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Biological Water Quality Report 1996



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1996 Biological Water Quality Report

Introduction.

The 1996 biological survey followed the same methodology and sampling network as the 1995 GQA survey. This has allowed a direct comparison to be made between 926 stretches representing 4719.6km of river length in the Region.

The biological classification scheme is based on a shortfall between the macroinvertebrates found at a site, and those which would be expected at that site under natural conditions of water quality. This compensates for the natural differences in biology between different river types. A biological model called RIVPACS (River InVertebrate Prediction And Classification System) is used to produce a prediction of taxa present under natural conditions. The biological GQA classification scheme uses the ratios of predicted and observed values for ASPT and Number of Taxa to place a site in one of six classes, a (very good) to f (bad).

As the predictions produced by RIVPACS are based on a number of parameters such as annual average alkalinity, width, depth and substrate which can vary with time, there is a danger that the predictions for a site will change over time. This would lead to a situation where the RIVPACS 'target' for a site constantly changes. To prevent this, the set of variables compiled for the 1995 survey were used to make a fixed prediction for each site which will be used for grading. This prediction will only be changed in the future if the site changes significantly eg due to engineering or siltation. This protocol allows a direct comparison to be made between years. If a change in grade is recorded, it is due to a change in the observed biology rather than a change in the prediction made by RIVPACS.

Processing GQA Data

Once the data has been received from Area, it is audited at RHO. All files received are checked, and any double entries investigated. A program has been created which checks that each GQA sample point has both a spring and an autumn sample registered, and that each sample has results and a substrate record associated with it. Any missing files are investigated.

Once all the data is correct, it is run through a file conversion program which converts the sample, results and substrate database files into a single ASCII file. This is then sent to Thames Region where combined species lists are produced, which are returned to RHO. These combined species lists are used as input files for the GQA program. The GQA program was used for the processing of all national data from the 1995 GQA survey. It classifies data and carries out a statistical comparison between two years. The results of the 1995 to 1996 comparison are discussed in this report.

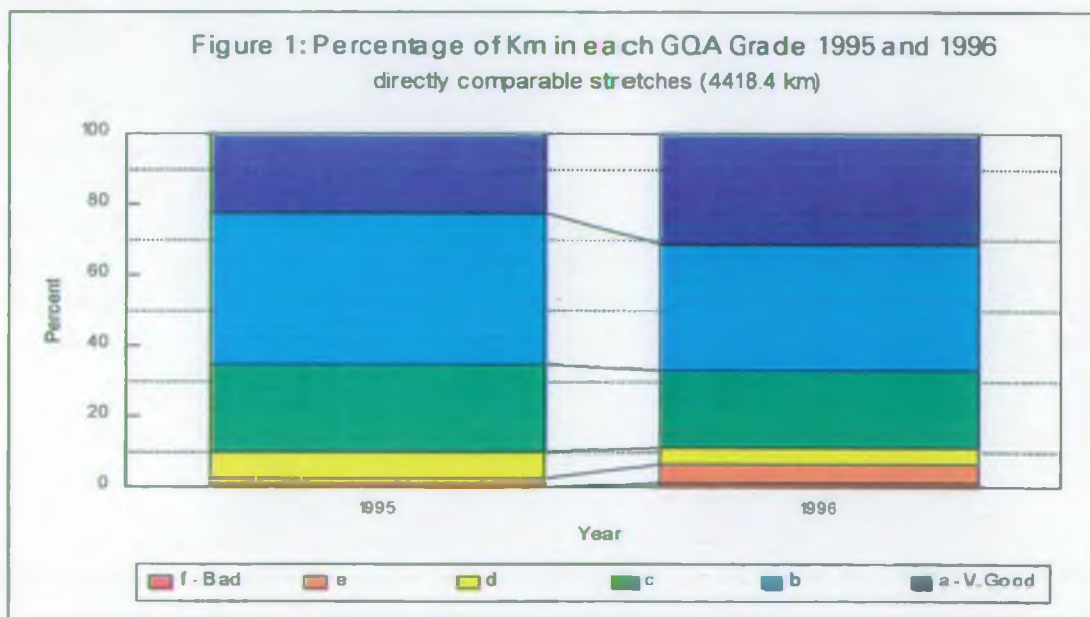
Results and Discussion

1 1995 versus 1996

During 1996, biological samples were taken at 741 sites. Of these, 700 had samples taken in both spring and autumn. Sites with only one sample have been assigned an interim classification, and a comparison including these is shown in Table 1. A map of the 1996 grades is included in Appendix 1.

Biological Class	% length in 1995	% length in 1996
a	22.2	30.0
b	42.8	35.7
c	24.7	22.1
d	7.3	5.5
e	2.6	5.6
f	0.4	1.2
Total Km Classified	4732.2	4719.6

The GQA classification system requires two samples to calculate statistics, therefore, it is only these sites which are used for a direct comparison with 1995. The sites which are directly comparable between 1995 and 1996 represent 868 river stretches and 4418.4 km of river length in the Region. Figure 1 displays the percentage of km in each grade.



1996 has seen an increase in the number of km in the top and bottom grades. This polarisation of grading may have been brought about by the drought. Some badly affected catchments may have had a decrease in biological quality associated with low flows, while for rivers with normal flow, the trend of improving water quality has continued. Better quality stretches are likely to have no discharges or ones which have minimal impact on the biota, therefore low flows have not exacerbated the impact on these stretches.

