	3	0	0	0	0	0	0	٥	٥

## A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE BURVEY OF THE MEST AND EAST OKEMENT RIVERS. MEST OKEMENT - JUNE 13th 1986 (85-801 BAMPLE) ABUNDANCES OF INDIVIDUAL BPECIES IN EACH SAMPLE

TATON NAME

	S	1 TE	COTT WI 053		TE			TE		U/9 \$1 <b>B</b> 51	TE I	14	60LF \$1 851	TE I	15		TE I	46
TRICLADIDA (FLATWORMS)												AAA		034	093	851	094	653
Planariidae	0	0	0	0	0	٥	ô	٥	٥	٥	1	0	٥	0	٥			
Polycelis felina	0	- 4		ĺ	1	Ö	Ŏ	٥	•	i	0	۵	0	•	-	0	0	0
Phagocata vitta	. 14	15	4	á	٥		Ó	Ó	ò	i	3	0	í	0	0	0	0	0
BIVALVIA (BIVALVE SHAILS)				•	٠	•	٧	٧	٧		J	V	1	0	ı	ı	0	0
Sphaeriidae	٥	٥	0	Ò	0	ō	ô	Ô	ð						_			
OLIGOCHAETA (TRUE WORMS)	453	•	232	49	-	316	344	•	108	0	0	0	0	0	0	0	0	l
ARACHNIDA (SPIDERS & HITES)				17	•	210	411	77	100	48	62	54	100	14	46	•	33	23
Hydracarina	0	1	0	٥	٥	Ó	٥											
EPHEMEROPTERA (MAYFLIES)	•	•	٧	٧	٠	v	U	0	0	0	0	0	0	0	0	0	2	ı
Bartidae																		
Baetis sp.	٥	0	0					_	_									
Baetis scambus	ŏ	Ó	-	1 2	0	0	0	0	0	0	0	0	0	0	Q	0	0	0
Baetis vernus	59	61	•		1	_	0	0	0	0	0	0	0	0	0	0	0	٥
Baetis rhodani	0	01		0	0		0	0	0	0	0	0	0	0	2	٥	0	0
Heptageniidae	v	٧	U	1	0	4	0	ı	2	0	0	Ç	1	0	0	0	0	0
Heptagenia lateralis	0			_		_												
Ephenerellidae	v	0	0	8	4	2	0	0	0	0	0	0	0	0	0	1	0	0
Ephemerella ignita		_																•
Caenidae	1	2	0	0	0	0	0	0	Q	0	0	0	0	0	٥	ð -	0	0
Caenis rivulorum														•	•	•	•	٠
PLECOPTERA (STONEFLIES)	0	0	0	0	0	l	0	0	Ç	0	0	0	0	0	0	0	0	0
Meaouridae																		
Protonemura meyeri	15	7	5	0	0	0	0	0	0	0	0							
Amphinemura sulcicullis	29	20	3	Ó	٥	Ò	٥	Ŏ	۵	٥	Ŏ	0	0	0	0	0	0	0
Leuctridae			•	•	•	•	•	٧	٧	٧	Ų	v	Ų	0	0	0	0	0
Leuctra sp.	0	٥	0	0	3	0	0	0	Ĉ									
Leuctra inerais	30	34	6	2	Ö	3	Ŏ	0	0	0	0	0	0	0	0	0	0	0
Leuctra fusca	28	80	14	i	i	29	0	Ŏ	0	0	0	0	0	0	0	0	0	Q
Perlodidae	•••		••	٠	٠	30	V	V	V	V	Ų	0	0	0	0	0	0	0
Isoperla grammatica	7	2	1	٥	٥	2	1	٥										
Chloroperlidae	•	•	•	٧	٧	4		Ų	0	0	0	0	0	0	0	0	0	0
Chloroperia torrentium	18	18	1	•	•						_							
Chloroperia tripunctata	.0	4	ò	3 2	2	13 0	0	0	0	0	0	0	0	0	0	0	0	0
COLEOPTERA (BEETLES)	٧	٧	٧	4	Ų	V	0	0	0	0	0	0	0	0	0	0	0	¢
Hydrophilidae																		
Hydraena gracilis					_													
Dytiscidae	0	0	ı	0	0	Q	0	0	0	0	0	0	0	0	٥	ô	٥	0
Oreodytes sanmarkii		_													•	•	•	•
Eleidae	0,	0	0	2	0	¢	0	0	0	0	0	0	٥	Ò	0	o	0	0
Elais aenea	_		_										•	•	•	•	٧	٧
Lianius volckmari	4	15	7	0	0	0	0	0	0	0	0	0	٥	٥	0	0	1	0
Outlanius sp.	16	22	11	1	0	l	1	0	0	i	Ò	Ò	ŏ	ă	ă	ŏ	1	٥
outtening sp.	0	i	0	l	0	0	0	0	0	Ò	Ó	Ŏ	ň	-	7			•

## A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS. WEST OKEMENT - JUNE 13th 1988 (85=801 SAMPLE) ABUNDANCES OF INDIVIDUAL SPECIES IN EACH SAMPLE

TAXON NAME

•	VELU	AKE	COTT.	U/S AT	17/1	BYPASS	D/9 B	YPAS	S	U/\$ N	l 6XI	EY	60LF	COUS	RSE	OKEHANP	. C/	STL E
		SITE		SI	TE 1	12	517	E N3		SIT	E N	}		E WS			E NA	
	B\$1	152	B53	BSI	\$2	993	BS1 B	92 B	<b>\$</b> 3	<b>DS1 0</b>	\$2 1	93	BSI B			8\$1 B		
SIALIDAE (ALDERFLIES)																		
Sialidae																		
Sialls fuliginosa	0	0	0	0	1	0	0	0	0	0	0	0	0	0	٥	٥	٥	٥
TRICHOPTERA (CADDISFLIES)														-	_	_	•	-
Rhyacophilidae																•		
Rhyacophila sp.	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	٥
Rhyacophila dorsalis	- 4	6	0	0	0	0	0	0	0	0	0	0	. 0	Ò	ò	Ŏ	ō	Ŏ
Polycentropodidae	0	0	0	9	5	5	0	0	0	0	0	1	Ö	i	4	ō	ō	ŏ
Plectrocnemia sp.	0	l	0	0	0	0	0	٥	Ô	Ò	å	0	Q	٥	ò	ŏ	0	٥
Plectrocnemia geniculata	2	0	0	0	0	٥	0	0	0	ō	Ò	٥	Ŏ	ō	٥	ō	Ŏ	٥
Polycentropus flavomaculatus	0	0	0	ı	0	3	Ó	Ō	Č	Ŏ	ò	ò	Ŏ	0	Ŏ	ŏ	ŏ	0
Polycentropus kingl	0	0	٥	ī	4	ō	Ö	ò	ò	ŏ	i	ŏ	0	ŏ	Ŏ	2	ĭ	2
Hydropsychidae					•	-	•	•	٠	•	•	•	•	٧	٧	•	٠	•
Hydropsyche siltalai	2	1	0	Ô	٥	٥	٥	0	2	0	Ô	٥	0	٥	٥	0	0	0
Linnephilidae				•	•	•	•	•	•	•	•	•	•	٧	٧	٧.	٧	٠
Potamophylax cinquiatus	0	0	0	٥	0	0	٥	٥	0	٥	٥	0	1	٥	0	0	Ô	
Sericostonatidae	Ĭ	•	•	•	٧	٧	•	٧	٧	٧	V	V	ı	V	v	Ų	v	0
Sericostoma personatum	0	0	0	2		2	۸	0	0	^								
LEFIDOPTERA (MOTHS - AQUATIC LARVA)		ă	ĭ	Ô	٥	á	0	٥	0	0	0	0	0	0	0	0	1	1
DIPTERA (TRUE FLIES)	•	•	•	•	٧	٧	v	٧	٧	٧	Ų	¥	Ų	V	Q	0	0	0
Tipulidae																		
Eloeophila sp.	0	0	0			٨												
Dicranota sp.	٥	1	2	1	,	0	0	0	0	0	4	1	0	1	0	0	0	Ł
Sigulidae	٧	•	4	v	V	v	v	V	V	Q	0	0	0	0	0	Q	0	0
Simulium cryophilum group	٥	1	٥	0	0	٥												
Simulium vernum group	ĭ	i	i	1	٥	ı	0	0	0	0	0	0	0	0	0	0	0	0
Simulium ornatum group	3	5	2	ò	0	Ò	0	0	0	0	0	0	0	0	0	0	0	0
Simulium variegatum group	3	4	9	. 0	0	٥	0		0	0	0	0	0	0	0	0	0	0
Chironomidae	10	2	13	21	61	12	22	1 2	0	0	0	0	0	0	0	0	0	0
Empididae		•	13	41	01	14	24	4	•	8	20	24	14	12	17	45	183	134
Chelifera group	0	0	0	٨	•													
Wiedemannia group	i	٥	٥	0 1	2	1	0	0	0	0	0	0	0	0	0	0	0	0
Rhagionidae	•	٧	v		٧	٧	v	V	V	9	ı	0	0	0	0	0	0	0
Atherix ibis	0	٥	0	. 0	0	٨			•						_	_		
Atherix marginata	٥	٥	٥	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
· ····································	٧	v	٧	U	U	ı	Q	¥	Q	0	0	0	0	0	0	1	0	0

## AND DEPLATED ABUNDANCES OF INDIVIDUAL SPECIES IN EACH SAMPLE

TAXON NAME

									ATTE	War se								
	S	ITE	COTT W! BS3	SI	TE I	12		TE N	13		TE I	14		TE N	15	O¥EHA:	IP.C4 ITE 1	
TRICLADIDA (FLATWORMS)		<u> </u>	823		127	B\$3	<u> 051</u>	<u> </u>	053	<u> </u>	152	<u> 053</u>	<u> 951</u>	<u> </u>	<u> 853</u>	BSI_	952	853
Planariidae																		
Polycelis felina	0	0	0					_		_								
Phagocata vitta	0			0	0	2	0	0	0	2	1	0	1	0	0	0	0	9
Crenobia alpina	Ÿ	0		0	0	0	0	0	0	3	0	1	1	0	0	0	0	•
BIVALVIA (BIVALVE SNA(LS)		٧	Ų	Ų	0	0	0	0	0	0	0	0	0	0	0	0	Ó	0
Sphaeriidae																		
Pisidium sp.	0	0	٨					_										
OLIGOCHAETA (TRUE NORMS)	18		93	1	0	0	0	0	0	0	0	0	0	0	0	0	0	Ç
ARACHNIDA (SPIDERS & MITES)			73	8	4	12	36	11	2	27	30	19	72	35	61	7	18	9
Hydracarina	1	٠.		_	_													
ANFHIPODA		1	l	2	2	0	1	0	Ţ	0	0	0	1	0	ŀ	0	0	0
Gansaridae																		
Gammarus pulex																		
EPHEMEROPTERA (MAYFLIES)	0	0	0	ı	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Baetidae																		
Baetis sp.	٨					_			_									
Baetis scambus	0	-		0	10	3	1	0	0	0	0	0	0	1	0	0	0	ņ
Baetis vernus	0	_		0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Baetis rhodani	1	!	Ţ	0	1	2	1	1	0	2	1	. 0	1	0	1	0	9	0
Heptageniidae	U	ŧ	0	3	8	5	2	0	ı	8	2	0	0	0	0	0	ŋ	0
Rhithrogena semicolorata				_	_													
Ecdyonurus sp.	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	Λ	۵
Leptophleblidae	0	0	1	6	9	5	1	1	0	0	1	1	0	0	0	0	ĝ	9
Ephemerellidae	2	3	1	t	0	0	0	0	ø	0	ø	0	0	0	0	0	0	0
FLECOPTERA (STONEFLIES)																		
Nesquridae																		
Protonemura sp.	0	2	0	1	1	1	0	0	٥	0	0	٥	0	0	0	0	e	0
Amphinemura sp.	0	2	0	2	6	0	2	0	0	0	0	٥	0	0	Ò	ō	ò	Õ
Leuctridae													•	•	•	•	•	•
Leuctra sp.	14	13	9	11	2	3	0	0	0	0	0	0	1	0	0	0	0	٥
Leuctra inerais Leuctra fusca	0	1	0	0	4	1	0	0	0	0	0	0	0	Ò	ō	Ŏ	0	0
Ferlodidae	0	!	0	0	1	2	0	0	0	0	0	0	9	0	Ò	0	٥	ò
Perlodes microcephala																·		-
	0	0	l l	0	0	0	0	0	0	0	0	0	0	0	0	0	0	٥
Isoperla grammatica Perlidae	0	0	0	0	ı	0	0	0	0	0	0	0	0	0	٥	0	ò	٥
Dinocras cephalotes																	•	•
	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	٥	0
Chloroperlidae														•		•	•	
Chloroperla torrentium	0	ı	0	0	1	0	0	0	0	0	0	0	٥	0	0	0	0	O
Chloroperla tripunctata	0	0	L	8	1	1	0	0	0	Ó	0	٥	0	Ŏ	Ŏ	ŏ	Ó	٥
COLEOPTERA (BEETLES)											•	•	•	•	•	•	٧	v
Syrinidae																		
Orectochilus villosus	0	0	0	1	0	t	0	0	0	0	0	0	0	0	0	٥	Ĉ	•
Eleidae									•	•	•	•	•	•	4	v	¥	ŋ
Elmis aenea	6	10	8	ı	0	0	0	0	0	٥	٥	0	0	٥	0	0	٥	0
Limnius volcheari	12	11	28	L	٥	0	3	1	Ò	Ŏ	i	i	1	ŏ	2	i	٥	0
Oulianius sp.	1	2	1	0	0	0	0	٥	٥	ĭ	À	ò	i	٨	Á		•	ļ

