local environment agency plan

AIRE

Draft Environmental Overview
September 1998

ENVIRONMENT AGENCY

YOUR VIEWS

Welcome to the Consultation Draft LEAP for the Aire, which is the Agency's initial analysis of the state of the environment and the issues that we believe need to be addressed.

We would like to hear your views:

- Have we identified all the major issues?
- Have we identified realistic proposals for action?
- Do you have any comments to make regarding the Plan in general?
- Do you want to comment on the work of the Agency in general?

During the consultation period for this Draft LEAP the Agency would be pleased to receive any comments in writing to:

Aire LEAP Officer
Environment Agency
Phoenix House
Global Avenue
LEEDS LS11 8PG

All comments must be received by 30th September 1998

Note: Whilst every effort has been made to ensure the accuracy of information in this Report it may contain some errors or omissions which we will be pleased to note

Further copies of the document can be obtained from the above address.

All comments received on the Consultation Draft will be considered in preparing the final LEAP which will build upon Section 3 of this consultation document by turning proposals into specific actions.

All written responses will be considered to be in the public domain unless consultees explicitly request otherwise.

EA-North East LEAPs

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1.0 INTRODUCTION

This document provides an overview of the environment of the Aire catchment. It brings together and examines information on the various pressures on the local environment and its consequent state. The Environmental Overview supports the Draft Aire Local Environment Agency Plan (LEAP) which was launched for public consultation on 18 June 1998. The LEAP identifies issues that arise as a result of the pressures and proposes actions to help resolve these.

The pressures on the environment are mainly a consequence of human activities. They include the needs for improved standards of living, wealth creation and improved quality of life as expressed by improved health, happiness and a clean and varied environment. The success of the Agency in this area will be judged primarily on how we have been able to reduce or alleviate the pressures themselves to achieve environmental improvements. In this Overview, pressures on the environment have been categorised as:-

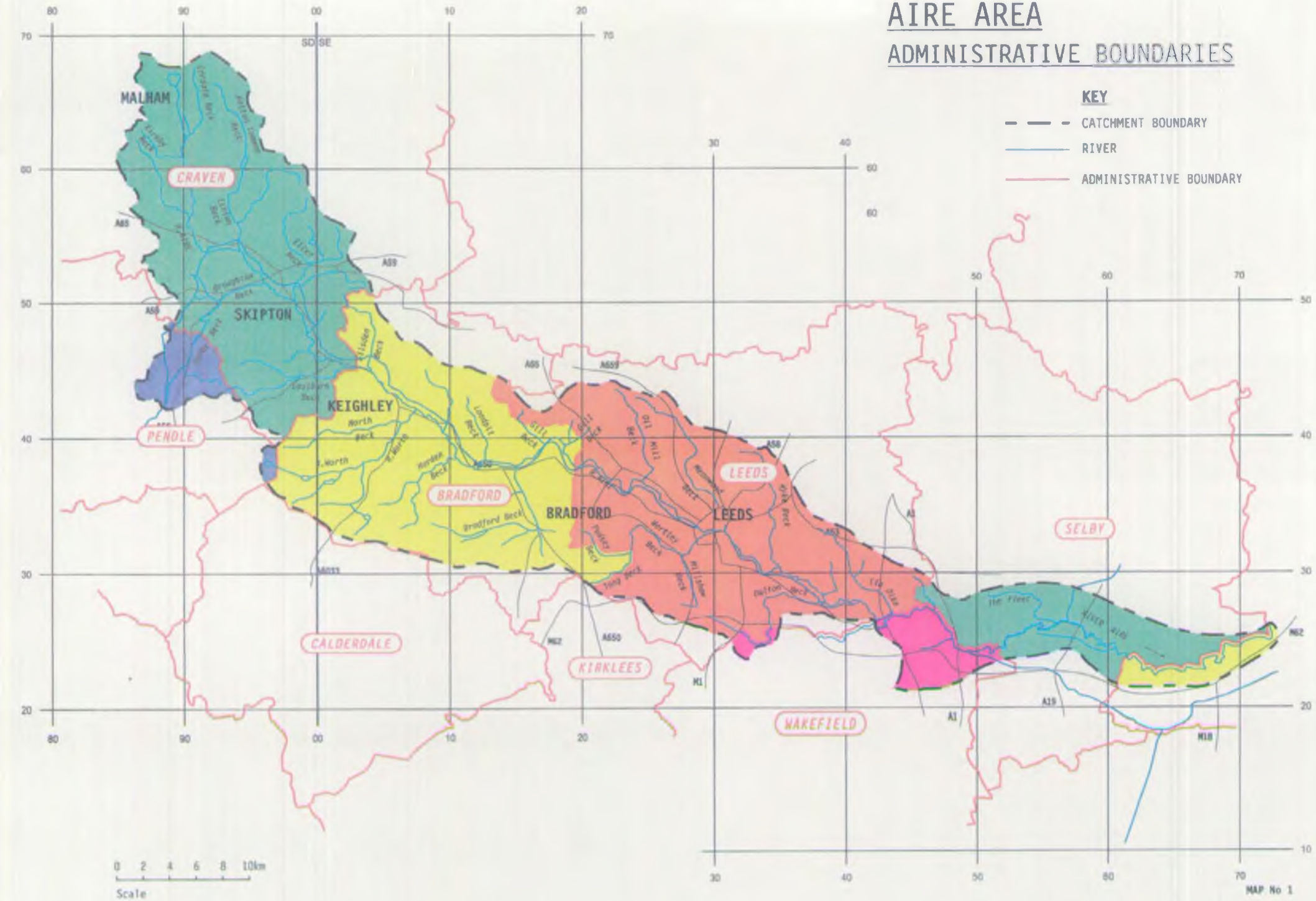
- natural forces
- society and lifestyles
- abstractions and removals
- usage, releases and discharges
- waste arisings and disposals
- illegal practices

Measuring the state of the environment is a fundamental aspect of the Agency's environmental management role. This provides the basis for assessing priorities for action, charting progress against environmental management plans and targets, and producing information on the environment for all those who have an interest in it. The state of the environment is looked at through six different, but complementary, "viewpoints":-

- land use and environmental resources;
- the status of key biological communities and populations, and of biodiversity;
- compliance with existing standards and targets;
- the "health" of environmental resources;
- environmental changes at long-term reference sites; and
- the aesthetic quality of the environment.