For directly comparable stretches, there has been a net improvement of 8.3% (365.4 km) since 1995. This is made up from an upgrade of 25.5 % and a downgrade of 17.2 %. Of the upgrades 1.66 % (73.5 km) are statistically significant (> 95% confidence), while 3.22 % (142.3 km) of the downgrades are statistically significant. This gives a net downgrade of 1.56% when only significant results are considered. These results suggest that the net improvement in grades may be due to small changes across class boundaries, while the larger, more definite changes, tend to be towards poorer biological quality. These significant downgrades should be investigated.

The chemistry data shows a drop of 26% between 1995 and 1996. This was attributed to low Dissolved Oxygen readings which are affected by low flows in the slow flowing, nutrient rich rivers of the Region. It would appear that the drop in DO, while strongly affecting the chemistry grades, is tolerated by most organisms, helping the biological quality to stay stable.

What Caused These Changes?

Part of the rise in biological water quality could have been due to the improvement in the quality of sorting. In 1996, the internal and external audits showed that the biologists were overlooking a smaller number of taxa on average than in 1995. This bias was therefore accounted for and the classification program re-run. The improvements in sorting accounted for < 1% of the apparent change in quality. This suggests that the recorded changes in quality were due to a genuine change in the observed biology.

A full list of sites which changed grade with a confidence of > 75% are included in Appendix 2. Sites which changed grade with a confidence of >95% were examined in greater detail and explanations for the change in grade were sought.

One of the most common reasons for a significant increase in biological quality is an improvement in the quality of effluent being discharged into it. Improvements in effluent treatment at Steeple Bumpstead STW (Eastern Area) lead to 3.5 km of Bumpstead Brook being upgraded from grade c to grade b. Brixworth STW (Northern Area) has also improved, causing biological quality to increase from grade b to grade a along a 6 km stretch of the Brampton Branch of the River Nene.

Low flows are the principal reason for decreases in biological quality. Reasons why drought leads to poor water quality include:

- 1. Lack of dilution of effluents.**

This can have an impact as non-biodegradable parts of the effluent will increase in concentration. As the lowest flows tend to occur during the summer, the lack of dilution of organic discharges is offset by increases in the efficiency of STW functioning during warm weather. Ammonia and BOD loadings may fall dramatically during hot (dry) summers as the biological treatment of the STW improves in efficiency.

2. **Higher risk of intermittent pollution**

This can arise from two sources:

a) Storm sewage overflow. Prevailing weather during drought years often means a higher incidence of storms. This can lead to overloading of STWs and discharge of storm water from STWs containing untreated sewage.

b) Pollution peaks from diffuse sources. During dry periods deposits can build up on roads, and agricultural products build up on fields. The first rainfall after a long dry period can, therefore, wash a disproportionately large quantity of diffuse pollutants into the river.

3. **Reduced Dissolved Oxygen (DO)**

Dissolved oxygen is obviously very important for aquatic organisms. Many taxa which score well on the BMWP index require high levels of DO. Even in the absence of an organic discharge there are several ways that the DO can be lowered by a drought.

a) Prevailing weather tends to be warmer. Oxygen is less soluble in warm water than in cold, so increased temperatures lead to lower levels of DO. At the same time, warmer temperatures will increase the metabolic rate and oxygen demand of cold blooded animals. The presence of large quantities of plant material will alleviate the problem in daylight hours, but exacerbate it during night-time. If a phytoplankton bloom occurs, DO will fall when a die off occurs and microbial activity increases.

b) The prevailing flow regime will tend towards slow moving water and stagnant pools. Slow flowing/standing water will absorb less oxygen than will a fast flowing turbulent watercourse.

4. **Habitat modification**

Rivers with low flows cannot carry a high sediment load. Fine particles which would otherwise be swept away, are deposited and remain on the river bed. This can change the substrate type, causing siltation and smothering. In very low flows, the fauna will change from typically riverine communities towards those more associated with lakes and ponds.

5. **Saline intrusion**

As the flow in a river drops, tidal effects have a greater influence and allow saline intrusion along a greater length. Animals with no tolerance to salinity may be wiped out. This is a particular problem in Anglian Region where rivers tend to be both slow flowing and low lying.

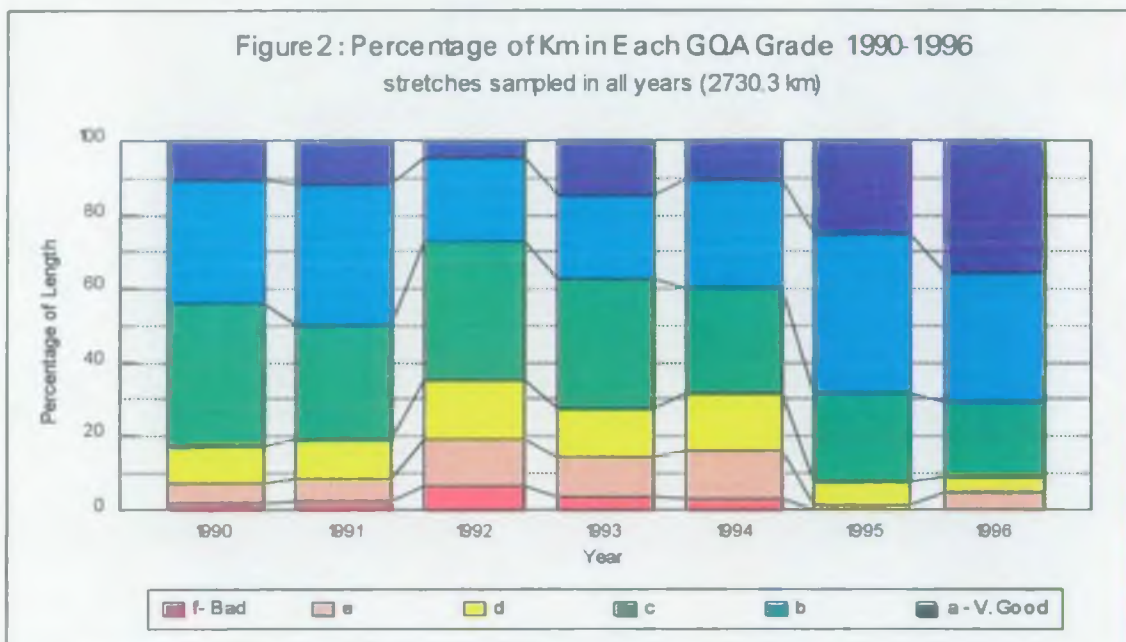
Low flows caused 8.5 km of the River Ingol to drop from grade c to grade e. Low flows on the South Forty Foot Drain allowed saline intrusion which caused significant downgrades over 26.4 km of river length.

