

Colour Standards for Watercourses

Volume 3: Questionnaire returns

University of Leeds
WRc plc

R&D Project Record P2/i275/1

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TH-8/97-B-AZXX

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Internal: Released to Regions

External: Restricted

Statement of use

This document provides background information relating to issues involved with the potential setting of colour standards for rivers. It is directed to regional and area water quality managers, their staff and external interested parties.

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FOREWORD

The work described in Volume 3 of this Project Record was commissioned by the National Rivers Authority (NRA) as part of its Research and Development Programme. Volume 1 contains a review of relevant literature, an interpretation of the raw data presented in Volume 2 and recommendations for the derivation of colour standards for rivers. This volume contains information supplied by regulatory authorities during 1991 in response to a questionnaire requesting data on colour problems in UK surface waters.

A restricted draft Project Record (Volume 1) of this study was first published in 1993. The work has since been appraised and updated by WRc. Between the publication of the draft report and the publication of this final report, the NRA has been superseded by the Environment Agency. Likewise, the Scottish River Purification Boards have been superseded by the Scottish Environmental Protection Agency (SEPA).

The co-operation of all UK regulatory bodies in providing data for this project is gratefully acknowledged.

CONTENTS

Page

1.	INFORMATION OBTAINED FROM THE QUESTIONNAIRES SENT OUT TO EACH REGION	2
1.1	The questionnaire and its purpose and application	2
1.2	The information	3
	NRA Anglian Central Region	3
	NRA Anglian E. Area, Ipswich, Suffolk	5
	NRA Anglian, E. Area, Chelmsford district	7
	NRA Anglian, E. Area, N. Essex District	7
	NRA Anglian, E. Area, Norwich	8
	NRA North West Region	10
	NRA Severn Trent Region	29
	NRA South West Region	33
	NRA Southern Region, E. Sussex	35
	NRA Thames Region	37
	NRA Wessex Region	39
	NRA Yorkshire Region	41
	Forth River Purification Board	47
	Highland River Purification Board	51
	North East River Purification Board	52
	Solway River Purification Board	54
	Tay River Purification Board	55
	Tweed River Purification Board	57
	Department of the Environment (NI).	58
	Appendix - A completed questionnaire of the colour survey for watercourses	60

1. INFORMATION OBTAINED FROM THE QUESTIONNAIRES SENT OUT TO EACH REGION.

1.1 The Questionnaire and its purpose and application.

The questionnaire set out to determine the extent of the problem of colour in rivers nationally. Other more detailed objectives of the questionnaire were:-

- Find out the watercourses/waterbody affected
- The cause of the perceived problem
- The number of complaints from the public, industrial abstractors, pressure groups, MP's, abstractors and any others
- The effect on river use
- Any actions to monitor the problem
- To find out which regions measured colour and how they measured it
- To determine which regions had defined acceptable colour standards
- To determine what limits on coloured effluents were required of dischargers in the different regions
- How consents were monitored
- Awareness of colour reduction technology

The questionnaires were circulated to all the NRA regions, the River Purification Boards and the DOE Northern Ireland. The questionnaires were returned around April 1991.

The answers from the questionnaire were placed into a database (idealist) from which the relevant data about each region was accessed. This database allows large amounts of text input and updating the database in detail is possible. It is recommended that the NRA use this or another database for national information on colour problems in the future.

An example sample of a completed questionnaire is given in Appendix 1. It should be noted that the questionnaire sought details of the worst conditions in terms of river length affected and complaints received over the five year period up to April 1991. Also included are brief comments (marked with*) of some changes that have taken place since the original returns.

1.2 The information obtained from various regions.

Region:

NRA Anglian Central Region

Respondent:

P. Waldron

Phone Number:

0480-414581

Problems:

The problems are widespread not localised. There are no river problems but there are slight problems with estuaries.

Period of problem:

Continuous problem

The Waters Affected:

The Great Ouse Estuary

Maximum length affected

1 km

Cause of problem:

Kings Lynn STW effluent, the colour can be red or green, it arises from a food dye manufacturer.

Maximum complaints in one year:

Public	5
Industrial Abstractors	0
Pressure Groups	0
MPs	0
Others	5

How the watercourse was affected:

The colour gives rise to a perceived pollution problem

Is the problem monitored:

N/A

Actions taken:

Anglian Water Services Ltd have served a notice on the discharger to control the effluent discharge.

Is colour measurement made:

No colour measurement has been employed.

Treatment of samples:

Since no method of colour measurement has been used then no methods of sample treatment are given.

Colour units used:

N/A

Guidelines set for the determination of colour standards:

N/A

Awareness of colour removal techniques:

N/A

Region:

NRA Anglian E. Area, Ipswich, Suffolk

Respondent:

B. Borley

Phone Number:

0473-7277712

Problems:

The problems are localised with both rivers and estuaries having slight problems.

Period of problem:

Incidents have occurred over the past two years.

The Waters Affected:

R. Blyth and R. Alde.

Maximum length affected

Total affected length is 13 km.

Cause of problem:

The cause is due to the change in iron content due to the lowering of the water table.

Maximum complaints in one year:

Public	20
Industrial Abstractors	0
Pressure Groups	2
MPs	0
Others	0

How the watercourse was affected:

A slight affect on amenity water.

Is the problem monitored:

Analysis of water for iron content.

Actions taken:

None

Is colour measurement made:

Colour is not measured and the rest of the questionnaire was not applicable.

Region:

NRA Anglian, E. Area, Chelmsford district

Respondent:

S. Bowers

Phone Number:

0245-478065

Problems:

There are slight problems with both rivers and estuaries, however they appear to be neither localised or widespread.

Period of problem:

Not given

The Waters Affected:

Not given

The rest of the questionnaire was not applicable.

Region:

NRA Anglian, E. Area, N. Essex District

Respondent:

Pat Ripton

Phone:

0376-72091

Problems:

No River or Estuary problems.

Period of problem:

The rest of the questionnaire was not applicable

Region:

NRA Anglian, E. Area, Norwich

Respondent:

A. Whitehead

Phone:

0603-622800

Period of problem:

At the present time (1991).

The Waters Affected:

Pulham stream a tributary of the R. Waveney.

Maximum length affected

Several miles.

Cause of problem:

The cause is effluent from Tivetshall Maltings.

Maximum complaints in one year:

Public	0
Industrial Abstractors	0
Pressure Groups	0
MPs	0
Others	0

How the watercourse was affected:

Slight amenity effect.

Is the problem monitored:

The effluent quality is routinely measured.

Actions taken:

The effluent is discharged to grass plots in an attempt to clean it up. This does improve the effluent.

Is colour measurement made:

Colour is not measured and the rest of the questionnaire was not applicable.

Region:

NRA North West Region

Respondent:

R. Ward.

Phone Number:

0925-53999

Problems:

There are serious problems with the rivers and slight problems with the estuaries in this region. The problems are both localised and widespread. There is a regional split, with colour problems being serious in the industrialised areas e.g. the R. Mersey and the Ribble catchments. Further north the colour problems are mainly due to ochre.

The affected watercourse, period and source of the problem, the maximum length affected and the complaints due to ochre are given in Table 1.1.

The affected watercourse, period and source of the problem, the maximum length affected and the complaints due to other sources of colour are given in Table 1.2.