AIRE AREA

ADMINISTRATIVE BOUNDARIES



2.0 PRESSURES (STRESSES AND STRAINS) ON THE LOCAL ENVIRONMENT

2.1 Natural forces - climate change

Climate change may be due to natural causes as there have been large shifts in climate in the past. It may also be accelerating due to human activities. Burning fossil fuels in cars, power stations and in industrial processes emits gases into the atmosphere ("greenhouse gases" such as carbon dioxide) which are believed to contribute to long-term climate change.

There is good evidence of global warming with national average air temperatures increasing by between 0.3 and 0.6°C during the 20th century. This is consistent with the expected effect of increased greenhouse gases, but is also within the bounds of normal climate variability.

Records of temperature for the upper LEAP area over the last 12 years show some deviation from the long-term average which is shown in the following graph.

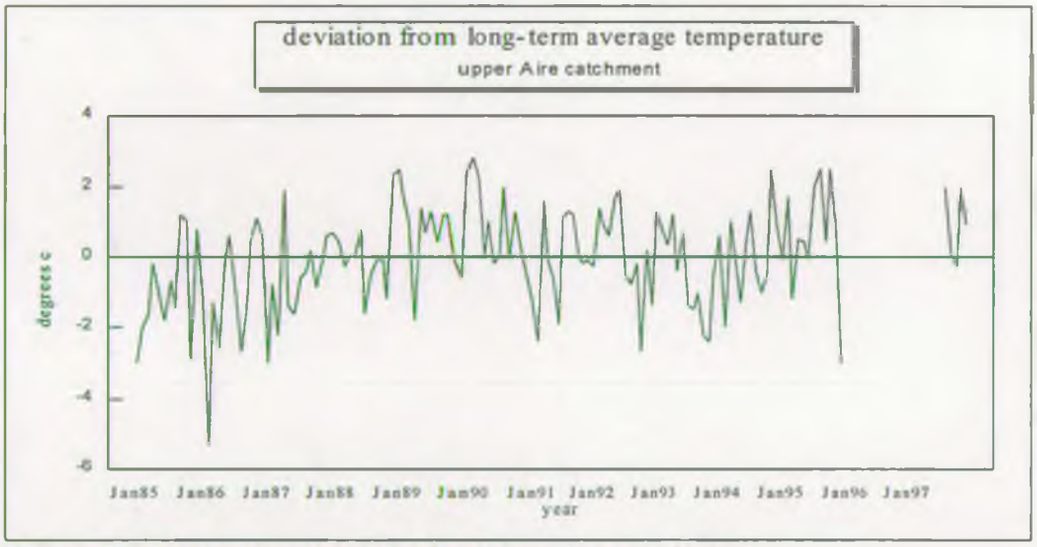


Figure 1. Air temperatures in the upper Aire catchment

Trends in local rainfall over the last four decades have been assessed at a site in Bradford. Ten year seasonal averages were calculated and compared to identify any trends. It was found that summer rainfall has decreased with every decade, although the decrease has been slight in recent years. No other significant trends were found for the whole sample period. However, in the last decade all seasonal rainfall has decreased when compared with the 1980s. The following graph shows the annual mean rainfall for Lister Park in Bradford over the last 30 years.

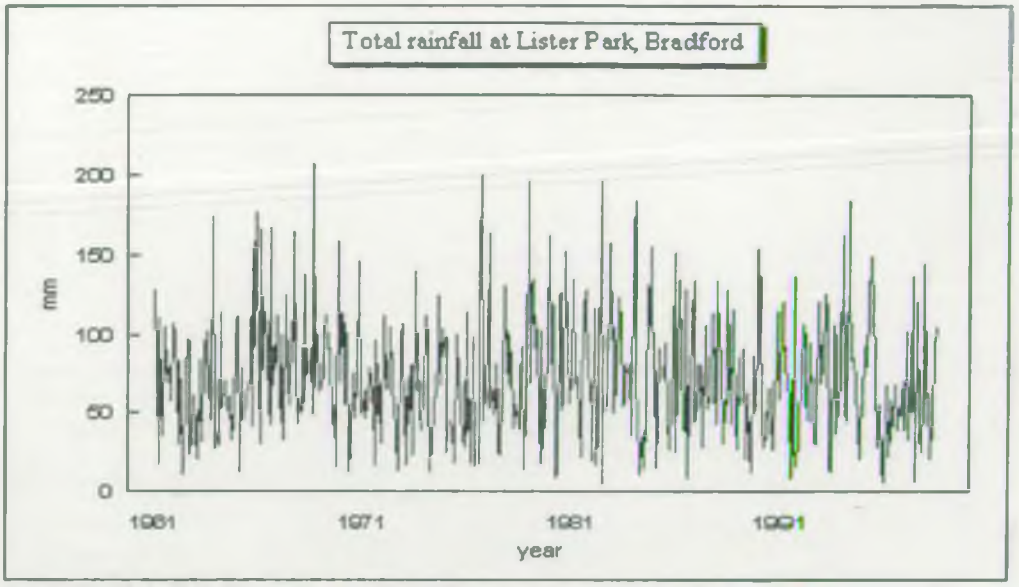


Figure 2. Total rainfall at Lister Park in Bradford 1961 to 1997

The United Kingdom will be affected in a complex way by climate changes. Current predictions suggest winters are likely to become wetter and summers drier, reducing overall rainfall totals in the south and east and increasing rainfall in the north. This will lead to more variable rainfall patterns and probably increase storminess. Sea level rise may affect the lower tidal reach of the Aire and flood protection may have to be reviewed in the future.

Changes in climate could affect the biodiversity of the Aire LEAP area as temperature and rainfall changes lead to habitat alterations. The rate at which this happens will depend upon the rate of climate change and the adaptability of species. Biodiversity could increase with a warmer climate, although there may be an initial reduction in diversity as species adapt to the changes.