Another factor which can be responsible for causing a decrease in biological quality is a pollution incident. Three pollution incidents on the River Wissey combined with low flows caused a significant decrease in quality over a 4.1 km stretch of river.

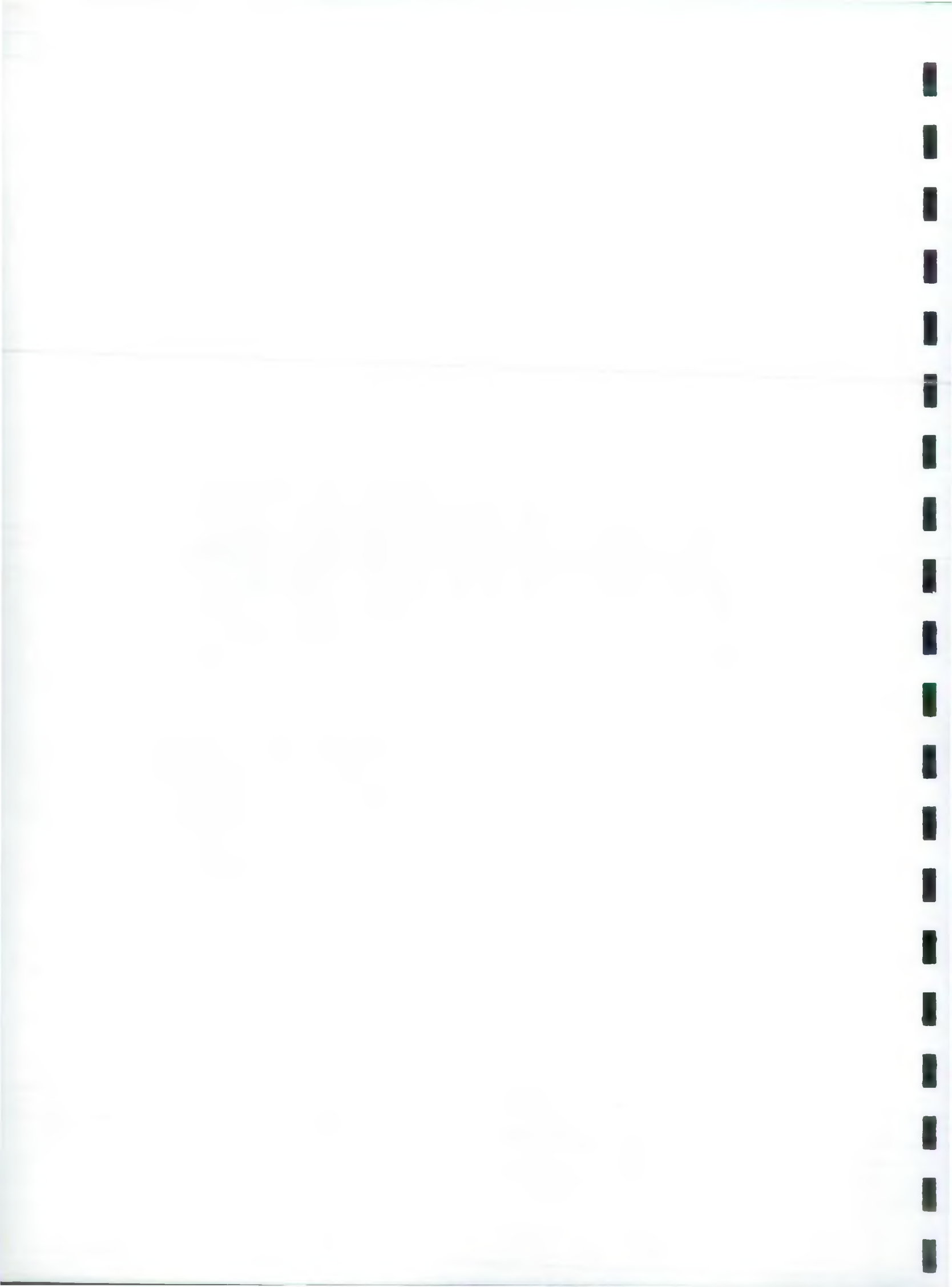
The above factors often occur in combination and one specific cause for a reduction in biological quality cannot easily be identified. The biological survey gives an integrated measure of the impact.