Table 1.1 Colour problems in the North West NRA Region due to ochre

Watercourse affected	Period affected	Maximum length affected	P	I	G	M	O	Source	Key to Complaints
Ghyll Beck	March 1990	4.6 km	12	0	1	0	0	coal spoil	P - Public I- Industrial Abstractors G - Pressure Groups M - MP's O-Others
R. Keeble	> 10 years	10.9 km	few	0	2	0	0	coal spoil	
Black Clough	> 15 years	6.3 km	few	0	0	0	0	minewater	
Bradley Brook	> 40 years	2.2 km	2	0	0	0	0	minewater	
Union Bank Brook	> 40 years	1.5 km	0	0	0	0	0	minewater	
Smithy Brook	1960 to date	3.3 km	4	0	0	0	0	minewater	
Down Brook	> 40 years	11.0 km	3	0	1	1	1	minewater	
Yellow Brook	> 30 years	0.4 km	2	0	0	0	0	minewater	
Slack Brook	> 10 years	2.5 km	0	0	0	0	0	minewater	
R. Sett	> 10 years	1.5 km	0	0	0	0	0	ochre	
R. Irwell	> 10 years	9.5 km	10-20	0	1	0	0	minewater	
Lydgate Brook	> 10 years	0.5 km	0	0	0	0	0	ochre	
Ealees Brook	> 10 years	2.0 km	0	0	0	0	0	ochre	
Naden Brook	> 10 years intermittent	2.5 km	<5	0	0	0	0	ochre	
Stanney Brook	> 10 years	4.7 km	few	0	0	0	0	ochre	
R. Medlock	> 10 years intermittent	7.0 km	<5	0	0	0	0	ochre	
Trent and Mersey Canal	> 15 years	2.5 km	6	0	0	0	0	ochre	
Valley Brook	> 10 years	5.0 km	0	0	2	0	0	ochre	
Bridgewater Canal	> 10 years	10.0 km	0	0	0	0	0	minewater	

Table 1.2 Colour problems in the North West NRA Region due to other sources

Watercourse affected	Period affected	Maximum length affected	P	I	G	M	O	Source	Key to Complaints
Scarth Hole	> 20 years	300 m	few	0	2	0	0	paper mill	P-Public I-Industrial Abstractors
Colne Water/ Pendle Water	2 years Deteriorated in 1989	9.5 km	few	6	0	2	0	textile dyes	
Stock Beck	intermittent	3.7 km	2-3	0	0	0	0	textile dyes	
Hole Brook/R.Darwen	15 years intermittent	3.3 km	5	0	0	0	0	paper mill	G-Pressure Groups M-MP's O-Others
R. Yarrow	1988 to date	6.7 km	4	0	0	0	0	carpet dyes	
Pearl Brook/R.Douglas	1985 to date	38.5 km	20	0	0	1	0	textile dyes	
R. Tawd	1985 to date	7.8 km	10	0	0	1	1	sewage overflow	
R Mersey	> 15 years	11.5 km	25	few	2	2	1	dye mfr.	
Mersey Estuary	> 15 years	16.5 km						as above	
Manchester ship canal	>15 years	27.0 km						as above	
R. Goyt	> 10 years	25.4 km	10	1	2	2	2	kier liquors & textile dyes via STW	
Black Brook	> 20 years	3.5 km	10	0	2	1	1	textile dyes	
R. Roch	1990 onwards	15.2 km	1-2	0	0	0	0	textile dyes	
R. Tame	> 10 years	14.0 km	<5	0	0	0	0	sewage mfr	
Eagley Brook	>10 years & deteriorating	13.2 km	25	0	1	1	1	textile dyes & paper dyes	
R. Irwell	last few years intermittent	21.0 km	40	<5	few	1	2	textile dyes	
R. Bollin	> 10 years	5.7 km	<5	0	0	0	0	textile dyes	
Westleigh Brook	10 years	5.6 km	10	0	0	0	1	textile dyes	
Chew Brook/ R. Tame	> 10 years	2.0 km	5	0	0	0	0	cigarette paper mfr	

Maximum length affected & grid references

Watercourse	Affected length and grid refs.
Ghyll Beck/Westnewton Beck	4.6 km NY162 436 - NY126 436
Scarth Hole (Tidal Water)	300m diameter plume at SD185 735
R. Keekle	10.9 km NY023215 NY011 129
Black Clough and R. Calder	6.3 km SD866 278 - SD849 321
Colne Water/ Pendle Water	9.5 km SD870 395 - SD827 349
Stock Beck (trib. of Ribble)	3.7 km SD878 480 - SD856497
Hole Bk/ R. Darwen	3.3 km SD605 294 - SD587 279
R. Yarrow	6.7 km SD563 173 - SD515 178
Bradley Brook	2.2 km SD568 112 - SD579 101
Pearl Brook/ R. Douglas	38.5 km SD620 111 - SD465 189
Union Bank Brook	1.5 km SJ522 902 - SJ534 896
R. Tawd	7.8 km SD488 060 - SD476 126
Smithy Brook	3.3 km SD553 034 - SD575 047
Down Brook	11.0 km SD548 007 - SJ594 956
Yellow Brook	0.4 km SD589 071 - SD587 070
R. Mersey	11.5 km SJ682 889 - SJ616 877
Mersey estuary	16.5 km SJ616 877 - SJ508 835
Manchester Ship Canal	27.0 km SJ758 966 - SJ494 820
R. Goyt	25.4 km SK011 833 - SD897 908
Black Brook	3.5 km SK046 821 - SK016 824
Slack Brook	2.5 km SD783 025 - SD801 023
R. Sett	1.5 km SK005 863 - SK000 852
R. Roch	15.2 km SD885 125 - SD802 073
R. Irwell	9.5 km SD868 267 - SD831 217
Lydgate Brook	0.5 km SD944 173 - SD943 169
Ealees Brook	2.0 km SD954 160 - SD939 163
Naden Brook	2.5 km SD854 134 - SD850 119
Stanney Brook & R. Roch	4.7 km SD909 135 - SD882 125
R. Medlock	7.0 km SD939 024 - SJ897 997
R. Tame	14.0 km SJ938 949 - SJ897 908
Eagley Brook	13.2 km SD685 158 - SD747 061
R. Irwell	21.0 km SD794 204 - SD837 990
Trent and Mersey Canal	2.5 km SJ837 542 - SJ832 560

Valley Brook	5.0 km SJ823 520 - SJ792 550
R. Bollin	5.7 km SJ898781 - SJ860810
Bridgewater Canal	10.0 km SJ776 970 - SJ703 998
Westleigh Brook	5.6 km SD650 035 - SJ649 990
Chew Brook/ R. Tame	2.0 km SE0075 0398 - SD9912 4300

Cause of problem:

The causes of the colour problems in the watercourses are given below.

Ghyll Beck/Westnewton Beck - For most of the time this stream is clear. The colour problem is from the river bed which is covered in ferric hydroxide. This is due to the disturbance of and old coal spoil from drainage improvement work in the area.

Scarth Hole (Tidal Waters) - Trade effluent from a tissue paper mill gives rise to a variety of colours depending on the product colour.

R. Keekle - The problem is due to ochre from old spoil heaps and abandoned mines.

Black Clough and R. Calder -Minewater from abandoned Deerplay Colliery

Colne Water/ Pendle Water - Colne STW receives effluent from a textile mill which dyes cloth, the final effluent from the sewage works is often dark blue.

Stock Beck - (trib. of Ribble) Barnoldswick STW final effluent is discoloured blue by trade effluent, printers and dyers discharge to the STW.

Hole Bk/ R. Darwen - Blackburn STW receives effluent from a paper mill and other traders, the final effluent is often red.

R. Yarrow - Chorley STW final effluent is the problem and the suspected cause of this is trade effluent from carpet dying.

Bradley Brook - Minewater from an abandoned mine is the cause.

Pearl Brook/ R. Douglas also Leeds/Liverpool canal - Horwich STW has problems with cloth dyeing, the effluent is generally red.

Union Bank Brook - British Coal's Sutton Manor Colliery was an active mine until June 1991 and there is still some ochre discharge. The discharge was expected to cease around October 1991.

R. Tawd - The problem is intermittent from storm sewage overflows and spillage's on Skemersdale industrial estate.

Smithy Brook - Minewater drainage from disused Summersales Colliery (Wigan) and Pemberton spoil heap, again ochre is the problem.

Down Brook - Quaker House Colliery is an active mine and it discharges several diffuse inputs of ochre from abandoned mineworkings.

Yellow Brook - The problem is minewater from Aspel Slough.