## A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE MEST AND EAST OKEMENT RIVERS. WEST OKEMENT - SEPT. 13th 1988 (BS-BOT SAMPLE) ABUNDANCES OF INDIVIDUAL SPECIES IN EACH SAMPLE

TATON NAME

#### SITE MAME

		SITE 852	WL	. U/S AI Si BS1 I	TE 1	12	SIT	E N3			E N4			E NS			E Wé	
TRICHOPTERA (CADDISFLIES)		VVL.	***	441	46 (	242	BST B	<u> 34. l</u>	23	BS1 P	17 L	27	<u> </u>	57 0	\$ } _	<u> </u>	5 <u>7</u> P	<u>53</u>
Rhyacophilidae																		
Rhyacophila sp.	0	٥	0	0	0	1	ð	٥	٥	ð	0	٨						
Polycentropodidae	_	•	•	•	•	•	•	٧	٧	v	٧	٧	0	0	0	Ú	ı	ŋ
Polyccentropus sp.	1	0	1	0	0	0	٥	0	0	٨	۸	٨						
Polycentropus flavomaculatus	Ō	Ò	Ö	Ó	Ö	ĭ	Ŏ	Ŏ	Ŏ	0	0	0	0	0	0	0	0	n
Polycentropus kingi	ò	Ò	ò	ŏ	Ô	i	ŏ	Ŏ	۸	Ŏ	٥	0	0	0	0	0	1	0
Hydropsychidae	•	•	•	•	•	•	٠	٧	v	v	V	v	V	Ų	0	0	Ú	ņ
Hydropsyche sp.	0	0	0	0	0	0	2	٥	0	۸	0	Α.		٨				
Hydropsyche pellucidula	0	ò	Ò	Ŏ	Ĭ	ò	ò	Ö	0	0	0	0	0	0	0	0	0	٨
Hydropsyche siltalai	Ó	Ô	Ò	i	i	10	ŏ	Ŏ	٨	Ŏ	•	V	0	0	0	0	0	0
DIFTERA (TRUE FLIES)	-	•	•	•	•	••	•	٧	v	v	v	v	V	y	ú	Ú	9	0
Tipulidae																		
Eloeophila sp.	0	0	1	0	0	0	0	0	٨		٨	٨						
Dicranota sp.	Å	ň	i	Ó	Ŏ		٥	0	0	0	0	0	0	0	0	0	Ó	Ò
Simuliidae	_	•	•	•	٧	٧	٧	٧	V	v	0	0	0	0	0	0	0	0
Simulium cryophilum group	0	C	0	0	5	0												
Simulium ornatum group	ŏ	ĭ	Ŏ	Ŏ	3	0	0	0	0	0	0	0	0	0	0	0	Û	0
Simulium variegatum group	ŏ	i	Ö	3	20	-	l 2	1	0	0	0	0	0	0	0	0	0	0
Chironomidae	15	12	7	8	51	2 30	Z	0	•	0	0	0	0	0	0	0	0	0
Espididae	10	14	,	•	31	30	1	1	ò	0	1	5	1	4	7	9	8	5
Wiedemannia group	0	0	0	Ó	4			_				_						
Rhagicnidae	V	٧	V	v	1	0	1	0	0	0	0	0	0	0	0	0	0	0
Atherix marginata	0	0	0	0	0	0	0	0	0	0	0	0	٥	0	0	0	1	0

Appendix 4. East Okement. Abundance of each individual "species" in each box sample for each month of sampling.

### A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE MEST AND EAST OKEMENT RIVERS. EAST OKEMENT - JUNE 8th 1987 (88=80X SAMPLE) ABUNDANCES OF INDIVIDUAL SPECIES IN EACH SAMPLE

TAXON NAME

	S	BYP			BYE TE E	8		TE E		SI	TE E	
TRICLADIDA (FLATNORMS)	- 201		200	<u> </u>	PUL	833	กรเ	032	833	D3 f	032	933
Planariidae												
Polycelis felina	0	0	0	0	0	2	1	0	0	0	1	0
GASTROPODA (SNAILS)		٠	•	•	•	-	•	٠	٠	•	•	V
Hydrobiidae												
Potamopyrgus jenkinsi	0	0	0	0	2	0	1	0	0	0	0	0
Ancylidae								•	Ť	•	•	•
Ancylus fluviatilis	0	0	0	0	0	ı	0	0	0	0	0	0
Zonitidae										-	·	•
Zonitoides nitidus	0	0	0	0	0	0	0	0	0	0	1	0
OLIGOCHAETA (TRUE WORMS)	4	4	1	32	8	5	10	12	7	29	44	10
ARACHNIDA (SPIDERS & MITES)												
Hydracarina	0	0	0	i	1	1	3	2	1	3	3	5
AMPHIPODA (SHRIMPS)												_
Gammaridae							-					
Sammarus pulex	0	0	0	1	1	0	0	0	0	0	2	0
EPHEMEROPTERA (MAYFLIES)												
Baetidae												
Baetis sp.	0	5	5	3	6	6	5	6	3	7	1	3
Baetis scambus	1	4	6	17	29	40	43	46	28	50	81	74
Baetis vernus	0	i	5	0	0	0	0	0	0	0	0	0
Baetis rhodani	0	0	6	4	0	7	6	4	3	0	0	1
Heptageniidae												
Rhithrogena semicolorata	0	0	2	0	0	0	1	0	0	0	0	0
Heptagenia lateralis	0	0	2	0	0	0	0	Q	ι	1	2	1
Ecdyonurus sp.	1	0	0	0	0	0	0	0	0	1	0	0
Ephemerellidae		_	_									
Ephemerella ignita	1	0	4	1	3	5	6	5	0	7	13	3
Caenidae												
Caenis rivulorum	0	0	0	0	0	0	0	0	0	0	2	0
PLECOPTERA (STONEFLIES) Nemouridae												
										_		
Protonemura sp. Protonemura meyeri	0	0	0	0	0	0	1	0	0	0	0	0
Amphinemura meyeri Amphinemura sulcicollis	0	1	0	0	0	1	0	0	0	0	0	0
Leuctridae	U	1	0	ı	0	0	0	0	0	0	0	0
Leuctra sp.	0	^				_					_	_
Leuctra inerais	0	0	5	4	4	3	4	2	1	1	5	7
Leuctra fusca	-	7	7	4	0	1	0	0	0	0	0	0
Perlodidae	0	0	0	0	0	0	0	0	1	0	1	1
Isoperla grammatica	^	2	^									_
Chloroperlidae	0	2	0	0	0	0	0	0	0	Q	0	0
Chloroperla sp.	0	0		^		-						_
Chloroperia sp. Chloroperia torrentium	4	6	i	0	0	2 2	0	3	1	1	5	2
Chloroperia tripunctata	0	0	6 2	0	0		0		0	0	0	0
ournicherra rishauctara	U	V	2	V	0	0	1	0	0	1	1	0

## A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS. EAST OKEMENT - JUNE 8th 1987 (BS=BOX SAMPLE) ABUNDANCES OF INDIVIDUAL SPECIES IN EACH SAMPLE

TAXON NAME

	SITE E7					PASS E8		LL H ITE	ILL E9		AR S ITE		
			2 BS3			BS3			DS3			953	
COLEOPTERA (BEETLES)													
Elmididae													
Elmis aenea	0	0	0	0	0	2	1	1	1	0	0	1	
Esolus parallelipipedus	0	0	Q	0	0		1	2					
Limnius volckmari	0	1	0	i	0	0	2	3			5		
Oulimnius sp.	0	0	0	0	0	0	0	0			1		
Oulimnius tuberculatus	0	0	0	0	0	0	0	0		0	Ö	Õ	
TRICHOPTERA (CADDISFLIES)											_	•	
Rhyacophilidae													
Rhyacophila sp.	0	1	0	0	0	0	0	0	0	1	0	Ô	
Rhyacophila dorsalis	0	0	0	2	4	1	1	0	0	Ò	1	Ò	
Polycentropodidae	0	0	0	0	0	0	0	0	0	t	2	ì	
Plectrocnemia conspersa	0	0	0	0	0	0	0	0	1	Ó	0	Ŏ	
Polycentropus kingi	1	0	0	0	0	1	2	0	0	2	6	1	
Hydropsychidae												•	
Hydropsyche siltalai	0	1	5	0	0	0	0	1	0	1	0	1	
Goeridae										<del>-</del>		•	
Silo sp.	0	0	0	0	0	0	0	0	0	0	1	0	
Silo pallipes	0	0	0	0	0	0	0	Ó	Ò	Ò	Ō	i	
Lepidostomatidae								·	-	•	•	•	
Lepidostoma hirtum	0	0	0	0	0	0	0	0	0	0	1	0	
Sericostomatidae							•	•	٠	•	•	•	
Sericostoma personatum	0	0	0	0	0	0	3	0	0	0	5	1	
Tipulidae							-	-	•	•	-	•	
Dicranota sp.	0	0	0	3	1	1	Ð	1	0	0	2	0	
Simuliidae										·	_	•	
Simulium sp.	0	4	1	0	0	0	0	0	0	0	0	0	
Simulium cryophilum	0	2	0	0	0	0	0	0	Ó	0	Ô	Ô	
Simulium vernum group	0	0	0	2	1	0	i	i	Ò	Ó	ō	Ŏ	
Simulium ornatum group	0	1	0	0	0	Q	Ō	Ò	0	ò	Ö	Ō.	
Simulium variegatum group	0	66	21	0	0	1	0	0	Õ	ò	ô	Ô	
Chironomidae	7	25	15	27	15	10	13	15	10	22	47	11	
Empididae	0	0	0	0	0	1	0	0	٥	1	0	1	
Chelifera group	0	0	0	Ö	Ô	0	i	Ô	Ŏ	ċ	ŏ	è	
Wiedemannia group	0	0	0	1	Ó	Ĺ	i	ò	Ö	i	2	Ö	

## A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE MEST AND EAST OKEMENT RIVERS. EAST OKEMENT - SEPT.10th 1987 (BS=BOX SAMPLE) ABUNDANCES OF INDIVIDUAL SPECIES IN EACH SAMPLE