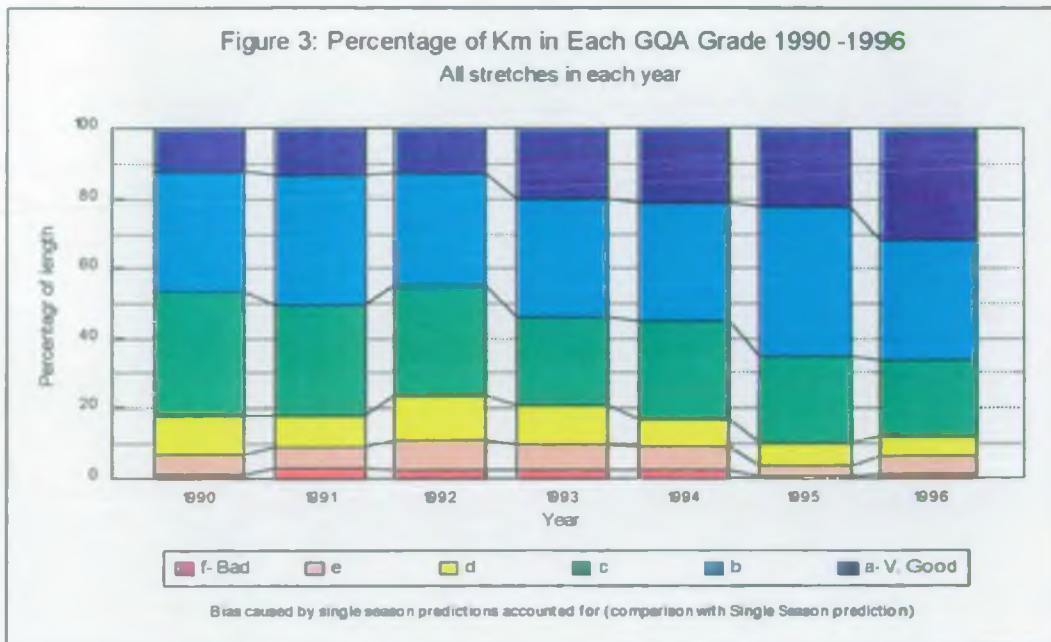
2 Long Term Trends.

GQA classification has been carried out on data from the years 1990 - 1996. A comparison of stretches which have been classified in every year is shown in Figure 2. This plot contains 'interim results' based on a single sample in a year, as in some years very few sites were sampled twice. This may lead to an underestimation of quality in the years 1992, 1993 and 1994 which have a high proportion of single season classifications. This underestimation is brought about because the GQA classification is based on a combined taxa list from two samples. The combined species list is compiled by amalgamating the two samples to create a single list of taxa found on both sampling occasions. If, for example, the spring sample contained three taxa, a, b and c and the autumn sample contained three taxa b, c and d, then the combined species list for that site would contain four taxa, a, b, c and d. If only one sample is used, the site is classified on what may be a less representative and shorter taxa list.

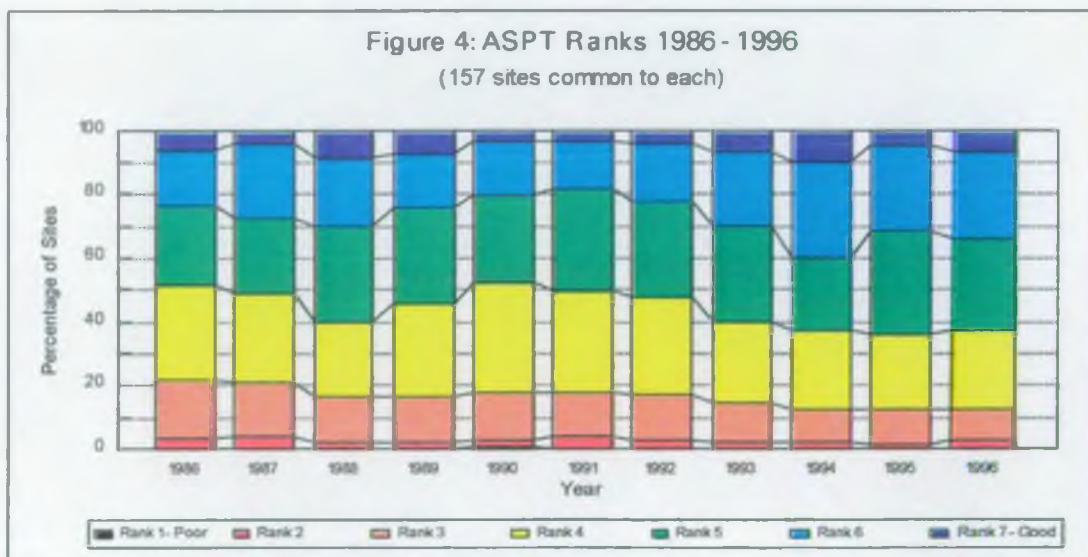


To remove the effects of the bias caused by single samples, the data was re-classified comparing the single season results the relevant single season RIVPACS prediction. The effect of this was to improve the apparent quality, particularly in the years 1992 to 1994. This is shown in figure 3.





The network of National Reporting sites have been used to monitor long term trends in water quality. Of the 250 National Reporting sites, 157 have been monitored every year since 1986. ASPT ranks have been assigned to these sites based on the ASPT score and the habitat classification. The percentage of sites in each grade are shown in figure 4.



The drought which occurred throughout 1989-1992 can clearly be seen in the ASPT ranks. The drought in these years had the effect of compressing the top grades. This compression of top grades is not seen in 1996. This is probably due to investment in effluent treatment off-setting the negative effect of the drought in better quality rivers.



The National Reporting Sites show similar trends to those shown by the GQA network data. A comparison of ASPT ranks between 1995 and 1996 show once again more sites in both the top and bottom categories, with a contraction of the middle categories. Although the fit between quality shown by ASPT ranks (figure 4) and GQA grades (figure3) is not perfect, both point to a steady increase in water quality, disrupted only by drought years.