R. Mersey, Mersey estuary and Manchester Ship Canal - Davyhulme (Manchester's main) STW final effluent receives a large amount of trade effluent. The source of the problem is thought to be due to one particular dye manufacturer. Problem is usually red dye.

R. Goyt - Whaley Bridge STW receives kier liquors in trade effluent and these are little affected by the sewage treatment process. Another problem is from a printing company but this effect is masked from the input upstream by Whaley Bridge STW.

Black Brook - Treated textile effluent from Dorma Sheets Ltd appear to cause the problem the pollution control officer has the view that optical (enhancers) dyes add to the problem.

Slack Brook - Minewater and/ or tip leachate cause the problem.

R. Sett - Problems are from natural ochre drainage.

R. Roch - Rochdale STW final effluent is the problem. The STW receives trade effluent from a textile dyer. The water quality upstream of Rochdale STW is also a problem due to the input from Stanney Brook.

R. Irwell - Minewater from abandoned collieries, Deerplay Colliery and more significantly Old Meadows Colliery.

Lydgate Brook - The problem is from natural ochre drainage.

Ealees Brook - Problems are from natural ochre drainage.

Naden Brook - Intermittent outbreaks of ochre from springs.

Stanney Brook & R. Roch - Inputs of ochre from diffuse sources into Stanney Brook has a significant impact on the R. Roch downstream.

R. Medlock - Natural ochre and tip drainage cause the problems

R. Tame - Hyde STW final effluent gives the colour problem, the trade effluent causing the colour problem is unknown. The problem has been reduced in recent years.

Eagley Brook - The problem is with Belmont STW final effluent which receives trade effluent from a bleaching and dyeing works. In the past Charles Turners Paper Mill also caused problems with the colour in the river.

R. Irwell - Rossendale STW final effluent which receives dye waste from several small textile companies.

Trent and Mersey Canal - Problems are from natural ochre inputs.

Valley Brook - Problems are from natural ochre inputs.

R. Bollin - Macclesfield STW final effluent is the problem, the STW receives

textile wastes.

Bridgewater Canal - Abandoned mineworkings cause the problem.

Westleigh Brook - Westhoughton STW final effluent is the problem, the STW receives dye wastes.

Chew Brook/ R. Tame - The problem is due to effluent from a cigarette paper manufacturer.

How the watercourse was affected:

Ghyll Beck/Westnewton Beck - the amenity quality of the water is affected.

On Scarth Hole (Tidal Waters) - adverse effect on amenity value is seen. It is in a nature reserve, is a fish spawning area and is used for boating.

R. Keekle - the general amenity quality of the water is affected and also it adversely affects a fishery.

Black Clough and the R. Calder - there is an extreme visual impact and there is also suppression of the invertebrates by the ochre blanketing the bed.

Colne Water/ Pendle Water - the visual impact detracts from the amenity value of the watercourse.

Stock Beck (trib. of Ribble) - the visual impact affects the amenity quality of the water. Only a slight problem at present.

On Hole Bk/ R. Darwen - adverse effect on amenity value.

R. Yarrow - there is an intermittent adverse effect on amenity value.

Bradley Brook - an adverse effect on amenity value will increase due a new golf course.

Pearl Brook/ R. Douglas - an adverse effect on amenity value is seen due to red discoloration.

Union Bank Brook - adverse effect on amenity value.

R. Tawd - adverse effect on amenity value.

Smithy Brook - adverse effect on amenity value. This runs through a highly populated area in an open public space

Down Brook - adverse effect of ochre on the watercourse reducing the amenity value.

Yellow Brook - adverse effect on amenity value is seen as a marked discoloration of a small stream in a public park.

R. Mersey/Mersey estuary/, M.S.Canal - adverse effect on amenity value is seen because of foam at Howley weir which is often pink. In 1989 complaints were received about the water in the Mersey estuary (39 km below Davyhulme sewage treatment works), and complaints about the Manchester Ship Canal (MSC) were received from abstractors at Runcorn.

R. Goyt - an adverse effect on amenity value along riverside walks is seen. The river is dark brown on occasion.

Black Brook - adverse effect on the amenity quality of the water.

Slack Brook - is bright orange, however, there are no complaints since there is little public access to it.

R. Sett - is orange due to ochre and often looks cloudy, the river is visually poor and passes through a very high amenity area.

R. Roch - adverse effect on amenity value.

R. Irwell - adverse effect on the amenity quality of the water prevents the establishment of a thriving fishery in this reach.

Lydgate Brook - adverse effect on amenity value and ecology is due to the blanketing effect of ochre on the river bed.

Ealees Brook - adverse effect on amenity value.

Naden Brook - adverse effect on amenity value is seen and again the ochre stains the river bed.

Stanney Brook & R. Roch - adverse effect on amenity value is seen as Stanney Brook has a bright orange bed. The R. Roch is murky green downstream of Stanney Brook.

R. Medlock - adverse effect on amenity value is seen as the river runs through a country park. The river bed has ochre deposits and often has a cloudy appearance.

R. Tame - adverse effect on amenity value.

Eagley Brook - adverse effect on amenity value.

R. Irwell - flows through high amenity areas, in the past colours have ranged from red-blue-purple-black. One abstractor complained that his pretreatment costs were affected.

Trent and Mersey canal - adverse effect on the amenity quality of the water by ochre and fisherman complain that ochre affects the fishing.

Valley Brook - adverse effect on amenity value but it is not considered a serious problem.

R. Bollin - slight affect on amenity use.

Bridgewater Canal - is bright orange due to ochre and there is therefore an adverse effect on its amenity use.

Westleigh Brook - the coloured watercourse runs through a golf course and an adverse effect on amenity value is seen.

Chew Brook/ R. Tame - adverse effect on amenity value as the river is white and turbid on occasions.

Is the problem monitored:

Action taken to monitor the problems on the various watercourses is shown below:-

Ghyll Beck/Westnewton Beck - samples are taken for pH and Fe analysis.

Scarth Hole (Tidal Waters) - photographs have been taken. Now starting to make videos of the problems.

R. Keekle - photographs taken. Videos likely to be taken.

Black Clough and R. Calder - samples taken for Fe analysis and photographs have been taken in the past.

Colne Water/ Pendle Water - samples have been taken for colour analyses.

Stock Beck (trib. of Ribble) - no monitoring done as yet.

Hole Bk/ R. Darwen - colour samples have been taken in the past.

R. Yarrow - colour samples have been taken of Chorley sewage treatment works final effluent.

Bradley Brook - none.

Pearl Brook/ R. Douglas - samples are collected for colour analyses and photographs are taken.

Union Bank Brook - samples are taken for Fe determination.

R. Tawd - occasional samples are taken.

Smithy Brook - routinely sampled but not for colour.

Down Brook - consented discharge monitored for iron.

Yellow Brook - discharge monitored.

R. Mersey/Mersey estuary/M.S.Canal - occasional colour samples taken and photographs.

R. Goyt - photographs and colour samples taken.

Black Brook - routine colour samples are taken.

Slack Brook - no monitoring done.

R. Sett - photographs taken.

R. Roch - routine colour samples are taken.

R. Irwell - samples and photographs taken to record the problem. Fe analyses are made.

Lydgate Brook - routinely sampled for Fe

Ealees Brook - none.

Naden Brook - none.

Stanney Brook & R. Roch - sampling underway 1991.

R. Medlock - none.

R. Tame - colour samples are taken from STW and R. Tame downstream.

Eagley Brook - colour samples are taken routinely.

R. Irwell - routine colour samples are taken with occasional photographs.

Trent and Mersey canal - none.

Valley Brook - none.

R. Bollin - occasional colour samples taken.

Bridgewater Canal - none.

Westleigh Brook - a few colour samples and photographs are taken.

Chew Brook/ R. Tame - colour samples are taken.

Actions taken:

The following actions were taken to overcome the colour problem.

Ghyll Beck/Westnewton Beck - initially barriers were created and liming introduced to precipitate ferric hydroxide. This was partially successful in the summer period. Consultants have been now being employed by owners of local woods and it appears as though the stream may have to be diverted around the coal spoil to improve matters.