TAXON NAME

		SITE	PASS E7 2 BS3	S	ITE :		S	ITE		S	ITE I	E10
TRICLADIDA (FLATWORMS)		1 00	<u> </u>	121	857	BS3	851	<u> 952</u>	B53	851	B52	BS3
Planariidae	٨											
Polycelis felina	0	_	•	1	0		0			0	0	0
Phagocata vitta	0			0	0		0			0	0	0
NEMATODA (NEMATODES)	ń	•		2			0			0	0	
GASTROPODA (SNAILS)	U	1	0	0	0	0	0	0	0	0	0	0
Hydrobiidae												
Potamopyrgus jenkinsi						_						_
Ancylidae	1	1	1	0	0	2	0	0	0	0	0	0
Ancylus fluviatilis	0	^										
OLIGOCHAETA (TRUE NORMS)		•	0 542	1	0	0	0	0	0	0	0	0
ARACHNIDA (SPIDERS & MITES)	1/4	147	342	71	152	148	74	119	134	65	95	60
Hydracarina	0	^	^			-						
AMPHIPODA (SHRIMPS)	v	0	0	1	5	3	4	4	13	13	12	4
Samaridae												
Gammarus pulex	0	0				40.			_			
EPHEMEROPTERA (MAYFLIES)	v	v	5	3	1	10	0	2	7	0	1	0
Baetidae												
Baetis sp.	0	۸	۸	^	4.	22						
Baetis scambus	0	0	0	0	41	22	0	0	17	0	0	0
Baetis vernus	1	0	0	0	-	0	0	0	1	0	2	1
Baetis rhodani	12	-	9	2 41	1 50	21	0	0	0	0	0	0
Baetis muticus	2	1	0	0	0	0	-	11	32 0	10	6	5
Centroptilum luteolum	Ó	Û	0	0	0	0	0	0	0	. 0	ı	
Heptageniidae	, ,	6	10	4	14	5	2	18	49	•		0
Rhithrogena semicolorata	0	2	2	0	12	0	0	2	2	10 0	2	3
Heptagenia lateralis	Ŏ	Ō	Ò	0	0	0	0	0	0	2	Ö	0
Ecdyonurus sp.	8	4	6	3	6	5	2	6	12	5	1	3
Leptophlebiidam	0	Ó	ō	0	0	0	0	1	0	0	0	0
Paraleptophlebia submarginata	Ď	0	Ó	Ó	٥	ő	2	0	1	Ó	2	0
Ephemerellidae	•	٧	٧	٧	٧	٧	-	٧		٧	4	V
Ephemerella ignita	0	0	0	٥	0	0	Ó	0	0	1	0	1
PLECOPTERA (STONEFLIES)	•	•	•	•	٠	٧	٧	٧	v	•	V	1
Nemouridae												
Protonemura sp.	13	6	7	0	٥	0	0	à	Ó	0	Λ	0
Amphinemura sulcicollis	0	0	Ó	Ŏ	Ò	ò	ŏ	3	Ŏ	Ô	0	i
Nemurella picteti	0	0	Ó	Ó	ō	Ò	i	0	0	Ŏ	0	ò
Nemoura avicularis	0	0	Ò	i	Ò	Ŏ	i	Ŏ	Ŏ	Ŏ	1	2
Leuctridae	•	•	•	•	•	•	•	•	٠	٧	٠	-
Leuctra sp.	4	17	9	8	1	5	3	8	36	3	8	15
Leuctra nigra	0	1	0	Õ	Ō	ō	ō	ō	0	Ŏ	Ō	0
Leuctra fusca	1	4	5	- 11	3	7	5	7	4	12	3	4
Perlodidae	0	0	Ō	0	0	Ó	0	í	Ò	0	0	0
Perlodes microcephala	0	3	2	2	i	2	ì	2	Ĭ	ĭ	ŏ	ŏ
Isoperla grammatica	Ō	Ō	Ō	Ō	Ō	ō	ō	ō	i	ò	ŏ	Ö
Chloroperlidae				-	-	-	•	•	٠	•	•	•
Chloroperla torrentium	0	0	1	0	1	0	0	0	0	0	0	0
Chloroperia tripunctata	23	21	10	3	i	2	8	10	14	17	16	5

## A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS. EAST OKEMENT - SEPT. 10th 1987 (BS=BOX SAMPLE) ABUNDANCES OF INDIVIDUAL SPECIES IN EACH SAMPLE

#### TAXON NAME

	U/	S BY	PASS	D/:	S BY	PASS	BA	LL H	ILL	GRAMM	AR S	CHOOL
		SITE		S	ITE	E8		ITE			ITE	
	BS	<u>1 BS</u>	2 BS3	BSI	8S2	893	851	852	953	-		BS3
COLEOPTERA (BEETLES)												
Hydrophilida <b>e</b>												
Hydraena gracilis	4			0	1	0	0	0	0	1	0	0
Helophorus sp.	0	0	0	0	0	0	1			0	-	-
Elmididae										-	_	•
Elais aenea	0	0	2	0	7	2	5	11	12	8	2	8
Esolus parallelipipedus	0	0	0	1	0		5			4		
Lienius volckeari	1	2	3	2	_	-	24			4		
Oulimnius sp.	0			1			29			4		
Oulimnius tuberculatus	Ó	0	-	0	0		0		-	0		
MEGALOPTERA (ALDERFLIES)	•	Ī	•	•	•	٧	•	•	•	٧	٧	V
Sialidae												
Sialis lutaria	0	٥	0	0	Ô	0	1	٥	0	0	0	0
TRICHOPTERA (CADDISFLIES)	•		•	•	•	v	•	٧	٧	V	U	٧
Rhyacophilidae												
Rhyacophila sp.	2	1	5	1	0	0						
Rhyacophila dorsalis	ī	Ô	0	Ō	3		1	4		1	0	-
Agapetus sp.	Ó	0	Ŏ	0	2		0	1	1	0	0	_
Philopotamidae	v	v	V	v	4	ı	V	V	V	0	0	0
Philopotamus montanus		۸	٨	^	^							_
Polycentropodidae	1	0	0	0	0	0	0	0	0	0	0	-
Plectrocnemia conspersa	1	0		0	0		0	3		2	0	-
Plectrocnemia geniculata	0	0	0	0	0		0	0	_	1	0	-
Polycentropus flavomaculatus	0	0	0	0	0	-	1	0	0	0	0	-
Hydropsychidae	0	2	0	3	0		3	2	1	2	0	
	2	0	0	0	0		0	0	0	0	0	-
Hydropsyche sp.	0	5	0	0	0	0	1	0	i	0	0	Q
Limnephilidae	0	0	<b>O</b>	0	0	O	0	1	0	0	0	0
Leptoceridae	_	_	_									
Athripsodes sp.	0	0	0	0	0	0	1	0	0	1	0	0
Mystacides azurea	0	0	0	Q	0	0	5	Q	0	0	0	l i
Oecatis sp.	0	0	0	0	0	0	0	0	0	0	0	1
Goeridae												
Silo sp.	0	0	0	1	t	1	0	0	0	0	0	0
Silo pallipes	1	0	0	0	0	0	0	0	0	0	0	0
Lepidostomatidae	0	0	0	0	0	0	0	0	0	1	0	0
iepidostoma hirtum	Q	0	0	0	0	0	0	3	0	0	3	0
Sericostomatidae	0	1	0	0	0	0	0	0	0	0	0	Ö
Sericostoma personatum	1	7	4	29	3	31	13	1	9	2	3	ò
Tipulidae												-
Padicia rivosa	0	0	1	0	0	0	0	0	0	0	0	0
Dicranota sp.	2	13	15	2	5	9	3	i	2	i	i	t
Simuliidae							_	Ī	-	•	•	•
Simulium cryophilum group	7	3	2	٥	Ô	0	0	Ô	Ò	0	0	0
Simulium variegatum group	32	5	5	Ō	1	ō	Ŏ	Ō	Ŏ	Ō	Ŏ	Ŏ
Ceratopogonidae	0	0	0	Ö	Ō	i	Ŏ	i	Ŏ	Ŏ	Ō	Ŏ
Chironomidae	30	49	47	70	16	69	144		128	59	60	59
Empididae		. •		•	- •		. 11	20		47	ΨV	41
Chelifera group	0	0	0	0	0	0	0	0	1	0	0	0
Wiedemannia group	2	Ŏ	Ŏ	Ö	Ô	0	ŏ	0	t	0	0	0
Rhagionidae	•	٧	•	٧	٧	٧	٧	V		v	V	٧
Atherix marginata	0	2	1	3	1	0	0	٨	2	٨	٨	۸
	V	4	ė.	J	ŗ	V	V	0	2	0	0	0

## A30 OXEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS. EAST OKEMENT - MARCH 2nd 1988 (BS=BOX SAMPLE) ABUNDANCES OF INDIVIDUAL SPECIES IN EACH SAMPLE

TAXON NAME

		SITE		S	S BYP LTE E	8	S	ITE		S	ITE	EIO
TRICLADIDA (FLATWORMS)		1. 05	2 BS3	151	152	<u> 153</u>	951	952	BS3	851	052	<u> 883</u>
Planariidae												
Polycelis felina	1	0	٥	1	0	ı	1	٥	0	ı	٥	٥
Phagocata vitta	Ò	4		ō	٥	ò	5			ò		
NEMATODA (KEMATODES)	0	Ó	Ö	Ö	ō	Õ	٥			٥		-
GASTROPODA (SNALLS)						•	·	٠	•	•	•	•
Kydrobiidae												
Potamopyrgus jenkinsi	0	0	0	0	0	٥	٥	٥	0	1	Ô	٥
OLIGOCHAETA (TRUE WORMS)	160	80	272	15	130	76	-		236	•	250	-
ARACHNIDA (SPIDERS & NITES)							*			•••		• • •
Hydracarina	0	0	٥	1	0	0	٥	0	٥	٥	1	٥
AMPHIPODA (SHRIMPS)							•	-	·	٠	•	•
Gammaridae												
Gammarus pulex	0	0	0	1	0	1	0	0	ı	0	0	0
EPHEMEROPTERA (MAYFLIES)												•
Baetidae												
Baetis rhodani	0	0	2	1	5	16	20	38	22	0	٥	0
Keptageniidae	0	0	0	0	٥	2	0	0		û		-
Rhithrogena semicolorata	4	5	11	0	18	9	4	8		Ó		
Heptagenia lateralis	0	0	i	0	0	0	0	0		Ò		
Ecdyonurus sp.	3	0	0	2	0	4	4	4	1	3		2
PLECOPTERA (STONEFLIES)									_	_	_	_
Taeniopteryqidae												
Brachyptera risi	0	0	0	0	1	0	0	4	0	٥	0	0
Kemouridae											-	·
Protonemura meyeri	0	0	1	0	0	ı	0	1	1	0	0	0
Amphineaura sp.	1	0	0	0	0	0	0	0	0	0	٥	0
Amphinemura sulcicollis	0	0	4	1	i	3	0	0	3	0	0	1
Leuctridae												
Leuctra ingrais	28	26	43	0	2	2	1	Q	0	0	٥	0
Leuctra hippopus Perlodidae	0	1	0	0	0	0	0	0	0	0	0	1
					_							
Perlodes microcephala	0	0	0	2	0	0	0	0	1	0	0	0
Isoperia grammatica Chioroperiidae	0	0	1	0	0	0	1	0	0	0	0	0
Chloroperla sp.					_	_	_			_		
Chloroperia sp.	48 23	24 10	42	ļ	?	7	2	1	4	0	5	2
Chioroperia tripunctata	23 5	10	29	0	1	0	1	1	3	1	0	-
enranakan sa rushinggaga	3	17	2	1	1	2	2	Û	3	2	٥	1

## A30 OKEHANPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS. EAST OKEMENT - MARCH 2nd 1988 (BS=BOX SAMPLE) ABUNDANCES OF INDIVIOUAL SPECIES IN EACH SAMPLE

#### TATON NAME

		BYE SITE			S BY Ite	PASS E8		L HI ITE 6		GRAKM	AR S ITE	
			B\$3			853		052				BS3
COLEOPTERA (BEETLES)											. <del>- 11</del>	<del></del>
Gyrinidae Occabachilla 111												
Orectochilus villosus	0	0	0	0	0	0	0	0	0	0	1	0
Hydrophilidae												
Hydraena gracilis	0	1	1	0	0	0	0	0	0	0	0	Ö
Eloidae												
Elais aenea	0	0	1	0	0	0	- 1	0	0	0	0	0
Esolus parallelipipedus	0	0	0	0	1	0	1	1	0	0	0	9
Lianius volckmari	4	2	3	0	0		12	6	3	2	12	2
Oulianius sp.	0	0	1	- 1	0	0	0	0	0	0	0	t
TRICHOPTERA (CADDISFLIES)												
Rhyacophilidae												
Rhyacophila dorsalis	0	0	0	0	0	0	0	1	0	0	0	0
Polycentropodidae	6	5	1	0	2	5	3	5	4	3	11	
Plectrocnemia conspersa	1	0	0	0	0	0	0	0	0	0	0	ō
Polycentropus sp.	2	1	0	0	0	0	0	0	0	ì	Ŏ	5
Hydropsychidae							-		•	•	•	•
Hydropsyche sittalai	0	1	4	0	0	1	٥	٥	٥	٥	ô	1
Goeridae						•	•	•	•	•	٠	•
Silo pallipes	0	0	0	٥	1	٥	0	٥	0	٥	ı	0
Sericostomatidae							_	•	•	•	•	•
Sericostoma personatum	5	1	0	0	0	0	0	0	٥	4	٥	٥
Tipulidae							·	•	•	•	•	•
Eloeophila sp.	1	0	0	0	0	Ô	0	1	0	1	0	1
Dicranota sp.	3	1	2	0	0	0	Ò	٥	ò	2	Ġ	i
Simuliidae					-		•	•	•	•	•	•
Simulium sp.	Ô	0	0	0	0	ı	0	0	0	0	0	٥
Simulium vernum group	0	1	0	Ò	0	٥	Ŏ	Ô	٥	ŏ	ŏ	Ŏ
Simulium armoricanum	0	0	2	Ó	Ó	٥	ō	Ō	ò	Ŏ	ō	ŏ
Siaulius cryophilus group	0	0	2	0	٥	Ó	ò	Ó	٥	ò	ō	٥
Simulium ornatum group	0	0	0	0	1	Ò	ō	Ö	ò	Ó	ŏ	ŏ
Ceratopogonidae	0	1	0	0	1	ò	Ö	Ò	i	ŏ	ŏ	ĭ
Chironomidae	27	2	0	2	12	18	13	15	2	14	27	37
Empididae				_				••	-	• •	• •	•
Wiedemannia group	0	٥	0	0	Ô	0	Ô	٥	1	1	٥	٥
Rhagionidae				-	•	•	•	•	•	•	*	٧
Atherix marginata	0	0	0	0	0	Ó	0	Đ	O	٥	1	٥