2.2 Society and lifestyles

Households

Around 1.1 million people currently live within the Aire catchment, concentrated mainly in the urban areas of Bradford, Bingley, Castleford, Keighley, Leeds and Skipton. Currently much of the upper Plan area is rural, and around Selby the land is used for agriculture. The different land uses are shown on map 2 (source: Environment Agency). Planned increases in the number of households (between 40,000 and 80,000 in Yorkshire by 2016 -source Department of the Environment) could mean the spread of urban areas. Further development of roads, urban areas and major industrial areas could threaten Tranquil Areas in the catchment (shown on map 3). These are designated by the Council for the Protection of Rural England (CPRE) and the Countryside Commission and are places which are considered to be unspoilt. The number of Tranquil Areas in the Yorkshire and Humberside region has declined over the last 30 years and there are now very few left in the Plan area. It is therefore important to preserve these small areas from being destroyed by further development. Increased development can result in the loss of wildlife habitats. The conservation value of rural parts of the area is high. There are also areas in the more

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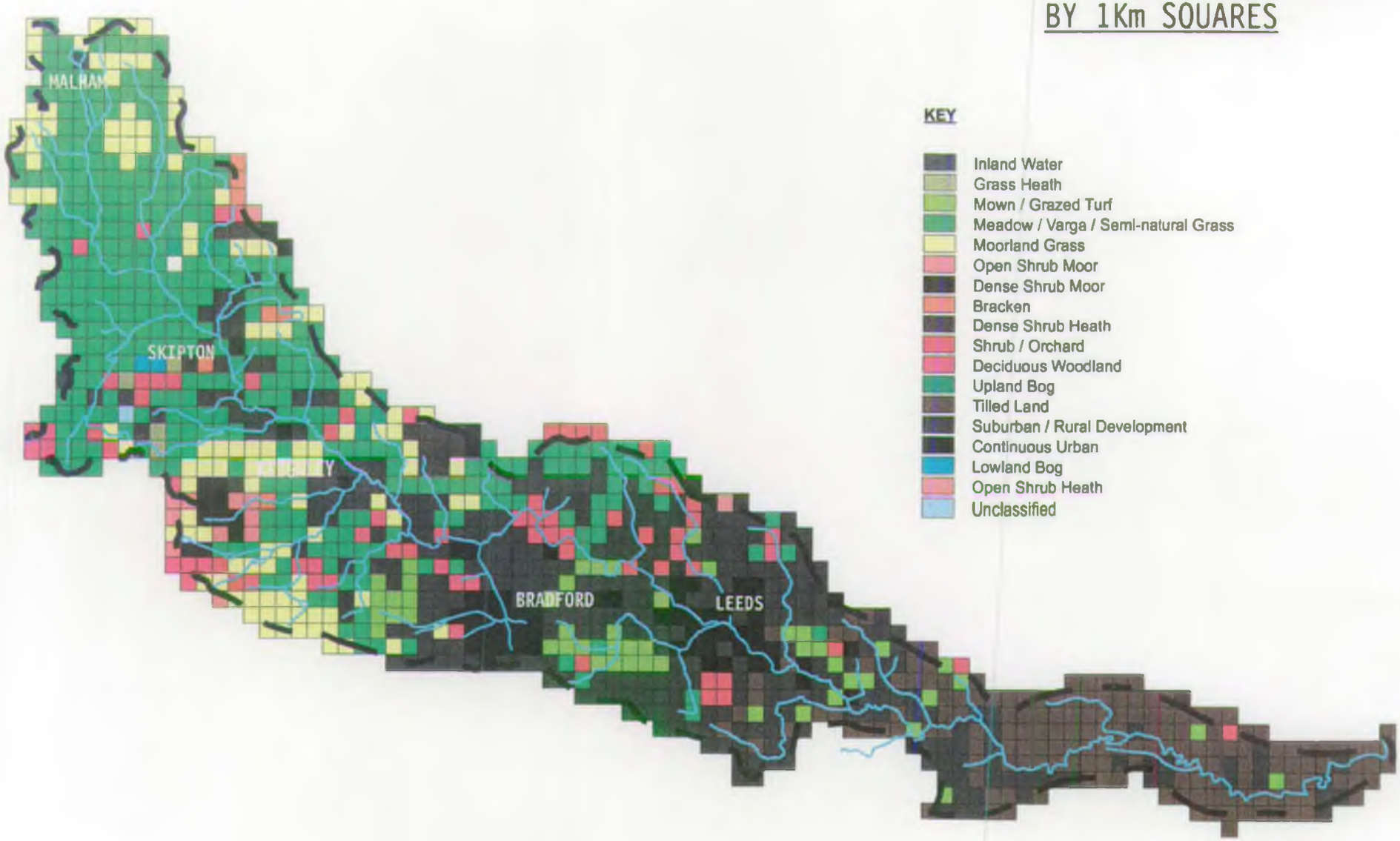
DOMINANT LAND COVER BY 1Km SQUARES



MAP No 2

AIRE

TRANQUIL AREAS

EARLY 1960's

EARLY 1990's

KEY

URBAN AREAS

TRANQUIL AREAS

SEMI-TRANQUIL AREAS

VULNERABLE

LESS VULNERABLE

0 10 20 30 40 50km

Scale

MAP No 3

industrialised and urban districts that are valued for conservation (see section 3.2) Fish populations can also be affected where barriers to migration prevent natural regeneration in areas of improved water quality and habitat. The Aire's industrial heritage has left 30 weirs along the river, 14 of which are impassible to all fish species in all flow conditions. Map 18 shows these barriers. Many of the weirs are listed structures, however various designs of fish pass are available and can be fitted without affecting a weir's other uses.