Scarth Hole (Tidal Waters) - additional treatment plant is being installed (this is not specifically for colour) and it should lead to visual improvement

R. Keekle - spoil heaps are to be removed and buried in 6 years time as part of an open cast coal reclamation scheme.

Black Clough and R. Calder - pilot plant studies were undertaken by the Lancashire River Authority into pH adjustment and polyelectrolyte addition in 1975. An alternative solution considered by the North West Water Authority involved diverting flows from the colliery to a foul sewer - this was rejected because of the costs involved and the allocation of responsibility for paying contributions.

Colne Water/ Pendle Water - pressure has been put on North West Water Ltd. who have carried out studies with traders to control colour. The problem was partially resolved by polyelectrolyte addition.

Stock Beck (trib. of Ribble) - North West Water Ltd. have been requested to impose tighter control on traders.

Hole Bk/ R. Darwen - requests for better trade effluent control from North West Water Ltd. have been made but little if any noticeable change.

R. Yarrow - pressure has again been put on North West Water Ltd. to control colour from traders.

Bradley Brook - none.

Pearl Brook/ R. Douglas - following pressure from the NRA - North West Water Ltd. issued a trade effluent consent with colour limits. The company involved in cloth dyeing moved to an alternative dye which reduced but did not eliminate the problem.

Union Bank Brook - modification in operational practices at mines to avoid blockages of pumps resulted in better quality discharge from the settlement lagoon to the water course.

R. Tawd - West Lancs District Council pursued first flush interception of surface water flows for the industrial estates drainage. North West Water Ltd. trade effluent section have carried out surveys to determine and eliminate wrong connections in the sewers.

Smithy Brook - none.

Down Brook - none.

Yellow Brook - none.

R. Mersey/Mersey estuary/M.S.Canal - North West Water Ltd. have been informed of the need to reduce colour and this has been relayed back to the industrial concern thought to be the main source of the problem. North West Water Ltd. are aware that colour standards will be imposed if the situation does not improve. Recently colour problems in Warrington have reduced - but it is not known if this is a permanent or temporary change. (*Negotiations underway in 1993 regarding colour standards to be met. Large dye manufacturers commenced colour removal for identified problem dyes after severe pollution incident followed by increased NRA pressure)

R. Goyt - intermittent discharges to the R. Goyt from E. Halls have been controlled by diversion to the sewer. Current dischargers have been informed of the NRA's intention to impose a colour standard in 1993 if no action taken to improve situation.

Black Brook - the trader in question have been made aware of the need for colour control and that colour standards will be imposed in 1993 if necessary. There has been a recent improvement in terms of river colour but it is still unsatisfactory. (*Negotiations underway in 1993 regarding colour standards to be imposed). (*In 1992 a new trade effluent plant was commissioned at Dorma sheets which includes colour removal by polyelectrolyte addition and dissolved air floatation. This has resulted in significant improvements in terms of colour in Black Brook).

Slack Brook - none.

R. Sett - none.

R. Roch - pressure has been put on North West Water Ltd. to control the trader prior to transfer from Rossendale sewage treatment works to Rochdale sewage treatment works. Colour standards have been imposed by North West Water Ltd. trade effluent section on the trader - this has only been partially successful.

R. Irwell - none.

Lydgate Brook - none.

Ealees Brook - none.

Naden Brook - none.

Stanney Brook & R. Roch - investigations are underway to trace the source of visual and water quality problems.

R. Medlock - tip drainage has been pumped to the sewer and colour has been reduced.

R. Tame - (Hyde STW) intermittent problem no actions have been taken.

Eagley Brook - improvements at the Charles Turner paper mill in dye usage led to improvement in the river downstream. However, the problem at Belmont sewage treatment works appears to have become worse recently. (*Provisional colour standards were set for Belmont STW in 1993 and an agreement reached with NWW Ltd that colour conditions can be imposed at six months notice if the problem is not resolved quickly).

R. Irwell - a monitoring exercise has led to the formulation of colour standards for the R. Irwell. Discussion with North West Water Ltd. led to colour conditions being imposed on traders discharging dye wastes to Rossendale sewage treatment works.

Improvements have been seen but the problem is not completely resolved. At the time of imposition of colour conditions a major trader transferred to Rochdale sewage treatment works and this may account for much of the improvement. One of the traders has been prosecuted by North West Water Ltd. for failing to comply to the consent.

Trent and Mersey canal - none.

Valley Brook - none.

R. Bollin - none because of substantial improvements in recent years. (* In 1993 colour problems appeared to get worse and NWW Ltd are pursuing trade effluent control measures following pressure from the NRA).

Bridgewater Canal - none.

Westleigh Brook - the problem has been highlighted to the trade effluent section of North West Water Ltd.

Chew Brook/ R. Tame - alteration of the method of trade effluent treatment. Acid addition has been used to dissolve chalk. The situation has been much improved but not completely resolved.

Is colour measurement made:

The NRA North West Region measures colour by making absorption measurements using a Hewlett Packard Diode Array spectrophotometer. The wavelengths (nm) at which absorptions were recorded (though the spectrum is continuous from 400 to 700) are at 400, 410, 460, 510, 540, 570, 620, 670 and 700.

The absorbances are measured for filtered and unfiltered samples. Recently river depths have been estimated when colour samples have been taken together with observations regarding the acceptability of river appearance.

Treatment of samples:

Samples are always filtered and within the last year the spectra of both unfiltered and filtered (0.45µm membrane) samples were determined. (* In 1993 decision taken to analyse filtered samples only). The unfiltered samples once in the lab are stored in a chilled, dark and raw state. The maximum time for analysis is usually 24 hours but it can be up to one week. Some investigations have been conducted on sample stability which showed that colour loss can occur after two days. This colour loss is variable, but it can be significant.

Colour units used:

The results are expressed as absorption per unit length.

The path length used for expression of absorption is 1cm.

The actual path length used for measurement is 4cm and these are converted into absorbances per cm.

Guidelines set for the determination of colour standards:

Internal investigations have been conducted into colour standards.

1) North West Water Ltd. trade effluent staff carried out a study in order to set a colour consent on a trader proposing to discharge waste from a new textile process (Dec. 1988). Red, yellow and blue dyes were provided by the trader and were diluted by what the North West Water Ltd. staff considered to be the maximum tolerable optical density. The values arrived at were:-

wavelength nm	435	570	620
absorption cm^{-1}	0.025	0.007	0.025

The consent was not issued as the trader did not follow through with his proposal.

2) The NRA North West Region (and earlier North West Water Authority) carried out a regular programme of routine monitoring and occasional special surveys. Using the results of spectra (filtered samples) in combination with samplers comments on the river appearance, provisional values for acceptable absorbances in the rivers under investigation were arrived at by NRA North West Region as follows:-

wavelength nm	400-440	441-480	481-620	621-700
absorption cm ⁻¹	0.03	0.02	0.007	0.005

These values are absolute and do not take into consideration the upstream river colour.

In 1991 a descriptive consent condition was considered though it has not been imposed. This stated that any discharges from the premises should have no adverse impact on the colour of the receiving watercourse. This was not imposed because of possible enforcement problems. At present, NRA NW has not set colour consents for discharges to the rivers directly but has agreed provisional standards for river colour with NWW Ltd. North West Water Ltd. has imposed colour limits on several traders at Rossendale STW and traders at Rochdale and Horwich STW to meet these standards. These were calculated for low flow conditions (95% exceedence) when colour problems are most likely to occur using a mass balance approach, splitting the available colour load between the traders in relation to their consented figures.

Thus estimates of an acceptable colour load burden for the river downstream of the sewage works discharge in question has been calculated using the provisional river standards. The colour load upstream of the discharge is subtracted leaving a maximum sewage works colour load which is then split by North West Water Ltd. between the relevant traders with coloured discharges.

Examples of colour consent set by the North West Water are shown below:-

For Broadclough, Kearns OCW, James Dewhurst, Wills Fabrics and others the following conditions applied.