## A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS. EAST OKEMENT - JUNE 13th 1988 (BS\*BOX SAMPLE) ABUNDANCES OF INDIVIDUAL SPECIES IN EACH SAMPLE

TAXON NAME

	5	BYF SITE BS2		\$1	BYI ITE (		SI	L HI ITE E 892	9		TE E	
TRICLADIDA (FLATWORMS)							7.1		- 44		441	
Planariidae												
Polycelis felina	2	0	0	0	2	0	0	0	0	0	2	0
Phagocata vitta	1	0	Ó	Ò	Ō	Ö	1	Ŏ	Ö	Ŏ	ō	Ŏ
Dendrocoelidae		Ī	·	-	•	•	•	•	•	•	•	•
Dendrocoelum lacteum	0	0	0	0	0	0	0	1	٥	0	0	0
GASTROPODA (SNAILS)		·	•	·	·	•	•	-	Ť	•	•	•
Hydrobildae												
Potamopyrgus jenkinsi	0	0	0	1	0	0	1	0	٥	0	0	0
NEMATODA (NEMATODES)	0	Ô	0	Ō	i	ò	Ō	ò	i	i	Ŏ	
OLIGOCHAETA (TRUE WORMS)	280	112	176		304	-	220	-	94	56	•	204
ARACHNIDA (SPIDERS & MITES)					•••				• •			•••
Hydracarina	0	0	2	1	0	0	0	2	0	i	Ô	0
EPHENEROPTERA (MAYFLIES)								-	•	·	·	•
Baetidae												
Baetis sp.	2	4	1	0	0	8	6	20	4	2	á	Ò
Baetis scambus	14	20	18	72	74	28	104	147	80	84	72	96
Baetis rhodani	18	3	5	5	86	44	32	93	4	2	0	
Heptagenfidae	0	1	0	0	0	٥	0		0		0	
Rhithrogena semicolorata	0	0	0	0	Ó		Ó	Ŏ	Ö	Ŏ	0	
Heptagenia lateralis	2	3	2	1	0	Ö	ì	Ō	Ó			
Ecdyonurus sp.	1	٥	0	0	0		Ö		Ò	Ó	Ò	
Ecdyonurus venasus	0	٥	0	0	Ò	Ò	3		٥			
Leptophlebildae		·	•	-	Ť	•	•	-	•	•	•	•
Habrophlebia fusca	0	Ô	0	1	. 0	Û	0	0	0	0	٥	0
Ephemerellidae	_	·	-	•	•	٠	•	•	·	•	•	·
Ephemerella ignita	7	4	4	16	13	3	14	29	11	. 6	7	å
PLECOPTERA (STONEFLIES)		·	•	• • •		•	• •		••	•	•	•
Nemouridae												
Protonemura meyeri	5	0	٥	0	٥	0	0	0	0	0	0	0
Amphinemura sulcicollis	ě	Ó		Ò			Ŏ		ò			
Leuctridae						_		•	Ī	•	•	·
Leuctra sp.	20	0	0	0	0	Q	0	0	0	0	0	0
Leuctra inereis	9	0	4	0		-	ì	-	Ò			
Leuctra fusca	25	15	34	i	2	-	Ŏ	-	i	•	•	•
Perlodidae								_	-	•	·	•
Isoperla grammatica	0	- 1	0	1	0	0	٥	0	0	. 0	0	0
Chloroperlidae						-	-	,	•	·	•	•
Chloroperia sp.	0	0	0	0	0	1	0	٥	0	0	0	2
Chloroperla torrentium	20	18	13	0			0	_				
Chloroperla tripunctata	5			0			Ö					

## A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE MEST AND EAST OKEMENT RIVERS. EAST OKEMENT - JUNE 13th 1988 (BS=BOX SAMPLE) ABUNDANCES OF INDIVIDUAL SPECIES IN EACH SAMPLE

TAXON NAME

	U/	S BY	PASS	0/9	3 8Y	PASS	BA	LL H	ILL	GRAMM!	AR S	CHBOL
		SITE	E7	SI	TE (			ITE I			ITE	
POLEODERA (BEER) CO.	85	1 95	2 853	DŞI	952	<b>B</b> \$3	BSI	052	853	DSI		
COLEOPTERA (BEETLES)												
Hydrophilidae												
Hydraena gracilis	1	2		0	0	0	0	0	0	0	0	0
Helophorus brevipalpis	0	1	Q	0	0	0	0	0	0		٥	-
Dytiscidae												•
Oreodytes sanmarkii	0	0	0	0	0	0	2	0	2	3	0	0
Elaidae										_		-
Elmis aenea	1	2		0	4	2	2	3	1	0	0	٥
Esolus parallelipipedus	0	0		0	0	0	1	1	1	2	0	6
Lianius volckmari	1			1	0	2	1	3	8	10	3	
Oulianius sp.	0	•	-	1	0	0	2	0	3	1	1	
TRICHOPTERA (CADDISFLIES)	0	0	0	0	0	0	0	0	0	0	1	0
Rhyacophilidae												
Rhyacophila sp.	2		_	0	2	1	1	0	0	0	0	0
Rhyacophila dorsalis	3	_	-	4	3	3	1	3	1	0	٥	0
Polycentropodidae	1	2	_	1	0	0	1	2	0	2	1	0
Plectrocnemia geniculata	1	0	-	0	0	0	0	0	0	0	0	Ó
Polycentropus sp.	0	0	0	0	0	0	0	0	2	0	Ó	Ō
Polycentropus flavomaculatus	0	6	5	0	0	0	0	0	0	Ò	Ó	Ŏ
Polycentropus kingi	0	4	5	2	1	1	5		10	6	7	-
Hydropsychidae							_	_		•	·	••
Hydropsyche siltalai	20	2	2	0	0	1	0	0	0	0	0	٥
Linnephilidae						•	•	•	•	•	•	•
Potamophylax cingulatus	0	0	1	0	0	0	0	0	0	0	0	0
Odontoceridae			_	·	•	•	•	•	•	٠	٧	٧
Odontocerum albicorne	0	1	0	0	0	0	0	0	0	0	0	0
Goeridae	_	•	•	•	•	•	•	٧	٧	·	V	V
Silo pallipes	0	1	0	0	0	٥	0	0	0	0	٨	
Lepidostomatidae	•	•	•	•	٧	٧	v	٧	٧	V	0	0
Lepidostoma hirtum	0	ô	3	٥	0	0	0	0	0	0	٥	0
Sericostomatidae	-	-	•	•	•	•	•	٧	٧	٧	۷	v
Sericostoma personatum	5	9	1	٥	3	0	0	4	2	0	1	1
Tipulidae			•	•	•	•	•	7	•	V	ı	
Eloeophila sp.	1	0	0	2	3	3	0	2	٥	٥	1	0
Dicranota sp.	13	0	1	Ō	0	0	Ŏ	Ō	Ö	Õ	0	0
Simuliidae			•	•	•	•	•	•	٧	٧	v	v
Simulium sp.	0	0	0	0	1	0	0	٥	0	0	٨	٥
Simulium cryophilum	1	1	Ô	Ò	ō	٥	ŏ	2	ŏ	Ó	0	0
Simulium yernum group	2	8	Ō	Ŏ	Ŏ	Ö	3	2	Ō	0	0	0
Simulium ornatum group	0	Ò	Ŏ	Ŏ	Ŏ	2	ĭ	2	Ŏ	0	0	
Simulium variegatum group	2	Ó	i	í	2	2	2	Ó	Ŏ	0		0
Chironomidae	64	94	74	93	_	72	124	•	92	_	0	0
Espididae	0	1	2	0	3	1		2		129		100
Chelifera group	0	ò	Ó	0	0	0	1	0	Ţ	1	2	2
Hemerodromia group	i	Ŏ	Ŏ	0	0	0			0	0	0	1
Niedemannia group	1	0	0				0	0	0	0	0	0
Dolichopodidae	0	•		0	3	0	0	2	0	0	0	ı
Rhagionidae	Ų	0	0	0	0	0	0	0	t	0	0	0
Atherix marginata	4				_							
orner ty mai Athera	1	0	0	1	4	0	0	2	1	0	1	0

## A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS. EAST OKEMENT - SEPT.13th 1988 (BS=801 SAMPLE) ABUNDANCES OF INDIVIDUAL SPECIES IN EACH SAMPLE

TAXON NAME

	U/	PASS	D/5	S BYI	PASS	BAL	L H	ILL	GRAMMA	AR SC	CHOOL	
		3118		91	ITE E	8	SI	TE E	9		TE E	
TRICLARIDA (FLATMOND)	<u>BS</u>	<u> 1 BS</u>	2 BS3	851	<b>BS2</b>	B53	951	BS2	953	BS1	B52	853
TRICLADIDA (FLATWORMS)										_		
Planariidae Palvaniin Kaliaa	0	0	1	t	0	0	0	0	0	0	0	0
Polycelis felina	0	0		1	1	0	0	ı	0	ı	0	1
Phagocata vitta	0	0	0	1	3	0	0	2	1	0	0	٥
BIVALVIA												
Sphaeriidae												
Pisidium sp.	0	0	0	0	1	¢	0	0	0	0	0	٥
GASTROPODA (SNA(LS)												
Hydrobiidae Bahasassassassassassassassassassassassass												
Potamopyrgus jenkinsi	0	0	0	0	0	0	0	0	1	0	0	0
Ancylidae												
Ancylus fluviatilis	0	0	1	6	0	0	0	2	2	1	1	á
OLIGOCHAETA (TRUE NORMS)	83	29	39	98	99	73	39	46	38	77	60	85
ARACHNIDA ISPIDERS & MITES)												
Hydracarina	0	1	1	0	0	0	3	1	0	3	1	3
ANPHIPODA												
Gammaridae												
Gamearus pulex	0	0	0	0	0	0	0	0	0	0	1	0
EPHEMEROPTERA (MAYFLIES)												
Baetidae												
Raetis sp.	0	0	0	0	0	0	0	0	19	0	0	0
Bartis scanbus	0	0	0	0	0	0	4	1	٥	2	2	6
Baetis rhodani	8	4	5	25	54	13	8	62	20	11	5	6
Raetis auticus	0	2	1	0	0	0	0	0	0	0	0	0
Heptageniidae												
Rhithrogena semicolorata	7	9	4	2	0	0	0	0	0	1	0	0
Ecdyonurus sp.	11	12	21	8	4	6	5	0	3	16	6	0
Leptophlebiidae	0	0	Q	0	0	0	0	0	٥	0	3	0
Ephemerellidae											_	-
Ephemerella ignita	0	0	0	0	0	0	0	1	0	0	0	1
PLECOPTERA (STONEFLIES)												
Nesouridae	_	_										
Protonemura sp. Nemoura avicularis	0	3	2	¢	2	0	0	0	0	1	1	0
	0	0	0	0	0	0	0	0	0	0	1	0
Leuctridae		_										
Leuctra sp.	1	2	6	2	1	0	2	1	t	0	0	0
Leuctra ingrais	0	1	0	0	0	0	0	0	0	0	0	0
Leuctra fusca Perlodidae	0	1	4	0	1	0	0	0	0	<b>0</b>	0	0
	0	0	0	0	0	0	1	0	0	0	0	0
Perlodes microcephala	0	0	0	0	0	0	0	0	0	1	0	0
Chloroperlidee												
Chloroperia sp.	0	0	0	1	0	0	0	0	0	0	0	0
Chloroperia torrentium	0	1	1	0	0	0	0	0	0	0	0	0
Chloroperia tripunctata	2	15	25	0	1	2	1	0	0	2	0	0