Another consequence of increased development can be the reduction of available floodplain. When a watercourse floods, excess water normally flows into the floodplain, (riverside land which provides extra flow and storage capacity). However, in the upper reaches of the River Aire the extensive natural floodplain has been built upon by generations of landowners. This has reduced the amount of water that can be stored during times of high flow. To minimise the risk of flooding further downstream, the impact of this development has been offset by a complex system of washlands helping to reduce flood levels around Keighley, and the construction over the last 30 years of controlled washlands downstream of Leeds. Controlled washlands have been required recently, at the developer's expense, to compensate for loss of storage capacity resulting from developments. Considerable changes in washlands have taken place over the last 30 years due to mining subsidence, opencast working and gravel abstraction. Major washlands in the catchment are shown on map 14.

Existing flood defence standards in certain parts of the Plan area are below the standard of service targets. This may be because of changes in Plan area characteristics (for example increased surface water run-off) due to development in the natural floodplain, structural deterioration of some defences or historical deficiency. In such locations, a relatively small number of properties will be at risk from flooding. A flood alleviation scheme is planned for Castleford in the next 5 years, and investigations are needed in the Bingley area and Kirkstall Road in Leeds (see section 3.1).

Households also exert pressure on the environment by using much of the water that is abstracted from the catchment. The average domestic consumption of water for England and Wales is 140 litres/person/day (Water Services Association 1996).The actual amount used will depend on the total number of people in a household and whether or not there is a garden which needs watering. The following chart shows water consumption per person in households in Yorkshire. (Data from Clarke et.al (1997) "Estimating Small Area Demand for Water: A New Methodology").

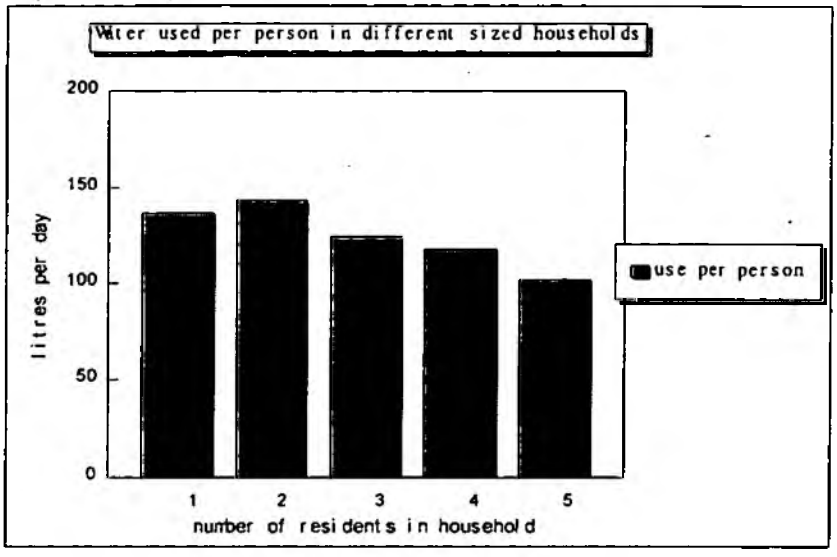


Figure 3. Water used per person in households in Yorkshire

This shows a trend of higher average water consumption per person in smaller households. As household growth predictions indicate there will be more smaller households, the amount of water used could be expected to increase over time.

Domestic consumption has already increased significantly over time, reflecting changes in household appliances, lifestyles and expectations. For example:-

- In 1972, 66% of households had washing machines, whereas this figure had risen to 90% by 1996; and
- dishwashers were used in only 4% of households in 1981 but 20% in 1996.

As well as making demands on the environment by using its resources, households exert further pressure by disposing of their wastes. Emissions to air from households have been significantly reduced due to the demise of domestic coal burning over the last 20 years (see section 3.3). However, improvements are needed in the amount of household waste that is disposed of to land.

It is estimated that the average household produces approximately one tonne of refuse per year which adds up to a vast amount of waste that has to be re-used or disposed of from the LEAP area. The diagram below shows the disposal routes of household waste collected in West Yorkshire in 1995/96. It shows that the majority (approximately 94%) is disposed of to land with less than 1% of all household waste recovered from household waste sites for recycling.

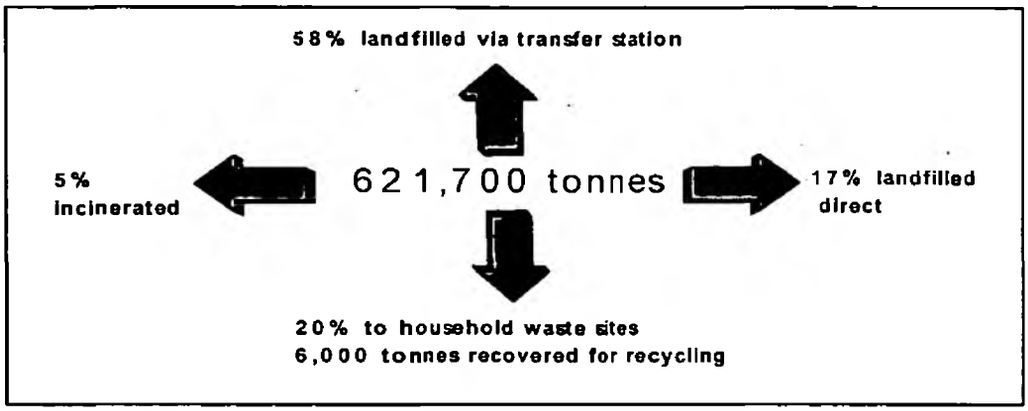


Figure 4. Disposal route of collected household waste in West Yorkshire in 1995/96

The disposal of household waste also contributes to pollution of the water environment. Approximately 80% of the water used by households is returned to rivers or estuaries through sewers and sewage treatment works (some water is lost through evaporation in garden use, and lost through leakage in supply pipes). There are 35 sewage treatment works in the catchment, these are shown on map 4. In addition to the direct effects of sewage itself, household products also have the potential to pollute. Detergents contain phosphorous, although changing formulations have led to a decline in the 1990s (Technical Committee on Detergents and the Environment, 1993). Toiletries, medicines and domestic cleaners contain a variety of substances including nickel, copper, lead, zinc and various pesticides. Dilution in sewers and at sewage treatment works normally reduces these substances to harmless levels but it is not always known what these levels are. Recent work has suggested that the sewage treatment process might not remove natural oestrogens and those associated with the birth control pill. These substances have been linked to observations of intersex in male fish downstream of discharges from sewage treatment works, including points of the River Aire (Environment Agency 1997) (see section 3.4).