The results from the 1996 survey demonstrate the value of biological assessment in monitoring our performance and in highlighting trouble spots. The results are a stable audit of performance and show the impact on the environment of all natural and man-made effects.

Appendix 1

A map of Biological Quality in Anglian Region 1996



BIOLOGICAL RIVER QUALITY SURVEY 1996

According to the
General Quality Assessment
(GQA) Scheme

River and Canal Quality

- Grade a
- Grade b
- Grade c
- Grade d
- Grade e
- Grade f



Appendix 2

Upgrades and Downgrades which have a confidence > 75%

Old	New	Change	Conf.	River Name	Stretch Name	Stretchcode	Biocode
c	a	UP	100	RIVER MEL	MELBOURN ROAD RAILWAY BRIDGE	033020103002	R02BF30M20
d	c	UP	99	GWASH NORTH	HEADWATERS...RUTLAND WATER	031011018005	R05BFGW5H010U
c	b	UP	98	PAKENHAM STREAM	MANOR FARM ... BLACK BOURN	033020068101	R02BF41M14
b	a	UP	97	BLACKWATER	OOMSEY BROOK...RIVER BRADN	037040001003	R01BFBL0350
d	c	UP	97	LAYER BROOK	PATERNOSTER HEATH - VINERS FARM TRIB	037030008003	R01BFRR0320
c	a	UP	97	TEN MILE RIVER	RIVER LARK/CONFL OUSE ... FERRY FARM	033020039003	R02BF40M02
c	b	UP	96	BUMPSTEAD BRK	STEEPLE BUMPSTEAD STW STOUR	036010017001B	R01BFST1032
c	b	UP	96	BUMPSTEAD BRK	STEEPLE BUMPSTEAD...STW	036010017001A	R01BFST1032
c	b	UP	96	IVEL	CONFL. HIZ CONFL IVEL NAVIGATION	033020138004	R02BF15M01
b	a	UP	96	RIVER CAM	MILLFIELD FARM... SAWSTON PAPER MILL	033020088008A	R02BF27M23
b	a	UP	96	RIVER CAM	DUXFORD...MILLFIELD FARM	033020088008B	R02BF27M23
c	a	UP	96	WILLOUGHBY HIGH DRAIN	HEADWATERS...ORBY DRAIN	029301601001	R03BFWLL070H
c	a	UP	95	RIVER RHEE	WHADDON BROOK BARRINGTON	033020098002	R02BF30M25
d	c	UP	95	WELLAND	HEADWATERS...HUSBANDS BOSWORTH	031010201003	R05BFWELL010S
c	b	UP	95	HIZ	HOLWELLBURY BROOK...THE GRANGE HENLOW	033020150001	R02BF13M06
b	a	UP	95	BRAMPTON BRNCH	KINGSTHORPE HOLLOW...NORTHAMPTON	032010351001A	R05BFBRAM129K
b	a	UP	95	BRAMPTON BRNCH	CHURCH BRAMPTON ARM...KINGSTHORPE HOLLOW	032010351001B	R05BFBRAM129K
e	d	UP	94	ANCHOLME OLD	COAL DYKE END...WORLABY P/S	029030502001	R03BFANCO050W
b	a	UP	94	WHILTON BRNCH	HEADWATERS...SURNEY BRIDGES	032010169002	R05BFWHL030L
d	c	UP	94	WID	CHAINBRIDGE...WASH ROAD TRIB	037040026007	R01BFW0812
d	c	UP	94	WID	CHAIN BRIDGE TRIBUTARY...CHAINBRIDGE	037040026008	R01BFW0812
d	c	UP	94	CHAINBRIDGE TR	HEADWATERS...WID	037040026101	R01BFW0812
b	a	UP	93	FORTY FOOT DRAIN	SWINGBROW ... NIGHTLAYERS FEN DRAIN	033020020012	R02BF53M07
c	b	UP	92	WATHE BK	TETNEY BLOW WELLS...TETNEY LOCK	029201102001	R03BFWAIT200T
d	c	UP	92	FLIT	CHICKSANDS PRIORY SHEFFORD	033020143002A	R02BF16M04
d	c	UP	92	FLIT	BEADLOW...CHICKSANDS PRIORY	033020143002B	R02BF16M04
b	a	UP	91	RATTLEDEN R	GEDDING...BURFORD BRIDGE	035050002003	R04BFRAT090
d	c	UP	90	BARTON BROOK	SPEED THE PLOUGH PH RECTORY FARM	033020145001	R02BF17M05
b	a	UP	90	POPHAMS EAU	THREE HOLES...NORDELPH	033020017001	R02BF53M14
b	a	UP	90	MIDDLE LEVEL MAIN DRAIN	THREE HOLES ... WIGGENHALL ST GERMAN'S	033020017002	R02BF53M14
e	d	UP	90	HOG DYKE	SP 974 730...NENE	032010901101	R05BFHOGD130R
d	c	UP	90	CROUCH	NEVENDON BROOK...TIDAL LIMIT	037070001001	R01BFCR01
d	c	UP	89	SOUTHERN STRM	CENTRAL STREAM...DEENE LAKE	032010823005	R05BFWILS060P
b	a	UP	89	BLACKWATER	ROBINS BROOK...COGGESHALL STW	037040001005	R01BFBL0560
b	a	UP	89	BLACKWATER	SHELBOURNE BR BROOK...ROBINS BRK	037040001006	R01BFBL0560
b	a	UP	89	BLACKWATER	BOCKING STW...SHELBOURNE BR BROOK	037040001007	R01BFBL0560
c	b	UP	88	SOHAM LODE	FOOT BRIDGE SOHAM COTES...R GT.OUSE	033020086001	R02BF36M10
d	c	UP	88	LITTLE OUSE	BOTESDALE LAKE...HOPTON FEN	033020053008	R02BF42M04
b	a	UP	87	TOVE	LINCOLN LODGE COSGROVE PARK	033020176001	R02BF04M08
b	a	UP	87	BLACKWATER	R BRADN...WICKHAM BISHOPS	037040001002	R01BFBL0160
c	b	UP	87	KYM	PASTURES FARM CONFL. OUSE	033020132001A	R02BF21M04