# A30 OKEHAMPION BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE MEST AND EAST OKEMENT RIVERS. EAST OKEMENT - SEPT. 13th 1988 (BS=BOX SAMPLE) ABUNDANCES OF INDIVIDUAL SPECIES IN EACH SAMPLE

TAXON NAME

SITE E7   SITE E8   SITE E9   E1	TE ( D\$?	
### COLEOPTERA (BEETLES)  Hydrophilidae  Hydraena gracilis  Elmidae  Elmidae  Elmis aenea  Esolus parallelipipedus  Limnius volckmari  Oulienius sp.  Oulienius sp.  Oulienius tuberculatus  TRICHOPTERA (CADDISFLIES)  Rhyacophilidae  Rhyacophila dorsalis  Rhyacophila dorsalis  Oulycentropodidae  Polycentropus sp.  Polycentropus flavomaculatus  Hydropsychidae  Hydropsyche siltalai  Ouncerua albicorne  Ouncerua albicorne	<u> 157</u>	
Hydrophilidae Hydraena gracilis Elaidae Elais aenea El		053
Hydraena gracilis 1 3 0 0 0 0 0 0 0 0 0 0 Elaidae  Elaidae  Elais aenea 0 2 2 5 0 0 3 7 3 3 Esolus parallelipipedus 0 0 0 0 1 0 3 5 3 2 Lianius volckaari 2 2 1 15 1 5 11 10 3 16 Oulienius sp. 0 0 1 0 0 0 0 1 1 0 0 0 1 0 0 TRICHOPTERA (CADDISFLIES)  Rhyacophilidae Rhyacophila sp. 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0		
Elais aenea Elais aenea Elais aenea Elais aenea Esolus parallelipipedus O 0 0 0 0 1 0 3 7 3 2  Lianius volckaari Dulienius sp. O 0 1 0 0 0 0 1 1 0 3 16  Oulienius sp. Oulianius tuberculatus O 0 0 0 0 0 0 0 0 0 1 0 0  RRICHOPTERA (CADDISFLIES) Rhyacophilidae Rhyacophila sp. Rhyacophila dorsalis O 0 0 0 1 0 1 0 0 0 0  Rapetus sp. O 0 0 1 0 1 0 1 0 0 0 0  Rapetus sp. O 0 0 0 1 0 1 0 1 0 0 0 0  Polycentropodidae O 0 0 0 0 0 0 0 0 0 0 0 0  Polycentropus sp. Polycentropus flavomaculatus O 0 1 0 1 0 0 0 0 0 0 0  Hydropsychidae Hydropsyche siltalai O 2 0 1 4 0 2 6 1 3  Odontocerum albicorne		
Esolus parallelipipedus	0	Q
Esolus parallelipipedus	_	
Limnius volckeari 2 2 1 15 1 5 11 10 3 16 Oulienius sp. 0 0 1 0 0 0 4 1 1 6 Oulienius tuberculatus 0 0 0 0 0 0 0 0 1 0 0  TRICHOPTERA (CADDISFLIES)  Rhyacophilidae Rhyacophila sp. 0 0 0 1 0 1 0 0 0 0 Rhyacophila dorsalis 0 0 0 0 2 1 2 0 0 0 Agapetus sp. 0 0 0 0 1 0 1 0 0 0 0 Polycentropodidae 0 0 0 0 0 0 0 0 0 0 0 Polycentropus sp. 0 0 0 0 0 0 0 0 0 0 0 Polycentropus flavomaculatus 0 0 1 0 0 0 0 0 0 Hydropsychidae Hydropsyche siltalai 0 2 0 1 4 0 2 6 1 3 Odontocerum albicorne 0 0 0 0 0 0 0 0 0 0	7	
Oulienius sp.	5	_
Oulienius tuberculatus         0 0 0 0 0 0 0 0 0 1 0 0           TRICHOPTERA (CADDISFLIES)         0 0 0 0 1 0 1 0 0 0 0           Rhyacophilidae         0 0 0 1 0 1 0 1 0 0 0 0           Rhyacophila sp.         0 0 0 0 1 0 1 0 1 0 0 0 0           Agapetus sp.         0 0 0 0 1 0 1 0 1 0 0 0 0           Polycentropodidae         0 0 0 0 0 0 0 0 0 0 0 0 0           Polycentropus sp.         0 0 0 0 0 0 0 0 0 0 0 0 0           Hydropsychidae         0 0 1 0 0 0 0 0 0 0 0 0 0           Hydropsyche siltalai         0 2 0 1 4 0 2 6 1 3           Odontoceridae         0 0 0 0 0 0 0 0 0 0 0 0 0	14	
### TRICHOPTERA (CADDISFLIES)  Rhyacophilidae  Rhyacophila sp. 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0	5	_
Rhyacophila sp. 0 0 0 1 0 1 0 0 0 0 Rhyacophila sp. 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0	Ų	0
Rhyacophila sp.       0 0 0 1 0 1 0 1 0 0 0 0         Rhyacophila dorsalis       0 0 0 0 2 1 2 0 0 0         Agapetus sp.       0 0 0 1 0 1 0 1 0 0 0 0         Polycentropodidae       0 0 0 0 0 0 0 0 0 0 0 0 0         Polycentropus sp.       0 0 0 0 0 0 0 0 0 0 0 0 0         Polycentropus flavomaculatus       0 0 1 0 0 0 0 0 0 0 0 0         Hydropsychidae         Hydropsyche siltalai       0 2 0 1 4 0 2 6 1 3         Odontoceridae         Odontocerum albicorne       0 0 0 0 0 0 0 0 0 0 0 0		
Rhyacophila dorsalis       0 0 0 0 0 2 1 2 0 0 0         Agapetus sp.       0 0 0 1 0 1 0 1 0 0 0 0         Polycentropodidae       0 0 0 0 0 0 0 0 0 0 0 0 0         Polycentropus sp.       0 0 0 0 0 0 0 0 0 0 0 0 0         Polycentropus flavomaculatus       0 0 1 0 0 0 0 0 0 0 0 0         Hydropsychidae         Hydropsyche siltalai       0 2 0 1 4 0 2 6 1 3         Odontoceridae         Odontocerum albicorne       0 0 0 0 0 0 0 0 0 0 0 0		
Agapetus sp. 0 0 0 1 0 1 0 0 0 0 Polycentropodidae 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0	
Polycentropodidae 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0	-
Polycentropus sp. 0 0 0 0 0 0 0 0 1 0 Polycentropus flavomaculatus 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0	_
Polycentropus flavomaculatus 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0	-
Hydropsychidae Hydropsyche siltalai 0 2 0 1 4 0 2 6 1 3 Odontoceridae Odontocerum albicorne 0 0 0 0 0 0 0 0	0	_
Hydropsyche siltalai 0 2 0 1 4 0 2 6 1 3 Odontoceridae 0 0 0 0 0 0 0 0 0 0 0	0	Q
Odontoceridae Odontocerum albicorne 0 0 0 0 0 0 0 0 0		
Odontocerum albicorne 0 0 0 0 0 0 0 0	0	0
	0	1
Atheirender		
Goeridae 000000000000000000000000000000000000	1	1
Silo nallings		
Lepidostomatidae	0	0
I Boildostoes highligh		
Conference	0	0
Contraction community	0	0
Sericostoma personatum 0 0 1 1 1 1 0 2 2 DIPTERA (TRUE FLIES)	l	3
Biotess indet		
Tipulidae 0 0 0 0 0 0 0 0 0	i	1
Direanota so		
Dicranota sp. 2 2 3 2 0 1 0 0 0 0 Simuliform	0	0
•		
Cigultus anathus and	¢	0
Cimultum material	0	0
Constance	0	0
Chirannaidae	1	0
Femididae 20 12 9 / 9 14 31	16	16
Chalifers areas	0	0
Hoserndroni's prove	0	2
Ni edenagoi a proun	0	1
#ledemannia group 100 120 300 i Rhagionidae	3	2
Albania and I		
Atherix marginata 0 1 0 1 3 0 1 2 0 0		

Appendix 5. West Okement. Abundance of each individual "family" in each box-sample for each month of sampling.

### A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE MEST AND EAST OKEMENT RIVERS. WEST OKEMENT - JUNE Bth 1987 (BS=80X SAMPLE) FAMILY ABUNDANCES

TAXON NAME (BHMP SCORE)

SITE NAME

	\$1	TE	COTT V1 DS3		ITE I			TE I	13		IE I			COUF TE 1 BS2	15		ITE 1	
Planariidae (5)	0	2	0	0	0	1	1	0	1	1	0	0	0	0	0	0	3	D22
DL16OCHAETA (1)	i	61	21	Ŏ	2	44	7	47	21	15	8	100	43	38	13	2	34	7
Glossiphoniidae (3)	0	0	0	ò	ō	0	ò	0	0	.0	٥	0	73	90	12	0	04	^
Hydracarina (/)	0	Ó	3	i	Ŏ	0	ŏ	ŏ	Õ	ŏ	۸	Ô	0	ň	0	0	٥	۷ ^
Oribatidae (/)	Ò	1	Ô	ō	Ŏ	Ŏ	ň	0	٨	ŏ	٨	Ŏ	۸	0	0	0	1	V
Baetidae (4)	2	4	7	8	10	72	ŏ	2	i	ì	1	ž	۸	7	0	0		
Heptageniidae (10)	0	0	0	ī	2	- 4	á	ō	ò		à	ō	٨	0	0	0		ı
Epheserellidae (10)	Ó	1	i	Ō	0	Ô	ō	ō	Õ	å	0	Õ	۸	0	0	0	. 1	0
Nemouridae (7)	0	1	Ó	0	Ô	4	Ŏ	ŏ	2	ŏ	٨	•	٨	1	,	a	,	٨
Leuctridae (10)	7	22	10	6	Å	49		1	ĵ	ŏ	٨	₹	0	1	0	2	10	26
Perlodidae (10)	0	0	l	3	٥	1	0	ō	ò	ů	'n	2	٨	ò	0	0	10	0
Ferlidae (10)	0	0	Ŏ	Ŏ	0	i	Ô	Ô	ň	Ŏ	٨	ñ	0	۸	0	0	۷	۷ ۸
Chloroperlidae (10)	0	i	ð	1	14	17	ō	ō	ŏ	ň	1	ĭ	٨	ő	Û	0	4	2
Hydrophilidae (5)	0	0	0	ō	0	1	ō	ò	Ô	ň	'n	ò	٨	٨	0	0	^	۸ .
Elmididae (5)	3	19	14	Ö	Ŏ	Ō	ŏ	- 0	ñ	ň	٨	Ŏ	۸	0	٥	7	,	2
Rhyacophilidae (7)	0	0	0	į	0	i	ò	0	1	Ô	1	Õ	Ô	0	٥	7		۸ .
Polycentropodidae (7)	0	0	0	5	5	4	3	Ŏ	٥	i	3	1	ŏ	Ŏ	Û	2	۸	1
Hydropsychidae (5)	0	0	0	3	0	Ó	à	2	Ō		Ô	i	Ŏ	1	1	0	٨	^
Sericostomatidae (10)	0	0	Ó	Ö	Ó	i	ò	0	Ŏ	Ŏ	Ó	ň	ň	۸	,	4	۸	٨
Tipulidae (5)	0	4	2	Ó	0	Ò	ō	ó	0	ň	ō	Ĭ	Ď	Ĭ	ĭ	0	7	,
Ceratopogonidae (/)	0	0	0	Ó	Ō	Ŏ	ŏ	ō	ŏ	ň	٨	i	٥	ò	,	1	J	
Simuliidae (5)	i	В	Õ	ň	0	2	Ů	2	ō	0	0	0	0	٨	۸	ı	V	Ų
Chironomidae (2)	5	2	4	74	37	48	11	9	12	37	53	36	7	2	3	12	16	13

FIGURES IN PARENTHESES INDICATE THE BIOLOGICAL WORKING PARTY (BMMP) SCORE FOR THE FAMILY. (/)=NON=SCORING TAXON.