Some households served by sewers have two drainage pipes. The foul sewer carries sewerage to a sewage works for treatment before it is discharged. The other, the surface water drain, carries clean water directly to rivers or soakaways. Any input to this drain will be untreated. Therefore, pollution will be caused by householders who wrongly connect washing machines, toilets etc. or misuse road drains to dispose of oily residues. In 1997, 37 pollution incidents in the Aire and Calder catchments were attributed to domestic or residential properties (see section 2.6).

Villages in rural areas have traditionally relied upon each dwelling having individual septic tanks. The overflow from such tanks is designed to drain into the soil via below-ground soakaways. In poorly drained areas with clay soils, or where the water table is high, tanks are drained to the nearest watercourse. The problem manifests itself in terms of localised pollution of becks, for example Stirton and Thorlby Beck near Skipton.

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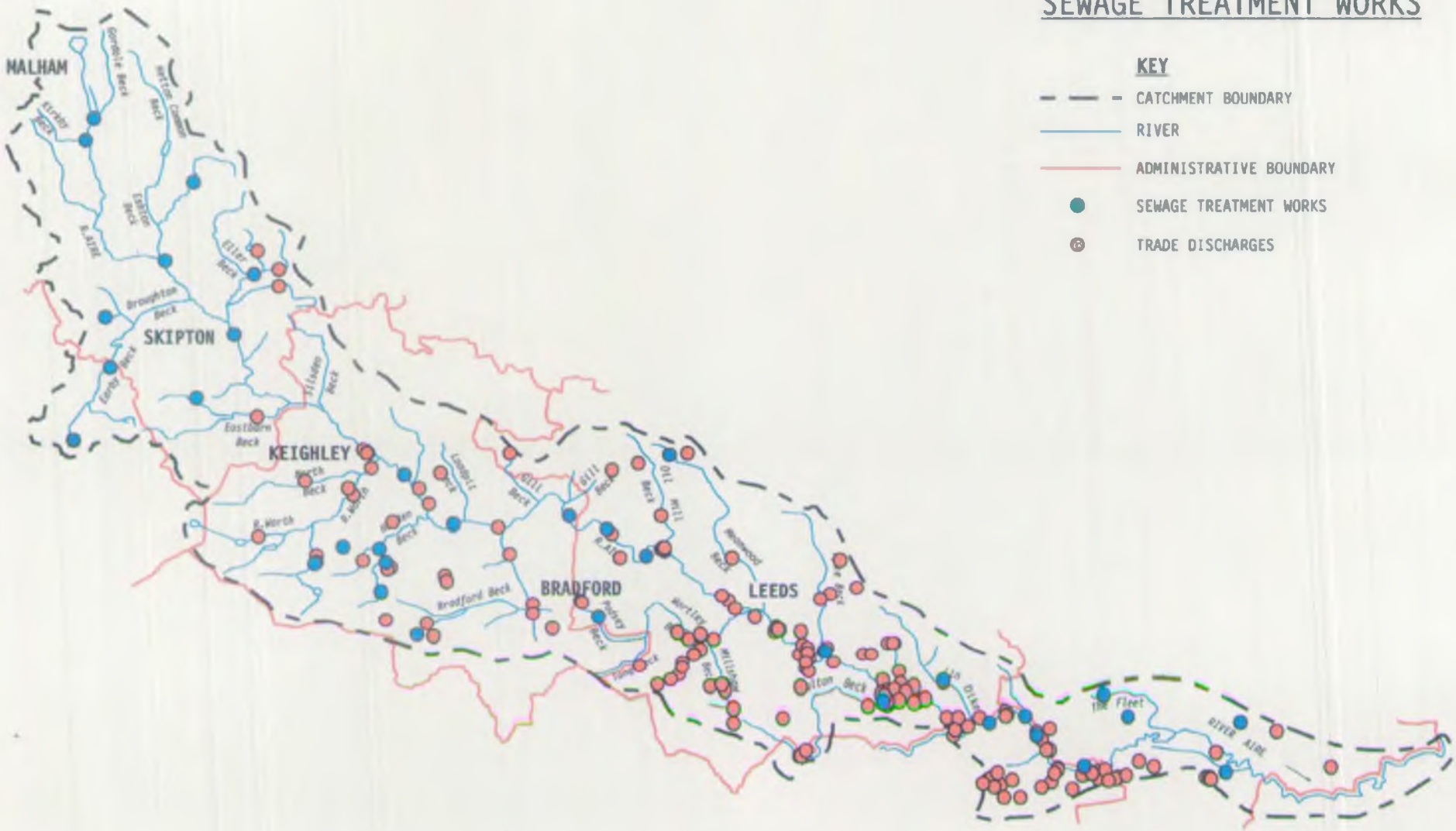
TRADE DISCHARGES AND SEWAGE TREATMENT WORKS



MAP No 4

Recreation

Enjoyment of the environment contributes to the quality of life and can also contribute to the local economy. The navigable waters and principle footpaths in the Aire LEAP area are shown in map 5. The extent of angling can be seen on map 6. The scenic upland areas of the Aire (most notable around Malham) attract visitors in their thousands every year. This area is popular with walkers, anglers, birdwatchers and sightseers alike. Much of the riverside is enjoyed by walkers and recognised paths include the Trans-Pennine Trail and the Leeds Country Way. Ramblers walking the Pennine Way follow the beginnings of the Aire from Malham Tarn to Gargrave, and there is also good walking in the Bronte country of Haworth and on the south side of Rombalds Moor. As the Aire valley widens near Gargrave, a unique double-decker aqueduct carries the Leeds and Liverpool Canal over the River Aire. There is no navigation on the river itself at this point, but narrow boats, cruisers and canoes make use of the canal here. Below Leeds, vessels are able to join the navigable Ouse via the Selby Canal at West Haddlesey. Canoeists only regularly canoe 4 stretches within the area (shown on map 6) but would welcome access to other rivers if they could negotiate an agreement to use the watercourse.