After filtration through a 0.45 micron filter the effluent shall not have an optical density of more than the following values when measured in a 1cm cell against deionised water.

wavelength nm	400-440	441-480	481-570	571-700
Optical Density cm^{-1}	0.40	0.30	0.06	0.10

If the colour in the trade effluent is removed by the sewage treatment process operated at Rossendale STW then the above conditions shall not apply. North West Water Ltd. have successfully prosecuted traders for failing to meet the conditions of a colour consent.

Awareness of colour removal techniques:

A trial was undertaken at Rossendale STW using a polyelectrolyte to attempt to take colour out of the effluent, this was unsuccessful (the trial was very short term). It is known that several traders use hydros (sodium dithionite) to reduce colour prior to discharge to sewer.

Region:

NRA Severn Trent Region

Respondent:

P. Whalley

Phone Number:

021-7112324

Problems:

River problems serious localised, and widespread. There are no estuary problems.

Period of problem:

Colour has been a long-standing problem.

The Waters Affected:

R. Anker, Bentley Brook, R. Soar and Grand Union Canal, R. Amber and Alfreton Brook, R. Churnet, R. Sence, R. Erewash, Erewash Canal.

Maximum length affected

Total length affected is 63 km

Cause of problem:

R. Soar - textile dyes discharged to STW at Loughborough via Wood Brook, Leicester (Wanlip) and Wigton via R. Sence).

NGR: SK 593 127 - SK 495 273

The Grand Union Canal has the same problem as the R. Soar.

R. Erewash - has the same problem as the R. Soar with the STW effluent coloured at Pinxton, Pye Bridge and Milnhay STW's. the Erewash Canal is affected by the same discharges as the R. Erewash.

NGR: SK 460 546 - SK 485 381

R. Amber/ R. Derwent - problems from treated dye wastes discharged direct from Stevensons Ltd. and Drabbles Ltd. (to Bentley Brook a tributary of the R. Derwent).

NGR: SK 385 564 - SK 349 515

Alfreton Brook has the same problems as the R. Amber (effluent from Stevensons Dyers, Ambergate).

R. Anker - Textile dyes via Hinkley STW.

R. Churnet - problems with coloured sewage effluent from Leek STW derived from approximately nine traders. Direct discharge from Joshua Wardle is also a problem.

Maximum complaints in one year:

Watercourse	R. Soar	R. Erewash	R. Amber	R. Churnet
Public	50	12-24	12	50+
Industrial Abstractors	-	-	1	-
Pressure Groups	-	-	-	2
MPs	Yes	-	Yes	Yes
Abstractors		BWB	Severn Trent Water	-
Others	Yes	Derbys. C. Council	Derbys. C. Council	Parish Council, Anglers

How the watercourse was affected:

Principal complaints are from the aesthetic and amenity viewpoint.

The discoloration for the R. Soar is dark blue to black.

The R. Erewash has a red/blue black colour.

R. Amber - can affect R. Derwent which is used as a major PWS source for Derby, Nottingham and Leicester.

The R. Amber used to be pink or rose but is now purple like ribena.

The R. Churnet is red but looks black in depth, it has been red for 2-3 years.

Is the problem monitored:

All sites are sampled. The R. Churnet has been photographed in addition. All sites have regular inspection.

Actions taken:

R. Soar - no action has been taken to date but standards are soon to be introduced.

R. Erewash the problem has developed over the last seven years. Another apparent problem is the dyeing of stones in the stream bed. (*colour standards have since been derived).

R. Amber - long term negotiation has been conducted with Stevensons. Treatment for colour is done on a well purified effluent with a polyelectrolyte and air flotation. No oxidants are used. The problems relate to the type of dyes used on fashion fabrics (reactive dyes). Reactive dyes are in solution which makes them difficult to treat.

R. Churnet - has the same problem with reactive dyes and for this river Severn Trent Water are considering the use of ozone at their Leek STW. (*since done) (*Alfreton Brook -consent for Alfreton STW reviewed to include colour standards 1993).

Is colour measurement made:

The colour of the samples is measured together with a subjective assessment at the time of sampling. The colour determination is carried out using absorption measurements from 400 to 800nm at 50 nm intervals.

Treatment of samples:

Samples are filtered in the lab before analysis using a 0.45µm membrane. The samples are stored in the dark, chilled, as taken state with the maximum time before analysis being approximately 24 hours.

Colour units used:

The units are finally expressed as absorbance cm^{-1}

Guidelines set for the determination of colour standards:

The subjective assessment of acceptable colour has been done for each site, measurement of the absorbance then used to give the standard. This was loosely based on an 18 inch depth of water with no significant colour. Any standard is absolute and not relative to its upstream colour in this case. This has been done several times for different rivers. For Leek STW samples of the effluent were photographed and for the times when no complaint was received or effluent considered acceptable the absorbance of these samples was used as a basis for derivation of a standard for the effluent.

The current limitations imposed for discharge consents are given in chapter 3 of volume 1 of this report.

Awareness of colour removal techniques:

Colour removal techniques were listed in general and included biological treatment then polyelectrolyte or alum dosing followed by separation of flocculated colour by settlement or air flotation. Alternatives are treatment by sand filtration to produce high quality effluent then ozone dosing. No information on pretreatment methods used at companies.

Region:

NRA South West Region

Respondent:

King Ming Lee

Phone Number:

0392-444000

Problems:

Slight problems with rivers, no estuary problems.

Period of problem:

June, July and August 1986. Frequent problems are also found with rain after droughts associated with peat.

The Waters Affected:

R. Exe (Devon) - many rivers are affected on Dartmoor and Bodmin Moor by the peat problem. Also the Red River suffers from the problem of red coloration which is linked with previous discharge from a tin mine.

Maximum length affected

R. Exe - 8 km

Cause of problem:

The problem on the R. Exe is a direct discharge from J. Heathcoats, Tiverton, Devon (Textile Manufacturers).

Maximum complaints in one year:

Public	20
Industrial Abstractors	0
Pressure Groups	0
MPs	0
Others	1

How the watercourse was affected:

Effect is on the amenity use only with red colours normally being the problem. There was said to be no environmental effect since the problem is purely a visual one.

Is the problem monitored:

Samples are taken and absorbance measured. All major discharge sites are visited every two weeks with a minimum of twelve samples a year being taken. However this does not result in routine colour analysis, colour is only measured if specifically asked for.

Actions taken:

J. Heathcoats installed a chemical flocculation plant (copperas) to remove the colour. This was successful.

Is colour measurement made:

Absorption measurements at 400nm are performed.

Treatment of samples:

The samples are always prefiltered through a 0.45µm membrane. The samples are stored in dark, chilled, raw conditions, the maximum time before analysis being 24 hours.

Colour units used:

Hazen units are used.

Guidelines set for the determination of colour standards:

Previously the South West Water Authority have produced a report concerning discharges from paper mills in the R. Culm catchment, recommendations are published as a WRC technical report. At the present time no discharger has standards stipulated on their consent.

Awareness of colour removal techniques:

Colour reduction technology in this region is used by J. Heathcoats Ltd., Tiverton Devon on cloth dyes, the treatment method being copperas precipitation (ferrous sulphate). The St. Regis Paper Co. Higher Kings Mill, Cullumpton, Devon use activated sludge and paper recycling

Region:

NRA Southern Region, E. Sussex

Respondent:

I. Gascoine

Phone Number:

0903-820692

Problems:

Rivers have a slight colour problem but there are no estuary problems.

Period of problem:

Intermittent over a long period of time.

The Waters Affected:

R. Test and R. Itchen.

Maximum length affected

No information about affected length.

Cause of problem:

The problem is caused by the use of malachite green to control diseases at fish farms.

Maximum complaints in one year:

Public	3
Industrial Abstractors	0
Pressure Groups	0
MPs	0
Others	0

How the watercourse was affected:

Basic amenity use.

Is the problem monitored:

No monitoring done.