## A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS. MEST OKEMENT - SEPT 10th 1987 (85-80X SAMPLE) FAMILY ABUNDANCES

TAXON NAME (BMMP SCORE)

SITE NAME

		AKE ITE I	COTT		)] T/   TE		0/5 81	BYP/		U/S	WIBI TE I		60LF	COUF		OKEHANP	. CA	
	BS1				-	BS3		-	B53	851	_			BS2	-			B\$3
Planariidae (5)	0	2	7	0	0	0	0	l	0	0	1	Ô	0	0	027	0	0	<u> </u>
Sphaeriidae	0	0	0	0	0	Ò	٥	ò	Ŏ	ŏ	Ö	ŏ	ĭ	ĭ	ō	3	1	,
OLIBOCHAETA (1)	140	260	228	90	39	52	106	IPL	56	53	29	46	158	123		5	10	7
Hydracarina (/)	2	0	1	2	2	1	1	0	0	ō	0	ī	1	۵		٥	٥	ò
Oribatidae (/)	0	0	0	1	0	Ö	Ŏ	٥	ò	Ò	Ó	ō	i	٥	ō	Ó	Ó	Ó
Gammaridae (6)	0	0	0	0	0	0	ā	Ó	Ò	i	0	Ŏ	Ŏ	0	Q	٥	Ŏ	ŏ
Baetidae (4)	4	51	7	0	7	4	Õ	15	Ô	Ö	Ó	Ŏ	ŏ	Ó	Ó	ů	Ŏ	0
Heptageniidae (10)	Ó	ı	1	17	24	25	å	٥	Ŏ	Ō	Ó	ŏ	Õ	Ò	Õ	å	Ŏ	0
Leptophlebiidae (10)	2	٥	1	3	Ô	Ô	å	ō	ò	Ō	Ò	Ŏ	Ö	Ô	Ŏ	Ů	0	Ŏ
Ephemerellidae (10)	1	Ô	ō	Ŏ	Ô	-	Ŏ	ŏ	Ŏ	Ŏ	ŏ	ŏ	ĭ	Ó	1	Ŏ	ŏ	٥
Nemouridae (7)	2	i	ò	7	ē	13	Ŏ	i	Ŏ	Ŏ	Õ	Ŏ		٥		0	ŏ	0
Leuctridae (10)	27	20	30	20	30	25	2	1	Ŏ	ŏ	i	۵	Ŏ	0	0	Ŏ	٥	0
Perlodidae (10)	1	2	3	4	3	1	ō	0	Ô	Ō	ò	٥	ŏ	á	Ó	ŏ	٨	0
Chloroperlidae (10)	1	1	4	13	9	15	í	ō	٥	ů	ō	Ŏ	Ŏ	2	3	0	0	٥
Dytiscidae (5)	Ö	Ó	Ó	1	Ô	0	Ó	Ŏ	Ò	Ō	Ŏ	Ŏ	Ö	Ô	Ď	0	Ó	Ó
Syrinidae (5)	Ō	0	0	Ō	Ò	i	Ó	ò	Ŏ	Ŏ	ŏ	Ŏ	ŏ	Ŏ	1	Ŏ	Ŏ	ŏ
Hydrophilidae (5)	0	0	Ō	2	Ö	Ö	ò	ō	Ċ	Ŏ	Ö	Ŏ	ŏ	ŏ	٥	ů	å	Ŏ
Helodidae (5)	0	0	0	0	1	Ò	Ŏ	ò	ò	Ŏ	Ò	ò	ō	ā	å	Ŏ	٨	Ó
Elaididae (5)	43	41	42	1	3	4	3	i	i	Ŏ	Ō	Ď	ŏ	3	5	3	7	Ă
Sialidae (4)	0	0	0	Ö	0	Ó	Ŏ	Ò	ō	Ŏ	i	Ŏ	ŏ	٥	ō	0	1	ò
Rhyacophilidae (7)	0	2	2	0	0	1	Ó	1	Ō	Ò	Ō	Ó	å	ō	ō	0	ń	1
Polycentropodidae (7)	9	0	L	6	5	1	i	0	Ò	ò	2	ò	ò	٥	2	ĭ	2	i
Hydropsychidae (5)	0	1	0	1	5	6	0	4	Ó	Ó	ō	ò	ō	ō	ī	i	ō	ò
Sericostomatidae (10)	0	0	0	Ō	0	Ō	Ò	Ó	ò	Ò	Ŏ	Ŏ	ā	Ó	٥	ă	ŏ	2
Tipulidae (5)	3	7	i	3	3	3	Ŏ	Ō	Ŏ	ŏ	Õ	2	ĭ	i	Ĭ	ŏ	ŏ	Ô
Ceratopogonidae (/)	0	0	ō	ō	Ŏ	٥	i	ō	Ŏ	Õ	0	ō	ī	i	Ä	ă	å	٥
Simuliidae (5)	1	16	6	Ó	3	i	Ó	ō	Ŏ	Ŏ	Ŏ	Ó	i	Ó	2	Ŏ	٥	Õ
Chironosidae (2)	171	57	27	65	117	153	13	17	14	34	30	31	22	46	31	2	16	90
Empididae (/)	0	1	0	2	Ō	1	ı	4	0	0	0	0	0	3	4	ò	٥	٥
Rhagionidae (/)	0	0	0	3	0	Ō	٥	Ó	Õ	ă	ò	å	ĭ	٥	à	ŏ	Ô	٥

FIGURES IN PARENTHESES INDICATE THE BIOLOGICAL WORKING PARTY (BMMP) SCORE FOR THE FAMILY. (/)=MON=SCORING TAXON.

## ASO OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE MEST AND EAST OVEHENT RIVERS. WEST OKEMENT - MARCH 2nd 1888 185\*801 SAMPLE) FAMILY ABUNDANCES

TAXON NAME (BMMP SCORE)

SITE NAME

	SITE		81	1T/BYPASS TE W2	5	BYF 11E	N2	U/\$ \$1	W16		60LF S1	COUR TE W		OKEHAMP SI	. Cr TE i	
Planariidae (5)		2 153		052 <u>053</u>	D\$!		2 D\$3	951	952	BSJ	DSI	052	<u>853</u>	351		-
Sphaeriidae (3)		00	2	0 2		. 0	•	- 4	3	5	l.	0	0	2	-0	- <del>-</del> -
OLIGOCHAETA (1)	96 17	• •	0 23	0 0			•	0	0	0	0	0	Đ	i	0	2
Glossiphoniidae (3)		0 0	23	0 0	46			7	50	86	55	57	11	31	5	4
Hydracarina (/)	ů,	1 0		0 0	9	•	-	0	0	0	0	0	0	0	0	0
Baetidae (4)	à e		,	0 0	,	. 0	•	0	0	0	0	0	0	0	0	0
Heptageniidae (10)	•	0 0	ĭ	1 0	Ų	0	•	0	0	0	0	0	0	0	0	2
Leptophlebiidae (10)	•	2	6	0 0	0	0	•	0	0	0	0	0	0	0	0	0
Taeniopterygidae (10	39	5 1	i	0 0		Ų	V	0	Q	Q	0	0	0	0	0	0
Nemouridae (7)	43 40	22	21	29 4			Ų	0	0	0	0	0	0	0	0	0
Leuctridae (10)	273 IB		50	33 16		5	•	0	1	4	ı	2	0	1	0	0
Perlodidae (10)	1 6		30	1 0	٥	1	3	1	ļ	2	2	0	Q	0	0	0
Chloroperlidae (10)	45 28	• • •	19	1 0		,	Ų	0		0	0	0	Q	0	0	0
Gyrinidae (5)	0 0		**	6 0	0	L	ì	0	1	ı	0	t	0	0	0	0
Hydrophilidae (5)	0 0	•	٥	0 0	-	0	•	Q	0	0	0	0	0	0	0	0
Elnidae (5)	22 72	•	۸	0 I	0	0	•	0	0	0	0	0	0	0	0	0
Rhyacophilidae (7)	0 1	. 0	1	0 0	0	0	2	0	0	0	0	0	0	7	2	2
Philopotamidae (8)	0 0	0	'n	0 0	0	0	٠	Q	0	0	0	0	0	0	0	0
Polycentropodidae (7)	2 1	2	ž	0 2	٥	V	- !	0	0	0	0	0	0	0	0	0
Hydropsychidae (5)	0 0		ĭ	4 4	Ô		Ţ	0	1	ŀ	0	0	0	0	0	ı
Sericostomatidae (10)	0 0	0	16	0 0	0	0	0	0	0	ļ	0	0	0	0	0	0
DIPTERA (/)	0 0	Ŏ	٥	0 0	Ů	0	0	٥	0	0	0	0	0	2	0	1
Tipulidae (5)	9 0	2	ŏ	0 0	Ó	٥	٥	0	0	V	0	0	0	0	0	1
Ceratopogonidae (/)	0 0	ō	ŏ	0 0	٥	Ó	0	٥	0	Ů	0	1	0	0	0	0
Siguliidae (5)	3 1	Ò	Ō	0 0	٨	٥	٨	ų A	Ů	1	Ç	0	0	4	2	0
Chironomidae (2)	9 7	2	2	2 2	Ĭ	٥	2	٨	V K	Ţ	Ų	ļ	0	0	0	0
Empididae (/)	0 0	Ī	ĭ	0 1	8	ĭ	٨	Ų	J	3	1	2	2	8	3	13
Rhagionidae (/)	0 0	0	i	0 0	ŏ	ō	i	3	0	٥	ı	4	۱	ı	0	0

FIGURES IN PARENTHESES INDICATE THE BIOLOGICAL WORKING PARTY (BHMP) SCORE FOR THE FAMILY. (/)=NON=SCORING TAION.

### A30 OKEHAMPTON BYPASS SCHEME NACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS. NEST OKEMENT - JUNE 13th 1988 (85-BOX SAMPLE) FAMILY ABUNDANCES

TATON NAME (BHMP SCORE)

SITE NAME

		TE I			TE I	12	-	TE		U/8 81 	TE I	14		TE W	5		TE N	là
Planarlidae (5)	14	19		<del></del>	1	***	0	Ô		2	126	0	DSI	0	1 1		9	853 0
Sphaeriidae (3)	0	0	ō		Ò	Ŏ	ŏ	٥	•	•	ò	Ö	٠	۸	٥		٥	١
OLIGOCHAETA (1)	653	152	232	49	•	316	344	•	108	84	42	-	100	14	46	•	23	23
Hydracarina (/)	0	1	0	0	0	۵	٥	٥	٥		-0	٥	.00	٥	٥	,	2	43
Baetidae (4)	59	61	32	i	i	21	ò	i	į	ň	٥	٥	Ĭ	۵	2	۸	á	٥
Heptageniidae (10)	٥	٥	٥	À	ā	2	ŏ	٥	٥	Ă	٥	۸	٨	٨	٨	,	٥	٥
Ephenerellidae (10)	i	2	Ŏ	Ŏ	ò	ō	Ŏ	٥	٥	•	ŏ	0	0	٨	٥	, ,	٥	0
Caenidae (7)	0	٥	Ŏ	ò	٥	ì	ŏ	ŏ	٥	•	٥	۸	0	Ö	٥	•	٥	٥
Nemouridae (7)	- 44	27	8	Ŏ	٥	ò	ŏ	٨	ŏ	0	Ŏ	0	Ó	٥	0	٥	٥	0
Leuctridae (10)		112	20	Ř	ě	39	٥	٥	•	<b>A</b>	٥	٥	0	٥	0	٥	٥	·
Perlodidae (10)	7	2	1	٨	۸	2	, v	0		۸	0	0		0	٥	Ī	Ĭ	0
Chloroperlidae (10)	18	18	i	5	7	13		٥	•	V	٥	٥	0	٥	٥	0	0	0
Dytiscidae (5)		à	ò	,	h	.,	Ŏ	0		, v	ŏ		0		٥	0	V	0
Hydrophilidae (5)	٥	Ŏ	ĭ	ō	۸	ŏ	0	٥	•	× *	٥	۸	4	0	V	v	0	U
Elnidae (5)	20	38	18	,	٥	1	Ĭ	0	•	,	٥	٨	0	0	4		2	Ų
Sialidae (4)	0	٥	٥	Ô	i	ò	ò	٥		٠	٥	٨	0	٥	7		4	ı
Rhyacophilidae (7)	i	į	i	ŏ	ò	à	Ŏ	٥	•	0	٥	٥	å	, ,	٧	•	V	٨
Polycentropodidae (7)	2	ī	Ö	11	9	Ä	Ŏ	ð	•	ň	i	ĭ	Ů	Ť	1	2	,	2
Hydropsychidae (5)	2	i	Ö	Ŏ	ò	ō	ŏ	٥	,	,	Ò	ò	,	۸	7	0	٨	0
Lianephilidae (7)	0	0	٥	Ò	٥	٥	Ò	ď	•	٥	ò	٨	Ĭ	٨	٨	٥	٨	٨
Sericostomatidae (10)	0	Ó	0	2	ī	2	ŏ	٥		ň	Ŏ	٥	,	0	٨		1	1
Lepidoptera (/)	0	0	1	Ō	ò	٥	à	Č	•	ò	ŏ	٥	٥	٨	٨	٥	٨	,
Tipulidae (5)	0	i	2	Ĭ	i	ò	ō	Ò	•	ŏ	i	Ť	٥	1	٨	٨	٨	ı
Simuliidae (5)	1	-11	12	Ĭ	0	i	Ö	i	Ŏ	۵	à	٥	Ď	٥	۸	٨	۸	١
Chironomidae (2)	10	2	13	31	61	12	22	2		ě	20	24	14	12	17	45	183	156
Espididae (/)	1	0	0	1	2	1	0	-	٥	٥	1	Õ	à	Ö	٥	0	٥	0
Rhagionidae (/)	0	0	0	0	0	1	Ŏ	0	0	Ö	0	i	Ŏ	Ö	0	i	0	ð

FIGURES IN PARENTHESES INDICATE THE BIOLOGICAL WORKING PARTY (BHMP) SCORE FOR THE FAMILY. (/)=NON=SCORING TAION.