Recreation can create pressures on the environment (e.g. disturbing wildlife, trampling vegetation and river bank erosion). Recreational users have different needs and the needs of some activities may conflict with the needs of others). Currently there are no health-related standards for water quality to protect the use of rivers for immersion sports (see section 3.4). Safety equipment by rivers, such as lifebuoys, is notoriously difficult to keep in operational condition due to vandalism.

2.3 Abstractions and removals

Water abstraction

Within the Aire Plan area, water is abstracted from the surface and below the ground for public supply, industry and other uses. Maps 7 and 8 show the licensed abstractions for surface and groundwater in the Aire catchment. Figure 5 shows the total amount abstracted.

	Number of licences	Licensed annual quantity (million cubic metres)	% of annual total
Groundwater	427	49.4	12
Surface Water	126	350.9	88
Total	553	398.6	100

Figure 5. Licensed water abstractions from the Aire catchment

The largest surface water abstraction made is for the power stations in the east of the Plan area. In total, around 7 times as much surface water is abstracted than groundwater. However, only 6.5% of surface water (22.6 million cubic metres)

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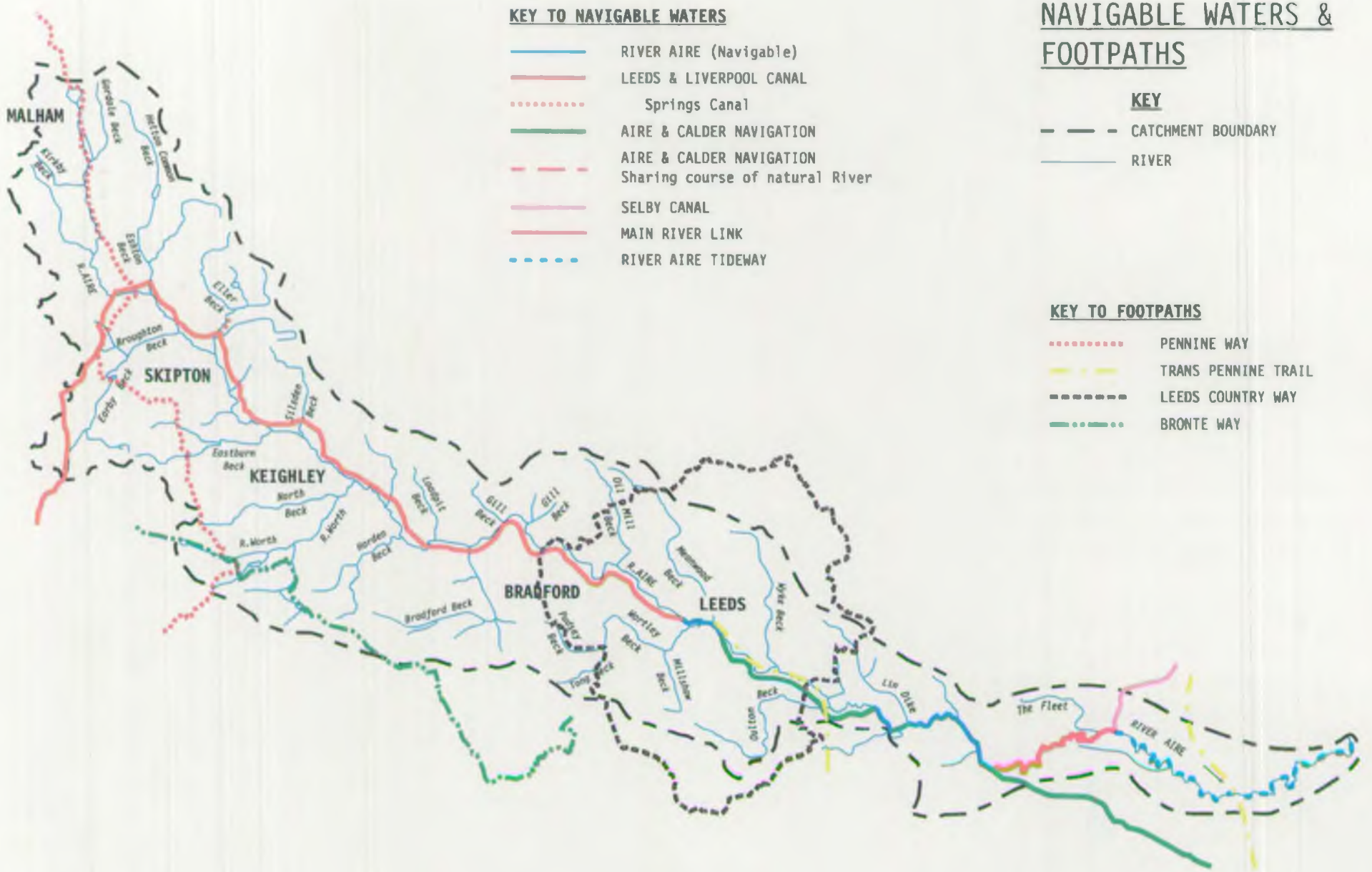
NAVIGABLE WATERS & FOOTPATHS