Old	New	Change	Conf.	River Name	Stretch Name	Stretchcode	Biocode
c	b	UP	87	KYM	RUSHEY FARM...PASTURES FARM	033020132001B	R02BF21M04
c	b	UP	87	KYM	GREAT STAUGHTON...RUSHEY FARM	033020132001C	R02BF21M04
c	a	UP	86	BUCKENHAM STREAM	WILBY HALL ... FEN PLANTATION	033020060001	R02BF44M18
c	a	UP	86	BUCKENHAM STREAM	LEYS PLANTATION ... RIVER THET	033020060002	R02BF44M18
b	a	UP	86	CHELMER	GT DUNMOW...STEBBING BROOK	037040018009	R01BFCH0860
c	b	UP	86	BLACK BOURN	A1088 RD BRIDGE ... PAKENHAM STREAM	033020068002	R02BF41M03
c	b	UP	85	BINHAM TR	WESTGATE...STIFFKEY	034020004001	R04BFSTF070
c	b	UP	84	RIVER CAM	CLAYHITHE... CONFL SWAFFHAM BULBECK LODGE	033020088002A	R02BF33M09
c	b	UP	84	RIVER CAM	A45 ROAD BRIDGE...CLAYHITHE	033020088002B	R02BF33M09
b	a	UP	84	BLACKWATER DRN	CAWSTON...WENSUM	034030022001	R04BFWEN205
b	a	UP	84	GWASH	NORTH BROOK...WELLAND (2)	031011018001A	R05BFGWSHZ30T
b	a	UP	84	OUSE	MARINA ... HEMINGFORD GREY MILL	033020001005A	R02BF26M23
b	a	UP	84	OUSE	BRAMPTON...MARINA	033020001005B	R02BF26M23
c	b	UP	83	GLAVEN	HILL HOUSE FARM...SELBRIGG LAKE OUTFLOW	034020002006	R04BFGLV005
c	b	UP	83	GLAVEN	BODHAM...HILL HOUSE FARM	034020002007	R04BFGLV005
c	b	UP	83	IVEL	CONFL IVEL NAVIGATION ... MANOR FARM	033020138003	R02BF19M01
c	b	UP	82	BRAMPTON BRNCH	MOULTON ARM...CHURCH BRAMPTON ARM	032010351002	R05BFBRAM120B
c	b	UP	82	BRAMPTON BRNCH	PITSFORD ARM...MOULTON ARM	032010351003	R05BFBRAM120B
c	b	UP	82	BRAMPTON BRNCH	SPRATTON BK...PITSFORD ARM	032010351004	R05BFBRAM120B
c	b	UP	82	PARSONAGE BRK	HIGH EASTER...CAN	037040024101	R01BFCA0347
c	b	UP	82	HIGH RODING BRK	HIGH RODING...CAN	037040024201	R01BFCA0347
c	b	UP	82	CAN	HEADWATERS...WARES BROOK TRIB	037040024007	R01BFCA0347
c	b	UP	82	DOVE	WESTHORPE...RIVER DOVE	034030008005	R04BFDOV030
d	c	UP	82	RIVER LINNET	LITTLE HORRINGER HALL ... RIVER LARK	033020073001	R02BF37M23
c	b	UP	81	RIVER CAM	RIVER GRANTA ... A10 RD BRIDGE	033020088006	R02BF29M03
b	a	UP	81	TWENTY FOOT DRAIN	WARBOYS HEATH ... FORTY FOOT DRAIN	033020020010	R02BF53M40
b	a	UP	81	COUNTER DRAIN	RAILWAY BR MANEA ... ONE HUNDRED FARM	033020020022	R02BF52M05
c	b	UP	79	SLEA NEW	RUSKINGTON BECK...COBBLERS LOCK	030021121003	R03BFSLEA140A
e	d	UP	79	NEW BEDFORD/HUNDRED FOOT	SUTTON GAULT ... RAILWAY BRIDGE MANEA	033020119006	R02BF26M32
d	c	UP	78	PIX BROOK	LETCHWORTH STW ... CONFL HIZ	033020155001	R02BF14M07
c	b	UP	78	ISE	SWANSPPOOL BROOK...NENE	032010638001	R05BFRISE310B
c	b	UP	78	ISE	HARROWDEN BROOK...SWANSPPOOL BROOK	032010638002	R05BFRISE310B
c	b	UP	78	ISE	PYCHLEY BROOK...HARROWDEN BROOK	032010638003	R05BFRISE310B
b	a	UP	77	BUCKLESHAM MILL R	BRIGHTWELL BRIDGE...BUCKLESHAM MILL	035040002002	R04BFMIL020
b	a	UP	77	BUCKLESHAM MILL R	MONUMENT FM.BRIDGE...BRIGHTWELL BRIDGE	035040002003	R04BFMIL020
b	a	UP	77	TAS	TASBURGH...STOKE MILL	034030011003	R04BFTAS092
b	a	UP	77	TAS	FORNCETT ST MARY...TASBURGH	034030011004	R04BFTAS092
b	a	UP	77	OUSE	BRACKLEY...EVENLY	033020001025A	R02BF01M04
b	a	UP	77	OUSE	BIDDLESTON PARK ... BRACKLEY	033020001025B	R02BF01M04
b	a	UP	77	RADSTONE BROOK	CONFL. TRIB RADSTONE BROOK ... RIVER OU	033020001027	R02BF01M04
b	a	UP	77	TRIB RADSTONE BROOK	TRIB RADSTONE BROOK...	033020001029	R02BF01M04