Actions taken:

Fish farmers have been asked to treat fish during hours when the

visual effects of the discharge are minimised.

Is colour measurement made:

The colour is measured using absorption techniques.

Treatment of samples:

The samples are filtered and stored in the dark, chilled and raw state, the maximum time before analyses is unknown. No investigations have been conducted into sample stability.

Colour units used:

The results are expressed in Hazen units.

Guidelines set for the determination of colour standards:

No internal investigations have been carried out, but it is currently the subject of WRC proposals for the development of EQS for basic amenity use. No standards are currently set though turbidity is consented at + 2.0 JTU (differential) for fish farms.

Awareness of colour removal techniques:

N/A

Region:

NRA Thames Region

Respondent:

J.W. Eastwood

Phone Number:

0734-535382

Problems:

The river problems have a slight impact but are widespread; there are no estuary problems.

Period of problem:

Since 1990.

The Waters Affected:

Cherwell/Oxford canal.

Maximum length affected

200 metres.

Cause of problem:

The colour problem is caused by Coffee & Tea in the Witney STW final effluent.

Maximum complaints in one year:

Public	0
Industrial Abstractors	0
Pressure Groups	0
MPs	0
Others	1

How the watercourse was affected:

Amenity value affected

Is the problem monitored:

The water is monitored by observation.

Actions taken:

A change in treatment has been made.

Is colour measurement made:

The extent of the sample discoloration is measured by absorption at 405nm.

Treatment of samples:

The samples are filtered using a 0.45 micron membrane filter and they are stored in the dark.

Colour units used:

The results are expressed in degrees Hazen.

Guidelines set for the determination of colour standards:

No previous guidelines or investigation have been carried to define colour standards. The current standard is set as an optical density measurement at 0.03 cm^{-1} at 490nm after filtration of the sample.

Awareness of colour removal techniques:

No awareness of colour reduction technology being used.

Region:

NRA Wessex Region

Respondant:

I. Nutter

Phone Number:

0278 457333

Problems:

There are slight problems with both rivers and estuaries.

Period of problem:

February 1991

The Waters Affected:

Estuary - Holes Bay, near Poole in Dorset. All of the bay was affected. NGR SZ 0050 9270 /SZ 0100 9030

Maximum length affected

Approximately 2 sqkm

Cause of problem:

Drums of rhodamine were washed out into the foul sewerage system by accident. The discharge from the sewage works caused discoloration for approximately one day.

Maximum complaints in one year:

Public	6
Industrial Abstractors	0
Pressure Groups	0
MPs	0
Others	1

How the watercourse was affected:

The amenity quality was affected.

Is the problem monitored:

An aerial survey was undertaken to monitor the progress of the incident.

R&D Project Record P2/i275/1

Actions taken:

NRA action was directed against the water company responsible for the water treatment plant. The problem has been resolved and the industrial premises involved has taken action to ensure that the problem will not recur.

Is colour measurement made:

The extent of discoloration is measured using absorption at 400nm.

Treatment of samples:

Samples are filtered through a 0.4 micron membrane and stored as raw samples in dark, chilled conditions. The maximum time before analysis was unknown.

Colour units used:

The results were expressed in Hazen units.

Guidelines set for the determination of colour standards:

No internal investigation or guidelines have been set with respect to acceptable standards. However consent conditions are applied to discharges on fish farms. These standards are usually comparative with respect to upstream quality and are expressed as degrees Hazen. The standards which have been applied are in the order of 6 -15 Hazen units and expressed as maximum limits. The consents are monitored by taking snap samples on a routine basis.

Awareness of colour removal techniques:

No methods of colour removal are mentioned.

Region:

NRA Yorkshire Region

Respondant:

C. Urquhart

Phone Number:

0532 440191

Problems:

There is a moderate colour problem with rivers but no colour problems with estuaries. The colour problems are both widespread and localised. (*In addition to problems caused by dischargers from trade/sewage works listed in this response are extensive problems due to ochre from various sources and also general coloration of many rivers due to ochre from various sources and also general coloration of many rivers due to natural sources following drought periods).

Period of problem:

1980 onwards

The Waters Affected:

R. Calder, R. Dearne, R. Doe Lea and the R. Wharfe.

Maximum length affected

R. Calder 45 km

R. Dearne 10 km SE327 089 SE376 065

R. Doe Lea 7.4 km

Cause of problem:

R. Calder - brown discoloration from Huddersfield STW final effluent, due to chemical trade effluent problems.

R. Dearne - Darton STW final effluent affected by trade effluent from a carpet manufacturer.

R. Doe Lea - Coalite Chemicals, Bolsover biological effluent treatment plant.

R. Wharfe - blue discharge from a paper mill.

R&D Project Record P2/i275/1

Maximum complaints in one year:

Watercourse	R.Calder	R.Dearne
Public	1	2
Industrial Abstractors	0	0
Pressure Groups	1	0
MPs	1	0
Others	0	0

R. Doe Lea has a total of ten complaints per year for all groups.

R. Wharfe has no complaints.

How the watercourse was affected:

R. Calder - the effects are very limited at the moment due to the present river classification at class 3 or 4. The problem will become more significant when class 2 quality is achieved.

R. Dearne - reduces amenity value and the effects are also felt by fisheries and industrial abstractors.

R. Doe Lea - amenity and fisheries are effected, the effluent discharge produces a class 4 river. Once restored to class 2 colour will become a higher priority.

R. Wharfe - adverse effect on amenity value.

Is the problem monitored:

A study has been done on the R. Calder in 1982.

Monitoring on the rivers has been done and chemical analyses and photographs have been taken on the R. Dearne.

Actions taken:

R. Calder - Yorkshire Water Authority imposed a consent on the discharge to the sewer. This was difficult to enforce. An agreement was reached with the company that when manufacturing dyes, especially reds, the effluent would be collected in emergency tanks or decolorised.

R. Dearne - referral to Yorkshire Water Services has been made.

R. Doe Lea - planned programmes of improvements to class 2 by 1994 have been agreed. The company is to pre-treat coloured process effluents by coagulation/flocculation and settlement prior to biological treatment.

R. Wharfe - a colour monitor based on a Kontron UV/VIS spectrophotometer was developed. This product is now marketed under an agreement between Kontron's parent company and Yorkshire Water.

Is colour measurement made:

The colour is measured using absorption at 400nm.

Treatment of samples:

Samples are stored in dark, chilled raw conditions, and filtered before analysis. The maximum time before analysis is unknown.

Colour units used:

The final units used are absorption per unit length with a path length of 1.0cm

Guidelines set for the determination of colour standards:

In 1982 YWA suggested a consent for a trade effluent to Huddersfield sewage treatment works. The colour problem was due to a red dye. Samples of trade effluent and sewage works effluent and the R. Calder above and below the discharge points were taken on a weekly basis over one year. Samples were filtered and scanned between 400-800 using a 1cm cell.

Absorbance was measured at 20nm intervals over the range 420-600nm. The basis of the consent was decided on considering two possible methods. a) There should be no peak or shoulder on the absorbance curve which exceeded a certain percentage of the background

absorbance. b) That the absorbance should not exceed the 95 percentile absorbance by more than 25% at any point between the continuous curve obtained by plotting the following proportion of the measured absorbance at 420nm.

wavelength (nm)	proportion
460	0.6
500	0.4
540	0.3
600	0.2

Under the terms of this proposed consent the test is to basically check whether the colour of Huddersfield's STW final effluent was changed. Thus the phrase "comparable deviation" is the crucial wording. The firm's effluent and Huddersfield STW must be compared with each other (the STW effluent being its normal colour). Background levels are compared, the idea being that the firm's and normal STW effluent (normal is defined as before the STW is affected by dye) will have similar deviations in their background spectra. Once established the firm's data can be checked to see if it complies with the terms of the consent.

Awareness of colour removal techniques:

The NRA Yorkshire region is aware of a coagulation/flocculation and settlement to process chemical effluent for Coalite Chemicals. Though no standard has been set an agreement to reduce colour has been made.