MAP No 5

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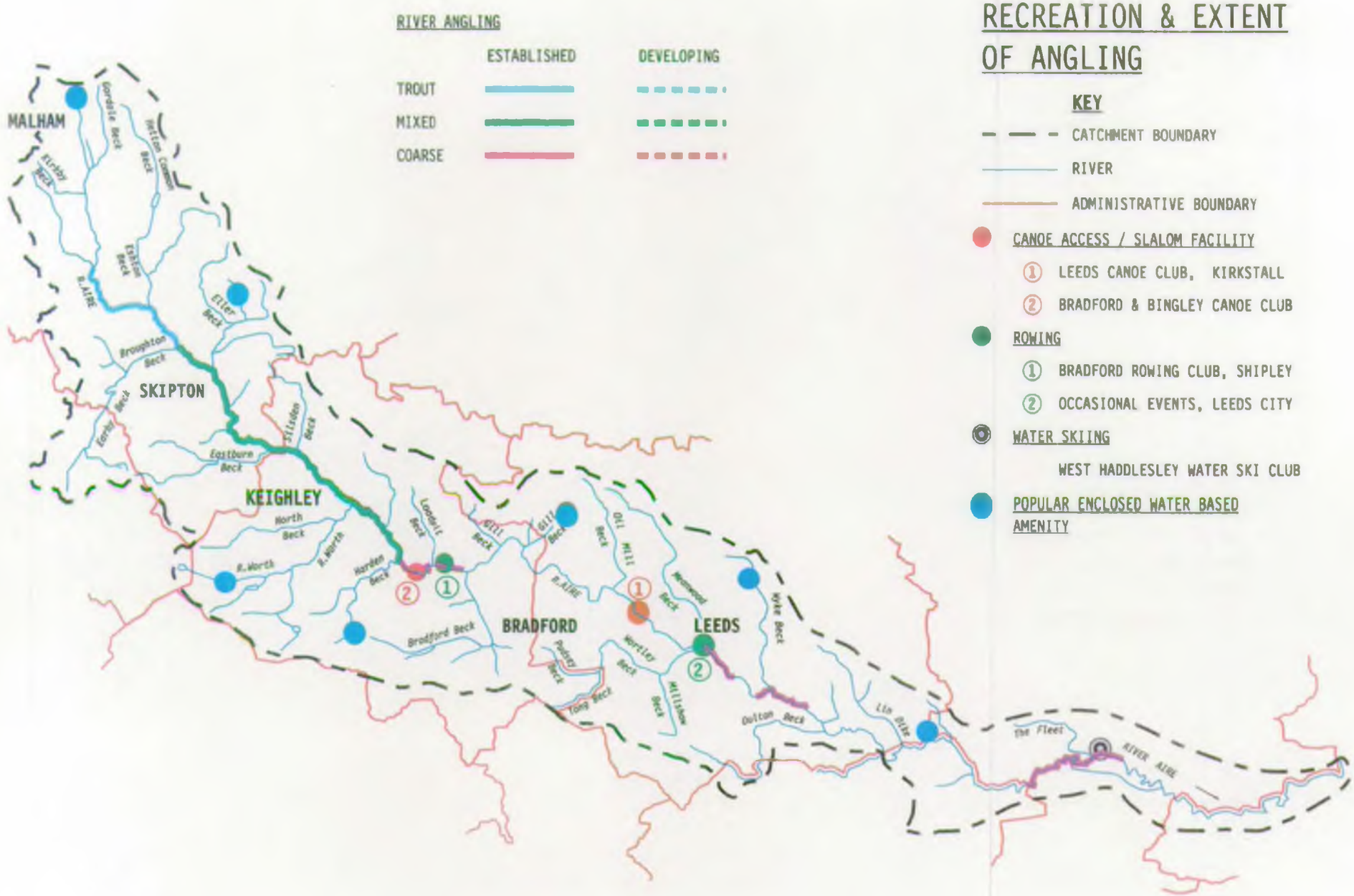
RECREATION & EXTENT OF ANGLING



KEY

- CATCHMENT BOUNDARY
- RIVER
- ADMINISTRATIVE BOUNDARY
- CANOE ACCESS / SLALOM FACILITY
  - ① LEEDS CANOE CLUB, KIRKSTALL
  - ② BRADFORD & BINGLEY CANOE CLUB
- ROWING
  - ① BRADFORD ROWING CLUB, SHIPLEY
  - ② OCCASIONAL EVENTS, LEEDS CITY
- WATER SKIING
  - WEST HADDLESLEY WATER SKI CLUB
- POPULAR ENCLOSED WATER BASED AMENITY

MAP No. 6

abstracted is used for public supply, compared with 60.6% (29.9 million cubic metres) of groundwater.

The charts below show trends in abstraction for public supply and industry/cooling and water power in the Aire catchment over the last 20 years. These show that surface water abstractions for industry/cooling have decreased significantly, as have groundwater abstractions for public supply.