c	e	DOWN	99	ORBY DRAIN	HEADWATERS..WILLOUGHBY HIGH DRAIN	029301601002	R03BFORBY050C
a	d	DOWN	99	GLEM	GLEMSFORD FLUME..STOUR	036010014001	R01BFGL01
c	e	DOWN	99	SOUTH FORTY FOOT DRAIN	SKERTH DRAIN..BOSTON DOCK	030021211001	R03BFSFFD150S
c	e	DOWN	99	SOUTH FORTY FOOT DRAIN	HELPRINGHAM EAU...SKERTH DR	030021211002	R03BFSFFD150S
c	f	DOWN	99	GRAND UNION CANAL	GAYTON..NORTON JUNCTION (1)	050004900003B	R05BGGUCM010B
c	f	DOWN	99	GRAND UNION CANAL	GAYTON..NORTHAMPTON	0500049000084	R05BGGUCM010B
c	f	DOWN	99	GRAND UNION CANAL	BLISWORTH..GAYTON	0500049000005	R05BGGUCM010B
d	f	DOWN	99	BURN	LONG PLANTATION..NORTH CREAKE	034010001004	R04BFBRN010
c	e	DOWN	99	INGOL	SHERBOURNE HALL ... BOATHOUSE CREEK	033030001001	R02BF65M02
b	e	DOWN	99	LAYER BRDOK	ROCKINGHAM FM..ABBERTON RESERVOIR	037030008002	R01BFRR03
b	c	DOWN	99	WISSEY	NECTON ... LOWER FM S PICKENHAM	033020040008	R02BF48M03
c	e	DOWN	99	ELMSWELL TRIB	HEADWATERS ... NORTON/THURSTON RD BRIDGE	033020065002	R02BF41M09
a	c	DOWN	99	RIVER GADDER	LAKE D/S COCKLEY CLEY ... R.WISSEY	033020042001	R02BF48M25
c	e	DOWN	99	RIVER LARK	BRIDGE FARM ... RIVER LINNET	033020072009	R02BF37M05
c	e	DOWN	99	SPICKETTS BRK	CATCHPOLE BK...TIDAL BLACKWATER	037040015001	R01BFMT8626
a	c	DOWN	98	ISE	RUSHTON..GEDDINGTON (2)	032010638006A	R05BFRJSE180G
b	d	DOWN	98	STAMBOURNE BRK	STAMBOURNE...COLNE	037030001101	R01BFCL0850
c	e	DOWN	97	BARNARDISTON BRK	HIGHPOINT PRISON...STOUR	036010019001	R01BFST1441
d	e	DOWN	97	EASTWOOD BRK	HEADWATERS...SOUTHEND AIRPORT	037070002003	R01BFRH0210
a	c	DOWN	97	WAVENEY	BECCLES YACHT STN...NTH COVE STAITHE	034030007002	R04BFWAV140
e	f	DOWN	96	SMEETH LODE	TRAFFORD HOUSE...WIGGENHALL ST GERMAN'S	033020020002	R02BF54M01
c	e	DOWN	96	NETTLEHAM BK	NETTLEHAM STW...RAILWAY	030020741002	R03BFNETT120S
b	c	DOWN	96	BADN	WARING...HORNCastle STW	030021026004	R03BFBAIN270T
d	e	DOWN	95	WILLOW BRK	DEENE LAKE..BLATHERWYCKE LAKE (1)	032010823004B	R05BFWILL080B
b	c	DOWN	95	SOUTH FORTY FOOT DRAIN	CASSWELLS BRIDGE..HELPRINGHAM EAU	030021211003	R03BFSFFD110D
b	c	DOWN	94	MARDYKE	STIFFORD...AVELEY TRIB	037100001003	R01BFMD0202
b	c	DOWN	94	MARDYKE	STIFFORD CLAYS...STIFFORD BRIDGE	037100001004	R01BFMD0202
b	c	DOWN	94	SINCIL DYKE	BARGATE WEIR...CANWICK STW	030020001018	R03BFSINC040D
a	b	DOWN	93	BLACKWATER	WILLOW GRANGE...WHITEWATER	034030015101	R04BFWEN110
e	f	DOWN	93	PIX BROOK	NORTON COMMON..LETCHWORTH STW	033020155002	R02BF14M05
b	c	DOWN	93	BURWELL LODE	LITTLE FEN ... PRIORY FARM	033020090002	R02BF34M12
d	e	DOWN	93	FRENZE BK	WINFARTHING...WOOLSEY BR	034030007402	R04BFWAV024
b	c	DOWN	92	WELLAND	MARSTON TRUSSEL BROOK..JORDON	031010201001	R05BFWELL030L
b	c	DOWN	92	WELLAND	HUSBANDS BOSWORTH..MARSTON TRUSSEL BRK	031010201002	R05BFWELL030L
b	d	DOWN	90	COUNTER DRAIN	FOOTPATH 100 FOOT FARM ... SALTERS LODE	013020020021	R02BF52M06
c	d	DOWN	90	ORE	SAXTEAD..FRAMLINGHAM STW	035030004004	R04BFORE010
b	c	DOWN	89	WENDON BROOK	M11 RIVER CAM	033020112001	R02BF27M25
d	e	DOWN	88	CROUCH	OUTWOOD COMMON BROOK...NEVENDON BRDOK	037070001002	R01BFCR0215
c	d	DOWN	88	ANWICK SOKE/CATCHWATER	ANWICK STW..FARRAWAY DRN	030020931001	R03BFANW1030A
b	d	DOWN	88	BRAIN	BRAINTREE STW...BULFORD MILL	037040036004	R01BFBR02
e	f	DOWN	87	HEACHAM RIVER	EMBANXMENT..NORTH BEACH ROAD BRIDGE	033040001002A	R02BF66M04