Region:

Clyde River Purification Board

Respondant:

Robert Kerr

Phone Number:

0292-26407

Problems:

None, the rest of the questionnaire was therefore left blank.

Region:

Forth River Purification Board.

Respondant:

D. Cambell

Phone:

031-449-7296

Problems:

Moderate river problem, slight estuary problem. The colour problems are both localised and widespread.

Period of problem:

R. Almond -frequent incidents up to 1990

South Queich - irregular incidents

Canal Burn - continual problem

Forth estuary- irregular

Firth of Forth - over several years.

The Waters Affected and Maximum length affected:

R. Almond - 6 km. NT 078 682 - NT 114 721

South Queich - 250 m. NO 121 015 - NO 123 015

Canal Burn - 1.6 km. NS 925 897 - NS 918 885

The Forth estuary - 3km. NS 945 844

The Firth of Forth - 100m at NT 132 824 and 3 km at NO 384 002.

Cause of problem:

R. Almond - dye works discharging to sewage works. Textile effluent is almost 5% of sewage flow of 5-7Ml, diluted in river approximately 3:1.

South Queich - woollen mill, the problem is particularly red and purple dyes.

Canal Burn - dyes from a paper mill.

The Forth estuary - chemical company manufacturing dyes.

The Firth of Forth - dyes used in paper making.

Maximum complaints in one year:

R. Almond - 15 complaints from the public in one year and MPs are involved in the general condition of the river.

South Queich- 2 public complaints and 2 from fisheries per year.

Canal Burn - 4 complaints from the public per year.

The Forth estuary - 4 complaints from the public per year.

The Firth of Forth - 100 affected stretch - 4 complaints per year
- 3 km affected stretch - long-standing problem, accepted by locals
but visitors complain

How the watercourse was affected:

R. Almond - there is a country park downstream of the sewage works. The public are very concerned about the detrimental effect of colour on this amenity.

Other watercourses - reduction in amenity value.

Is the problem monitored:

R. Almond monitoring is done by absorption analysis.

Actions taken:

R. Almond - guidance has been given to the drainage authority and a guideline consent condition for colour. A time scale has been agreed with the trade effluent discharger for the investigation of treatment processes for removing colour and installing a trade effluent plant.

South Queich - problems were resolved when a trade effluent treatment plant was installed. Balancing followed by polyelectrolyte addition and clarification. No colour

standard has been set. The trade effluent plant was installed to meet water quality standards and colour reduction has been a spin off of this.

Canal Burn - effluent plant installed to improve effluent quality but due to lack of dilution the problem of colour still remains. Extension of the outflow pipe into the Forth estuary will resolve this problem. Installation of more dye holding vessels necessitating less dumping of dye.

The Forth estuary - holding tanks installed to balance effluent and discharge on a falling tide. This has not been completely successful. Installation of an effluent treatment plant within the next four years to improve the effluent quality will also address the problem of colour.

The Firth of Forth - balancing of effluent and dissolved air flotation is being tried the effectiveness of which is still to be assessed.

Is colour measurement made:

R. Almond - the colour is measured by absorbance between 400 and 700nm.

Treatment of samples:

The samples are stored in the dark, chilled in raw condition and filtered before measurement. The maximum time before analysis was unknown. No investigation have been conducted on sample stability.

Colour units used:

The results are expressed as absorption per unit length (cm).

Guidelines set for the determination of colour standards:

Samples of the R. Almond have been taken along with samples of sewage works effluent discharging to the river. Absorption levels have been determined on samples at seven wavelengths from 400-700nm. Samples were diluted with water until no colour was observed and the absorption determined. From this guidance has been given to the drainage authority on a colour standards consent. The standards were absolute values. Guidelines shown below have only been set on one occasion.

Wavelength (nm)	400	450	500	550	600	650	700
Absorbance (cm ⁻¹)	0.040	0.020	0.020	0.015	0.015	0.010	0.005

The consents are not yet set, but the absorbance of effluent samples is measured.

Awareness of colour removal techniques:

The coloured effluent problems in this region arise from dyes and treatment methods for colour removal are being investigated by the Russel Corporation.

Region:

Highland River Purification Board.

Respondant:

D. Buchanan

Phone Number:

Dingwall 62021

Problems:

None, did not fill in the questionnaire.

Region:

North East River Purification Board.

Respondant:

D.W. Mackay

Phone Number:

0224-248338

Problems:

No river problem but a slight problem with estuaries.

Period of problem:

1988-1991 continuing

The Waters Affected:

The affected water is the Sea

Maximum length affected

N/A

Cause of problem:

Blood from slaughterhouse waste and also paper mills.

Maximum complaints in one year:

Public	1
Industrial Abstractors	1
Pressure Groups	5
MPs	1
Others	0

How the watercourse was affected:

The amenity quality is affected on three sites.

Is the problem monitored:

No monitoring done since colour is not a primary problem.

Actions taken:

In the case of blood there has been pressure to enforce trade effluent control, dissolved air floatation to remove blood is likely at one location. Elimination of untreated discharges to the river and the instalment of an activated sludge plant has been the action taken in the case of paper mills.

Is colour measurement made:

No colour measurements are made and the rest of the questionnaire was not applicable.

Region:

Solway River Purification Board.

Respondant:

D. McNay

Phone Number:

0387-720502

Problems:

No river and no estuary problems.

The rest of the questionnaire was not applicable.

Region:

Tay River Purification Board

Respondant:

Ron Allcock

Phone Number:

0738 27989

Problems:

There are slight problems with both rivers and estuaries which are both localised and widespread.

Period of problem:

Continuous

The Waters Affected & maximum length affected:

Luncarty Lade 0.8 km.

Eden estuary - 0.8 km.

Cause of problem:

Luncarty Lade - trade effluent from a bleaching and dyeing factory.

Eden estuary - trade effluent discharge from paper mill.

Maximum complaints in one year:

1 public complaint

How the watercourse was affected:

Luncarty Lade is a man-made watercourse constructed to serve the bleaching and dying factory, it is not used for any other purpose and the effect is on the amenity value of the land it passes through.

Eden estuary is a Local Authority Nature Reserve and the effect is again on the amenity quality.

Is the problem monitored:

Photographs have been taken.

Actions taken:

Luncarty Lade - a trade effluent plant is being installed at the bleaching and dyeing works. This should help to remove some of the colour in the effluent.

Eden estuary - an effluent treatment plant is being installed and this will in effect remove the colour.

Is colour measurement made:

Colour measurement is not performed and the rest of the questionnaire was not applicable.

Region:

Tweed River Purification Board

Respondant:

J. C. Currie

Phone Number:

0896 2425

Problems:

No problems, could not contribute anything to the questionnaire.

Region:

Department of the Environment (NI).

Respondant:

E. Hagen

Phone Number:

Belfast 230560

Problems:

There is a slight problem with both rivers and estuaries. The problems are localised.

Period of problem:

Intermittent - several years.

The Waters Affected & maximum length affected:

Belfast Lough J 395 864

R. Mourne/Foyle 2-3 km starting at H345 975

R. Kellswater 4-5 km (J140 970 to J094 974)

R. Knockoneill 3km (C871 047 to C901035)

R. Kilbroney 3-4 km (J196 204 to J178 181)

R. Larne 4-5 km (D371023 to D403022)

Total 22 km

Cause of problem:

Belfast Lough - screen printing fabrics (a direct discharge).

R. Mourne/Foyle, R. Kellswater, R. Knockoneill and R. Kilbroney the problems are caused by effluent from fabric dyeing.

R. Larne has the problem of malachite green from a fish farm.

Maximum complaints in one year:

Water affected	Complaints
Belfast Lough	A handful from the public
R. Mourne/Foyle	A few from the public
R. Kellswater	Occasional from industrial abstractors
R. Knockoneill	A handful from the public
R. Kilbroney	A handful from the public
R. Larne	A handful from the public and infrequently from industrial abstractors

How the watercourse was affected:

All the waters affected show visible discoloration.