### A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE MEST AND EAST OKEMENT RIVERS. WEST OKEMENT - SEPTEMBER 13th 1988 (85=80X SAMPLE) FAMILY ABUNDANCES

TAION NAME (BHMP SCORE)

#### SITE NAME

	51	I 3T			DET/ ITE	BYPASS V2		BYPA TE N		U/\$ \$1	NIGI TE N		60LF	COUR TE N		PWWH3.40	. CA	
	DS1	952	<b>B</b> \$3	BS1	152	153	BSL					<b>P\$3</b>						-
Planariidae (5)	i	1	0	0	٥	2	777	***	0	<u></u> 5	***	444	85 <u> </u> _			<u> </u>		
Sphaeriidae (3)	Ó	٥	٥	ĭ	ň	ō	Ó	٨	Ó		1	1	2	0	0	0	0	0
OLIGOCHAETA (1)	18	17	93	Ř	ĭ	12	36	11	•	0	0		0	0	0	0	٨	0
Hydracarina (/)	1	1	1	2	,		30	11	- 2	27	20	19	72	35	61	7	19	9
Gammaridae (6)		۰	٠	- 1	^	•	L	V		0	0	0	1	0	1	Q	0	0
Baetidae (4)	·	2	V		40	.0	9	0	0	Ç	0	Q	0	0	0	0	Û	0
Heptageniidae (10)		4	1	3	19	11	•	L	1	10	4	0	t	ı	1	0	0	0
Leptophlebiidae	0	v		•	-11	5	1	ı	0	0	1	1	. 0	0	0	0	0	0
Nemouridae (7)	2	3	1	1	0	0	0	0	0	0	0	0	0	0	0	ņ	0	0
	0	2	Q	4	7	9	2	0	0	0	0	0	0	٥	0	Ô	٥	0
Leuctridae (10)	14	15	9	11	7	7 '	0	0	0	٥	0	0	1	Ó	Ó	Ô	û	ò
Ferlodidae (10)	0	0	1	0	l	0	0	0	0	0	0	0	Ō	à	å	ň	Á	Ŏ
Perlidae (10)	0	0	0	0	t	0	0	0	٥	à	٥	ñ	ň	Ô	٨	۸	•	٨
Chloroperlidae (10)	0	1	1	8	2	1	Ò	à	ò	۸	٥	۸	^	٥	•	•	٧	V
Gyrinidae (5)	0	0	0	ī	ō	i	ň	ň	ŏ	۸	۸	۸		•	٠	Ų	v	0
Elmidae (5)	21	23	34	ż	ň	۸	ř	1	۵	·	v	·		0	Ų	Ų	Q	)
Rhyacophilidae (7)	0	٥	0		Ň	ĭ	,				ı	1	1	0	2	1	2	2
Polycentropodidae (7)	i	٨	i	Ň	V	•	V	U	V	Ų	Ų	Û	0	0	0	0	l	0
Pydropsychidae (5)	,	۸	٨				Ų	V	0	Q	0	0	0	0	0	0	ı	0
Tipulidae (5)	,			1	2	10	2	0	0	0	0	0	0	0	0	0	n	ø
Sisuliidae (S)	•		3		0	0	Q	0	Q	0	0	0	0	0	0	0	0	0
Chironomidae (2)	4.7		Ü	3	28	2	2	1	4	0	0	0	0	0	0	0	0	0
	15	12	!	8	51	20	4	1	á	0	3	5	ı	4	7	9	8	5
Espididae (/)	0	0	0	0	1	0	1	0	0	0	0	¢	Ó	٥	0	0	ō	ō
Rhagionidae (/)	0	0	0	0	0	0	0	0	0	0	٥	û	Ó	٥	٨	Á	ĭ	۸

FIGURES IN PARENTHESES INDICATE THE BIOLOGICAL WORKING PARTY (BMMP) SCORE FOR THE FAMILY. (/)=NON=SCORING TAXON.

Appendix 6. East Okement. Abundance of each individual "family" in each box-sample for each month of sampling.

### A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS. EAST OKEMENT - JUNE 8th 1987 (BS=BOX SAMPLE) FAMILY ABUNDANCES

#### TAXON NAME (BMMP SCORE)

#### SITE NAME

	U/S	BYP	ASS	D/S	BYP	ASS	BALI	. HI	L	GRAMM	AR S	CHOOL
	S	TE 1	.7	S	ITE E	E <b>B</b>		TE 8			ITE	
	BS1	BS2	<b>B</b> S3	951	B52	BS3	RSI	852	BS3			B53
Planariidae (5)	0	0	0	0	0	2	1	0	0	0	1	
Hydrobiidae (3)	0	0	0	0	2	Ô	1	٥	ō	0	Ò	-
Ancylidae (6)	0	0	0	0	0	1	ō	Ò	0	å	Ó	-
Zonitidae (/)	0	0	0	0	Ó	0	Ó	0	ō	0	1	ō
OLIGOCHAETA (1)	4	4	1	32	8	5	10	12	7	29	44	-
Hydracarina (/)	0	0	0	1	1	i	3	2	i	3	3	
Gammaridae (6)	0	0	0	1	i	Ö	ō	ō	ō	ō	2	_
Baetidae (4)	1	10	22	24	35	53	54	56	34	57	82	
Heptageniidae (10)	1	0	4	0	0	0	ī	0	1	2	2	
Ephemerellidae (10)	1	0	4	1	3	5	6	5	ō	7	13	•
Caenidae (7)	0	0	0	0	0	0	ō	0	Ô	0	2	•
Nemouridae (7)	0	2	Û	1	0	i	1	Ö	ō	Ō	à	-
Leuctridae (10)	0	7	12	8	4	4	i	2	2	i	6	8
Perlodidae (10)	0	2	0	0	0	Ó	- 0	0	ō	0	0	0
Chloroperlidae (10)	4	6	9	Ō	0	4	1	3	ĭ	2	ě	2
Gyrinidae (5)	0	0	0	0	Ô	1	ā	Û	ò	Ô	0	0
Elmididae (5)	0	1	0	1	0	2	4	6	ě	11	8	4
Rhyacophilidae (7)	0	1	Û	2	4	i	i	0	Õ		1	0
Philopotamidae (8)	Ò	0	ō	0	Ö	ō	ò	ō	Ŏ	0	0	0
Polycentropodidae (7)	i	0	ō	Ŏ	Ô	i	2	Û	ì	3	8	2
Hydropsychidae (5)	0	1	5	Ŏ	Ŏ	ò	ō	i	ò	1	0	1
Speridae (10)	0	ō	0	0	Ŏ	Ö	Ö	0	ŏ	٥	i	1
Lepidostomatidae (10)	0	Ó	0	0	Ō	0	ò	Ô	ŏ	å	i	0
Sericostomatidae (10)	Ò	0	Ò	0	0	ō	3	٥	Ŏ	0	5	1
Tipulidae (5)	Ō	0	0	3	1	i	ŏ	1	Õ	Ó	2	Û
Simuliidae (5)	0	73	25	2	1	1	1	i	ŏ	Ŏ	ā	Ô
Chironomidae (2)	7	25	15	27	15	10	13	15	10	22	47	11
Empididae (/)	0	0	0	1	0	2	2	0	0	7	"	

FIGURES IN PARENTHESES INDICATE THE BIOLOGICAL WORKING PARTY (BMWP) SCORE FOR THE FAMILY.

### A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS. EAST OKEMENT - SEPT.10th 1987 (BS=BOX SAMPLE) FAMILY ABUNDANCES

TAXON NAME (BMMP SCORE)

#### SITE NAME

	U/S BYPASS	D/S BYPASS	BALL HILL	GRAMMAR SCHOOL				
	SITE E7	SITE EB	SITE E9	SITE E10				
Planariidae (5)	BS1 BS2 BS3 0 0 2	BS1 BS2 BS3	BS1 BS2 BS3	BS1 BS2 BS3				
Hydrobiidae (3)	• • •	3 0 1	0 0 0	0 0 0				
Ancylidae (6)	1 1 1	0 0 2	0 0 0	0 0 0				
OLIGOCHAETA (1)		1 0 0	0 0 0	0 0 0				
Hydracarina (/)	174 149 542	91 152 148	94 119 134	65 95 60				
Gammaridae (6)	0 0 0	1 5 3	4 4 13	13 12 4				
Baetidae (4)	0 0 5	3 1 10	0 2 7	0 1 0				
= '''	15 8 9	43 92 43	4 11 50	10 9 6				
Heptageniidae (10)	12 12 18	7 32 10	5 26 63	17 3 6				
Leptophlebiidae (10)	0 0 0	0 0 0	2 1 1	0 2 0				
Ephemerellidae (10)	0 0 0	0 0 0	0 0 0	1 0 1				
Nemouridae (7)	13 6 7	1 0 0	5 3 0	0 1 3				
Leuctridae (10)	6 22 14	19 4 12	8 15 40	15 11 19				
Perlodidae (10)	0 3 2	2 1 2	1 3 2	100				
Chloroperlidae (10)	23 21 11	3 2 2	B 10 14	17 16 5				
Hydrophilidae (5)	4 2 3	0 1 0	1 0 0	1 0 0				
Elmididae (5)	1 2 5	4 23 11	63 30 30	20 18 19				
Sialidae (4)	0 0 0	0 0 0	1 0 0	0 0 0				
Rhyacophilidae (7)	3 1 5	1 5 1	1 5 5	1 0 1				
Philopotamidae (8)	1 0 0	0 0 0	0 0 0	0 0 0				
Polycentropodidae (7)	1 2 0	3 0 2	4 5 7	5 0 1				
Hydropsychidae (5)	2 1 0	0 0 0	1 0 1	0 0 0				
Limnephilidae (7)	0 0 0	0 0 0	0 1 0	0 0 0				
Leptoceridae (10)	0 0 0	0 0 0	6 0 0	1 0 1				
Goeridae (10)	1 0 0	iii	0 0 0	0 0 0				
Lepidostomatidae (10)	0 0 0	0 0 0	0 3 0	1 3 0				
Sericostomatidae (10)	1 3 4	29 3 31	13 1 9	2 3 6				
Tipulidae (5)	2 13 16	2 5 9	3 1 2					
Simuliidae (5)	39 8 7	0 1 0	0 0 0	1 1 1				
Ceratopogonidae (/)	0 0 0	0 0 1	0 1 0					
Chironomidae (2)	30 49 47	70 16 69	144 88 128					
Empididae (/)	2 0 0	0 0 0						
Rhagionidae (/)	0 2 1	3 1 0	0 0 2 0 2	0 0 0				

FIGURES IN PARENTHESES INDICATE THE BIOLOGICAL WORKING PARTY (BMMP) SCORE FOR THE FAMILY. (/)=NON=SCORING TAXON.