d	e	DOWN	86	PRITTLE BRK	HEADWATERS...TIDAL LIMIT	037070009001	R01BFRH0120
d	e	DOWN	86	LACEBY BK	200M DVS LITTLECOATES BR..GRIMSBY DOCK	029171001001	R03BFFRES040B
a	b	DOWN	86	STEBBING BRK	LINSELL ..CHELMER	037040034001	R01BFCH0909
a	c	DOWN	86	RASE	BULLY HILL ..RASE STH BRANCH	029030014003	R03BFRASE020B
b	c	DOWN	84	BARLINGS EAU	DUNHOLME BECK...NETTLEHAM BECK	030020738004	R03BFBARL090S
b	c	DOWN	84	BARLINGS EAU	FALDINGWORTH GRANGE...DUNHOME BK	030020738005	R03BFBARL090S
c	d	DOWN	84	STARSTON BK	BROOK HOUSE BR...STARSTON BR	034030001303	R04BFWAV09S
b	c	DOWN	84	GRAND UNION CANAL	GREAT SEABROOK...GRAFTON REGIS	033500049002	R02BG08M19
c	d	DOWN	84	STOUR BRK	HAVERHILL STW...STOUR	036010018001	R01BFST13
b	c	DOWN	83	RIVER LARK	A134 RD BR B S.E. ... FORNHAM ST GENEVIE	033020072007	R02BF37M08
c	e	DOWN	83	ROCHFORD RESERVOIR	ROCHFORD RESERVOIR.....	037070010101	R01BFRH0202
c	e	DOWN	83	EASTWOOD BRK	RAYLEIGH BK...ROACH	037070002001	R01BFRH0202
b	c	DOWN	83	BROUGHTON BROOK	M1 OUZEL	033020167001	R02BF09M06
b	d	DOWN	82	NAR	LITCHAM STW LEXHAM HALL	033020007007	R02BF58M03
b	c	DOWN	82	FOX'S BK	THORPE MARKET ..SWAYFIELD	034030003301	R04BFANT007
c	e	DOWN	82	EASTWOOD BRK	SOUTHEND AIRPORT...RAYLEIGH BK	037070002002	R01BFRH0203
b	c	DOWN	81	TIFFEY	CHAPEL BRIDGE..KIMBERLEY LAKE	034030013002	R04BFTF060
e	d	DOWN	81	MAUD FOSTER DRN	COWBRIDGE LOCK...HAVEN	030021308001	R03BFMAUD020R
b	c	DOWN	81	CHAD BRK	SHIMPLING STW...ACTON	036010013001B	R01BFCD012S
b	c	DOWN	80	LACEBY BK	WELBECK SPRINGS...LACEBY	029171001005	R03BFLACE020T
a	b	DOWN	80	WAVENEY	ELLINGHAM MILL...SHIPMEADOW	034030007004	R04BFWAV129
b	c	DOWN	80	TAS	OLD HALL BRIDGE...FORNCETT ST MARY	034030011005	R04BFTAS040
a	b	DOWN	78	PADBURY BROOK	HETHE...OLDFIELD FARM	033020187003A	R02BF02M06
a	b	DOWN	78	PADBURY BROOK	ARDLEY...HETHE	033020187003B	R02BF02M06
c	d	DOWN	78	MARDYKE (W TRIB)	HEADWATERS...UPMINSTER STW	037100001007	R01BFMD05038S
c	d	DOWN	78	FRAMPTON TOWN DR	FRAMPTON...NEW HAMMOND BECK	030021211101	R03BFTOWN050A
d	e	DOWN	78	SLEA OLD	WHITE HOUSE...COBBLERS LOCK	030021122001	R03BFOLD5040E
d	e	DOWN	78	SLEA OLD	SLEAFORD STW...WHITE HOUSE	030021122002	R03BFOLD5040E
b	c	DOWN	77	WENSUM	NEW MILLS...YARE	034030001001	R04BFWEN270
d	e	DOWN	77	SLADE BRK	HEADWATERS...LODDINGTON ARM (2)	032010638302A	R05BFSLAD080A
c	d	DOWN	77	HIZ	CONFL. RIVER OUGHTON ... HOLWELLBURY BR	033020150002	R02BF13M04
d	e	DOWN	76	THORNDON STRM	THE WASH...RIVER DOVE	034030008101	R04BFD0V050
b	c	DOWN	75	COTTENHAM LODE	COTTENHAM ... R.GTOUSE	033020039101	R02BF35M16
a	b	DOWN	75	WITHAM	P A S...CRINGLE BROOK	030020001014	R03BFWITH140E
c	e	DOWN	75	RIVER LARK	RIVER LINNET ... A134 RD BR BURY ST EDMU	033020072008	R02BF37M07