Is the problem monitored:

No monitoring of colour since it is not considered to be a serious problem.

Actions taken:

No action taken and the rest of the questionnaire was not applicable.

Appendix A completed questionnaire of the colour survey for watercourses

Please fax the completed questionnaire to 0532 333308
or return in the enclosed envelope

NRA PROJECT A04.5 - COLOURED EFFLUENT IN RIVERS

Respondent:

I D NUTTER

Position:

Senior Scientist

Regulatory Authority:

Wessex Region

Address:

Rivers House, East Quay Bridgwater, Somerset, TA6 4YS
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Telephone No:

(0278) 457333

Fax No:

(0278) 452985

Questions 1 - 4 seek to identify the nature of any colour problem in your region

1 Please annotate the scale below to indicate, for your region, relative to other water quality problems you encounter, the importance of discolouration problems.

(a) Rivers

1 No Problem	2 Slight Problem ✓	3 Moderate Problem	4 Serious	5 Very Serious Problem
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(b) Estuary/coastal waters

1 No Problem	2 Slight Problem ✓	3 Moderate Problem	4 Serious	5 Very Serious Problem
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2 Are there localised instances of serious colour problems in your region?

Generally No

Yes	No ✓
-----	---------

3 Have there been any incidences of serious, prolonged or widespread discolouration within the past five years in your region?

Yes ✓	No
----------	----

If you have any other information relating to colour problems in your region, which you think would be useful for this project, please include on a separate sheet.

Please photocopy question 4, if necessary.

- 4 If you have ticked yes to questions 2 or 3, please provide the following information for each system affected: - additional information attached

Date/period of incident February 1991

Watercourses/waterbody affected Estuary - Holes Bay, near Poole in Dorset

Define maximum length of watercourse affected - give grid references for limits All of the Bay was affected

approx 2km²

REF

SZ 0050 9270

SZ 0100 9030

Perceived cause of problem - please give as much detail as possible, eg, if STW effluent discharge give source/type of trade effluent causing problem if known: Drums of Rhodamine were washed out into the foul sewerage system by accident. The discharge from the sewage works caused discolouration of the Bay for approximately one day. The Company concerned is involved in the manufacture of chemical products.

Complaints generated from:	Maximum number in one year
Public	6 for this specific incident.
Industrial Abstractors	
Pressure groups	
Involvement of MPs	
Abstractors	
Others	

Details of effect on river use, eg: amenity, industrial abstraction, public abstraction, etc

Effect on amenity

If you have any other information relating to colour problems in your region, which you think would be useful for this project, please include on a separate sheet.

<p>Actions taken to monitor the problem (analytical results, photographs, videos, etc)</p> <p>An aerial survey was undertaken to monitor progress of the incident</p>
<p>Actions taken to overcome the problem and with what success</p> <p>NRA action was directed against the water company responsible for the operation of the treatment plant. However, it is understood that the industrial premises involved has taken action to ensure that the problem cannot recur.</p>

Questions 5-10 seek to identify how your region currently measures colour and how those measurements are recorded. See attached sheet

- 5 Does your region measure colour?
(ie, can you specify whether the discolouration is, for example, green, blue, yellow, etc.

Yes	No
	✓

- 6 Do you measure the extent of discolouration?

Yes	No
✓	

If so, are your determinations carried out using:

- (a) absorption techniques

✓

at what wavelengths

400 nm

- (b) comparator techniques

--

- (c) other

--

If you have any other information relating to colour problems in your region, which you think would be useful for this project, please include on a separate sheet.

7 Do you pre-filter your samples?

Always

Sometimes

Never

Under what circumstances is filtration used:

If you always or sometimes filter your samples, please specify the filter type and size.

0.4 micron membrane

8 Is any special sampling equipment used - please give details

None

Please annotate these boxes to represent your storage prior to analysis:

light	dark <input checked="" type="checkbox"/>
-------	--

chilled <input checked="" type="checkbox"/>	ambient
---	---------

chemical addition	raw <input checked="" type="checkbox"/>
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maximum time before analysis	unknown <input checked="" type="checkbox"/>
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Have any investigations been conducted on sample stability

Yes	No <input checked="" type="checkbox"/>
-----	--

Are any other special precautions taken with sampling and storage prior to analysis?

No

If you have any other information relating to colour problems in your region, which you think would be useful for this project, please send it on a separate sheet.

- 9 Are your results expressed in degrees hazen
absorption per unit length
- What factors do you use to convert between
hazen and absorption?
- If you use absorption measures, what path
length do you finally express your
determination as?
- 10 From you records, can you identify:
- | | |
|---|--------------------------|
| measurement methods
(yes/no) | <input type="checkbox"/> |
| whether arithmetic
conversion has
occurred (yes/no) | <input type="checkbox"/> |
| path length (yes/no) | <input type="checkbox"/> |
| sample pre-treatment
(yes/no) | <input type="checkbox"/> |

Questions 11-14 seek information on informal or regionally based guidelines for colour standards:

- 11 Has your, or your predecessor organisation, ever initiated internal investigations to define acceptable colour standards for watercourses/waterbodies? If so, please give a brief synopsis (attach separate sheet if necessary). Do these standards relate to absolute values or to changes compared with upstream quality?

In view of the fact that problems with coloured discharges tend to be relatively minor in this region, little work has been done to establish acceptable standards.

However, consent conditions relating to colour are applied to discharges from fish farms. These standards are usually comparative values with respect to upstream river quality and are expressed as degrees hazen.

If you have any other information relating to colour problems in your region, which you think would be useful for this project, please send it to the Project Records Department on a separate sheet.

- 12 What standards do you currently require of dischargers when setting limits on coloured effluents? Give examples of different types of colour limitation imposed in a discharge consent.

Colour standards have not been applied to industrial discharges in the past. The conditions which apply to fish farm discharges are in the order of 6 - 15 hazen and are expressed as maximum limits.

- 13 Please specify how you are monitoring these consents?

Snap samples are taken on a routine basis.

- 14 Have you, or your predecessor organisation, ever taken legal action over breaches of a colour condition in a discharge consent?

Not to date

Yes	No <input checked="" type="checkbox"/>
-----	--

If you have any other information relating to colour problems in your region, which you think would be useful for this project, please include on a separate sheet.

Question 15 relates to methods of colour removal

- 15 Are you aware of colour reduction technology being employed (or planned) by companies in your region to prevent unacceptable river conditions either directly or indirectly via discharges to sewer? For each company, please list:

effluent type	
treatment method	
colour standards imposed	
name and address of company	

We are not aware of any company in this region which is considering use of colour reduction technology at the present.

If you have any other information relating to colour problems in your region, which you think would be useful for this project, please include on a separate sheet.

Question 4 - additional information

There have been a number of minor incidents in recent years caused by coloured effluents:-

- (i) A paper mill which occasionally caused a tributary of the river Allen near Wimborne in Dorset to turn white. The Company has now ceased trading (discharge to Stour catchment - SU 0035 0637)
- (ii) A tannery which can have a coloured effluent, but which has no visible impact on the receiving watercourse due to dilution factors. (discharge to the Hampshire Avon, near Salisbury - SU 1802 2140)
- (iii) A Company which is involved in the manufacture of carbon black. Discolouration can be observed in the discharge and the receiving watercourse is sometimes affected (discharge to Severn estuary catchments - ST 5290 8190)
- (iv) A sewage treatment works which received a coloured trade effluent. The Company has now ceased trading but in the past discharges from the sewage works were discoloured on occasion as a result of the manufacture of coloured paper products (discharge to river Frome in Frome, Somerset - ST 7762 4858)
- (v) A paper mill which can cause the receiving watercourse, a tributary of the Avon to turn white from time to time. This tends not to be a problem if the discharge is within consent. ie the colour problem is controlled by other parameters in the consent. (discharge to river Avon catchment - ST 7900 6720)
- (vi) A quarry which can have a red coloured discharge at times due to the nature of the ground rock. (discharge to river Boyd near Bristol - ST 7107 7281)