### A30 OKEHAMPTOM BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS. EAST OKEMENT - MARCH 2nd 1988 (BS=BOX SAMPLE) FAMILY ABUNDANCES

TAXON NAME (BMNP SCORE)

SITE NAME

	S	BYP/	:7	\$	BYP ITE	EO	S	L HI Ite i	E9	GRANNAR SCHOOL SITE E10				
Planariidae (5)		D\$Z	<u> D\$3</u>	BS!		B\$3	151	152	183	851	1\$2	153		
Hydrobiidae (3)	1	- 1	0	1	0	1	6	1	1	1	0	0		
OLIGOCHAETA (1)	0	0	0	0	0	0	Q	0	0	1	0	0		
Hydracarina (/)	160			15	130	76	179	283	236	281	250	240		
Gammaridae (6)	0	0	0	ı	0	0	0	0	0	0	ı	0		
	0	0	0	1	0	1	0	0	ı	0	0	0		
Baetidae (4)	0	0	2	1	5	16	20	38	22	0	0	Ó		
Heptageniidae (10)	7	5	12	2	18	15	8	12	6	3	Å	,		
Taeniopterygidae(10)	0	0	0	0	1	0	0	4	Ō	Ď	ō	_		
Nemouridae (7)	1	0	5	1	ı	4	à	1	À	ă	Ô	1		
Leuctridae (10)	28	37	43	0	2	2	ĭ	ò	ò	Ŏ	Ŏ			
Perlodidae (10)	0	0	1	2	٥	ò	i	Ŏ	ĭ	0	٥			
Chloroperlidae (10)	76	46	73	2	4	9		2	10	•	•	0		
Gyrinidae(5)	0	0	٥	ō	Ò	ó	J	_		3	5	•		
Hydrophilidae (5)	Ŏ	ĭ	ĭ	0	0	ů	0	0	0	0		0		
Elaidee (5)	4	2		,	•	U	0	0	0	0	0	0		
Rhyacophilidae (7)	0	0	ð	ŀ	1	1	- 11	7	3	2	12	12		
Polycentropodidae (7)	v	•	v	0	0	0	0	1	0	0	0	0		
Hydropsychidae (5)	7	6	1	0	2	5	2	5	4	4	11	13		
Goeridae (10)	0	ı	4	0	0	1	0	0	0	0	0	1		
	0	0	0	0	1	0	0	0	0	0	- 1	0		
Sericostonatidae (10)	5	1	0	0	0	0	Û	0	0	- 4	0	. 0		
Tipulidae (5)	4	l	2	0	0	0	0	1	0	3	0	2		
Simulidae (5)	0	1	4	0	0	1	0	0	0	Ó	ò	ŏ		
Ceratopogonidae (/)	0	1	0	0	0	0	0	٥	1	ō	ò	i		
Chironoaldae (2)	27	2	0	2	12	18	13	15	2	14	27	37		
Empidae (/)	0	0	0	0	0	0	0	ō	ī	- 1	۵	0		
Rhagionidae (/)	0	0	0	0	0	Ó	Ŏ	¢	ò	ò	1	ŏ		

FIGURES IN PARENTHESES INDICATE THE BIOLOGICAL WORKING PARTY (DMMP) SCORE FOR THE FAMILY. (/)=NOH=SCORING TAXON.

## A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS. EAST OKEMENT - JUNE 13th 1988 (BS=BOX SAMPLE) FAMILY ABUNDANCES

TAXON NAME (BHWP SCORE)

#### SITE NAME

	S	BYP ITE	E7		B BYA			LL KI BITE		GRAMN S		CHOOL E10
01	BS1	BS2	BS3	<u>851</u>	BS2	BS3	DS	L BS2	DS3			853
Planariidae (5)	3	0	0	(	) 2	0		1 0		0		
Dendrocoelidae (5)	0	0	0	(	) (	0	(	ì		Ó	_	•
Hydrobiidae (3)	0	0	0			) (		l d	•	Ŏ	•	•
OLIGOCHAETA (1)	280	112	176	88	304	169	220	352	•	56	102	•
Hydracarina (/)	0	0	2	1				) 2		1	102	
Baetidae (4)	34	37	_	77	160	•	144		•	•	•	
Heptageniidae (10)	3	4	2	1		- •	1	200		72	78	
Leptophlebiidae (10)	Ō	Ó	ō		•	•	Ò	_	•	0	l	0
Ephemerellidae (10)	7	4	4	16		-		•	•	0	0	•
Nemouridae (7)	11	0	0	10		_	14			4	7	-
Leuctridae (10)	54	15	38		•	-	0	•	0	0	0	•
Perlodidae (10)	0	1	0		2	•	0	•	•	0	0	•
Chloroperlidae (10)	25	18	•	ı.	0	-	0	•	0	0	0	•
Dytiscidae (5)	23		17	0	•	•	0	•	0	0	0	2
Hydrophilidae (5)	Ų	0	0	0	•	•	2	-	2	3	0	0
Elaidae (5)	1	2	0	0	_	0	0	•	0	0	0	0
Rhyacophilidae (7)	2	1	0	2	-	4	6	•	13	13	- 4	11
Polycentropodidae (7)	5	2	3	4	5	4	2	3	1	0	0	0
	2	12	12	3	1	1	6	5	12	8	8	11
Hydropsychidae (5)	20	2	2	0	0	- 1	0	0	0	0	0	٥
Limnephilidae (7)	0	0	1	0	0	0	0	0	0	٥	٥	Ó
Odontoceridae (10)	0	1	0	0	0	0	0	0	0	0	Ó	Ó
Goeridae (10)	0	1	0	0	0	0	0	0	0	ò	ò	ò
Lepidostomatidae (10)	0	0	3	0	0	0	Ó	٥	Ò	Ŏ	٥	٥
Sericostomatidae (10)	5	9	1	0	3	0	Ò	4	2	ŏ	1	1
Tipulidae (5)	14	٥	ı	2	3	3	Ó	2	ō	Ö		ů
Simuliidae (5)	5	9	1	1	3	Ă	Ă	6	Ď	0	0	0
Chironomidae (2)	64	94	74	62	200	72	124	180	92	134	88	100
Empididae (/)	2	1	2	0	- 6	i	1	4	1	136		100
Dolichopodidae (/)	0	0	Ŏ	Ŏ	ō	ò	ò	ō	i	0	2	4
Rhagionidae (/)	1	0	Ó	i	,	٥	Ď	2	i	0	4	V

FIGURES IN PARENTHESES INDICATE THE BIOLOGICAL WORKING PARTY (BMWP) SCORE FOR THE FAMILY.

### A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS. EAST OKEMENT - SEPTEMBER 13th 1988 (BS=BOX SAMPLE)

#### FAMILY ABUNDANCES

TAXON NAME (BMMP SCORE)

SITE NAME

	SI	BYPA TE E	7	D/S S1	BYPA TE E		BALL 91	HIL TE E		GRAMMAR SCHOOL SITE ELO				
	851	852	<u>853</u>	<b>B</b> \$1	B\$2	953	BSI	B\$2	<b>BS3</b>	B\$1 852 853				
Planariidae (5)	0	¢	4	3	4	0	0	3	<u>-</u>		0	ī		
Hydrobiidae (3)	0	0	0	0	0	0	0	0	1	0	0	0		
Ancylidae	0	0	1	6	0	0	0	2	· 2	1	1	6		
Sphaeriidae (3)	0	0	0	0	1	0	0	0	0	9	0	0		
OLIGOCHAETA (1)	83	29	39	98	99	73	39	46	38	77	60	85		
Hydracarina (/)	0	1	1	0	0	0	3	1	0	3	1	3		
Gammaridae (6)	0	0	0	0	0	0	0	0	0	Ó	1	Ó		
Baetidae (4)	8	6	6	25	54	13	12	63	39	13	7	12		
Heptageniidae (10)	18	21	25	10	4	6	5	0	3	17	6	9		
Leptophlebiidae (10)	0	0	0	0	0	0	0	Ô	0	0	3	ò		
Ephemerellidae (10)	0	0	0	0	0	Ö	Ö	ì	Ò	ō	٥	Ĭ		
Nemouridae (7)	0	3	2	0	2	Ō	Ō	0	ò	i	2	ò		
Leuctridae (10)	1	4	10	2	2	Ò	2	i	1	٥	ō	Ó		
Ferlodidae (10)	0	0	0	Ō	Ō	Ò	ī	ò	Ö	ĭ	0	Õ		
Chloroperiidae (10)	2	16	26	1	ì	2	i	0	Ŏ	. 2	٥	ò		
Hydrophilidae (5)	1	3	0	0	0	Ō	0	Ô	ŏ	. 0	0	Ô		
Elmidae (5)	2	4	4	20	2	5	21	24	10	27	31	27		
Rhyacophilidae (7)	0	0	0	2	2	3	2	0	Ô	0	0	2		
Polycentropodidae (7)	0	Ö	1	ō	Ō	Ŏ	ō	å	ĭ	0	Ō	í		
Hydropsychidae (5)	0	2	Ó	i	4	Ô	2	Å	i	3	Ŏ	Ů,		
Odontoceridae (10)	Ò	0	Ö	Ò	Ò	Ŏ	ō	٥	ò	0	0	1		
Leptoceridae (10)	0	0	Ó	Ó	0	Ô	ŏ	0	Ŏ	Ô	i	1		
Goeridae (10)	1	1	Ó	Ó	Ò	Ò	Ŏ	Ó	Ŏ	ò	Ò	ò		
Lepidostomatidae (10)	0	0	Ò	å	Ó	ò	Ō	Ŏ	1	Õ	0	Ó		
Sericostomatidae (10)	0	Ò	i	i	i	i	ĭ	ì	2	2	1	3		
Tipulidae (5)	2	2	3	2	Ö	i	ò	ò	Ó	Ô	Ò	0		
Simuliidae (5)	0	4	i	Ō	3	2	Ŏ	0	Ŏ	ŏ	0	٥		
Ceratopogonidae (/)	0	0	Ó	Ó	Ō	Ō	ŏ	0	٥	ŏ	ì	Ó		
Chironomidae (2)	3	6	8	20	12	9	7	9	14	31	16	16		
Empididae (/)	1	Ō	ō	1	3	Ó	2	ó	4	3	3	5		
Rhagionidae (/)	0	l	0	i	3	0	ĭ	2	Ò	Ō	0	2		

FIGURES IN PARENTHESES INDICATE THE BIOLOGICAL WORKING PARTY (BMWP) SCORE FOR THE FAMILY. (/)\*NON=SCORING TAXON.

TOTAL BMWP SCORE

NUMBER OF SCORING TAXA

AVERAGE SCORE PER TAXON = 3.00

A30 OKEHAMPTON BYPASS SCHEME MACROINVERTEBRATE SURVEY OF THE WEST AND EAST OKEMENT RIVERS.

THE MACROINVERTEBRATE FAUNA OF THE RAILWAY STREAM DOWNSTREAM AND UPSTREAM OF THE BYPASS. DECEMBER 1st.1987

#### D/S BYPASS U/S BYPASS SPECIES LIST WITH No. PER SAMPLE SPECIES LIST WITH No. PER SAMPLE Lumbriculidae 1 Polycelis felina 120 Lumbricidae 1 Ancylus fluviatilis 32 Pedicia rivosa 1 Sphaeriidae 4 Lumbricidae 8 Other Oligochaeta 32 Gammarus pulex 168 Baetis rhodani 108 Baetis muticus Rhithrogena semicolorata Protonemura meyeri Nemoura cambrica group Leuctra sp. (nigra?) 52 Chloroperla torrentium 4 12 Helodes sp. Elmis aenea 1 Rhyacophila dorsalis 16 140 Agapetus sp. Philopotamus montanus 72 Plectrocnemia sp.(?) 1 Lype sp. 4 Diplectrona felix 60 Potamophylax group 24 Micropterna sequax Juvenile Limnephilidae 44 Beraea maurus 1 Sericostoma personatum 2 Tipula sp. Dicranota sp. Chironomidae 32 Simuliidae 220 (incl. Simulium cryophilum gp. Simulium ornatum group) TOTAL No. OF INDIVIDUALS TOTAL No. OF INDIVIDUALS 1214 INDICES OF ENVIRONMENTAL QUALITY INDICES OF ENVIRONMENTAL QUALITY

TOTAL DAWP SCORE

NUMBER OF SCORING TAXA

AVERAGE SCORE PER TAXON = 6.35

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