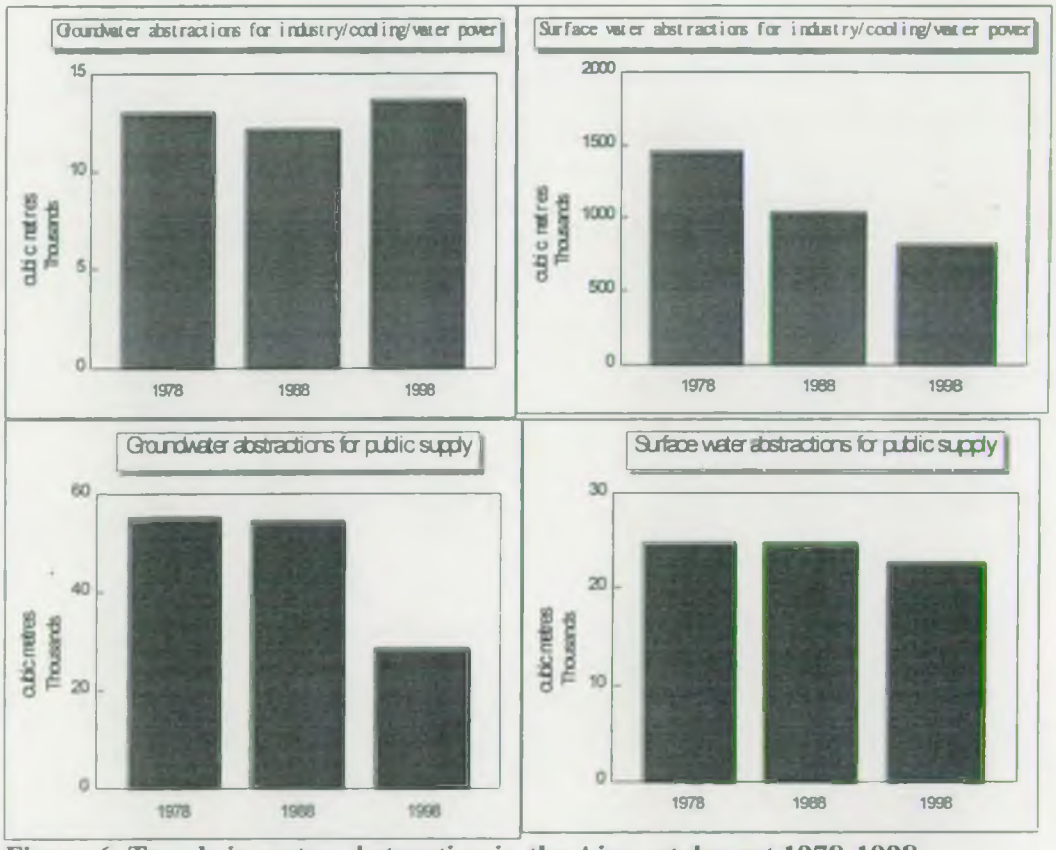


Figure 6. Trends in water abstraction in the Aire catchment 1978-1998

Abstraction from surface waters affects the watercourse immediately downstream by reducing its volume. In the past, licences to abstract water were granted without time limits or restrictions at times of low flow, which could have detrimental effects on wildlife. A policy using time limits and "hands-off" flow restrictions (a condition where, if river flows fall below a pre-defined level, abstraction ceases until water levels recover) was developed in the 1980s and applied to spray irrigation licences, in particular in the lower Plan area. The policy has now been refined and updated to take more account of environmental needs and has been used in other catchments. If applied to the River Aire the Surface Water Abstraction Licensing Policy could set time limits and "hands-off" flow restrictions to a wider range of abstractions than was previously the case.

To compensate for the impact of impounding water, there is a statutory requirement to release compensation flows from reservoirs. These were set many years ago, based mainly on the requirements of industrial users (particularly for water power). With the decline in industrial water use and increased environmental awareness the operation of these releases should be reviewed to ensure they are appropriate for the

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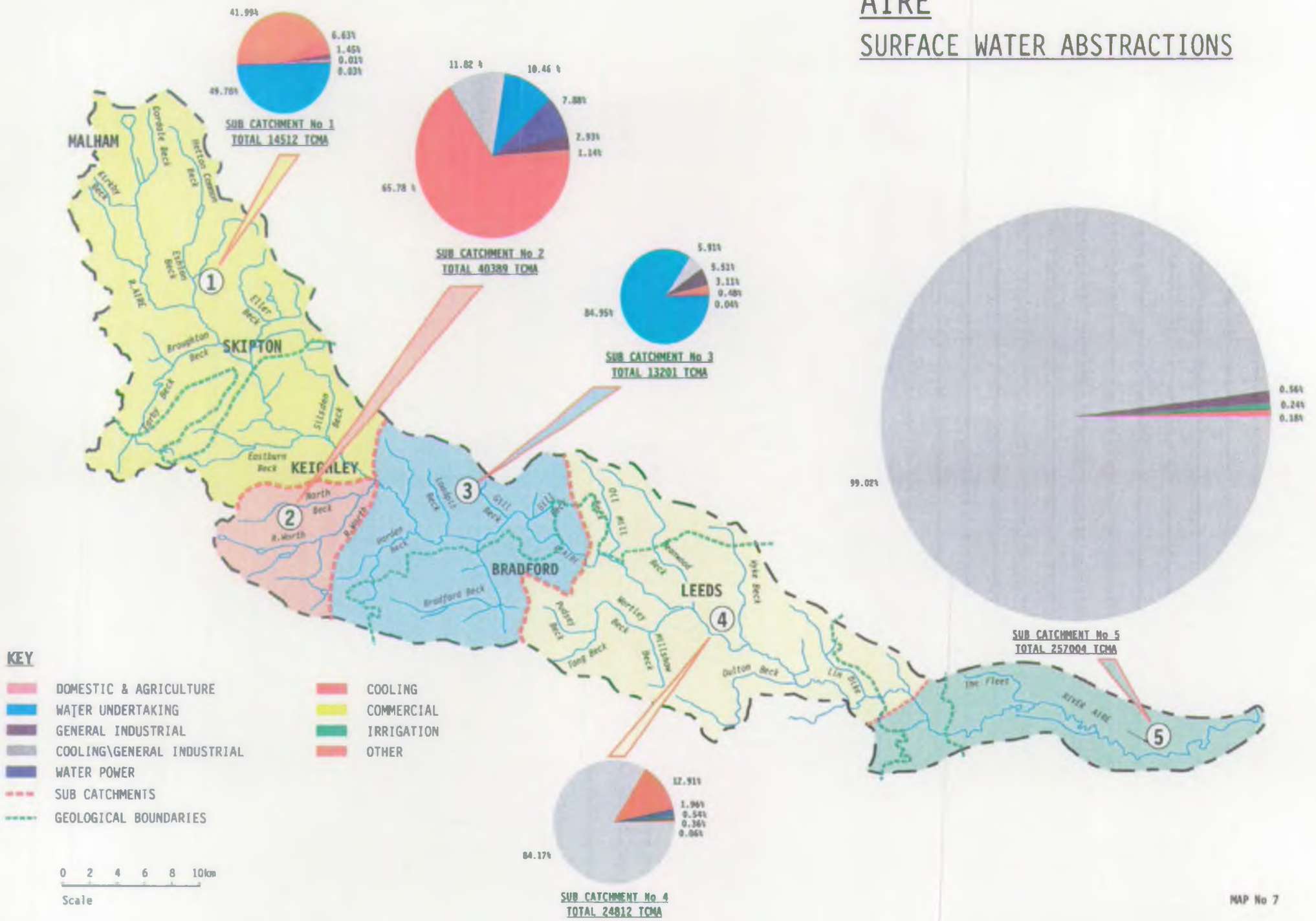
SURFACE WATER ABSTRACTIONS



MAP No 7

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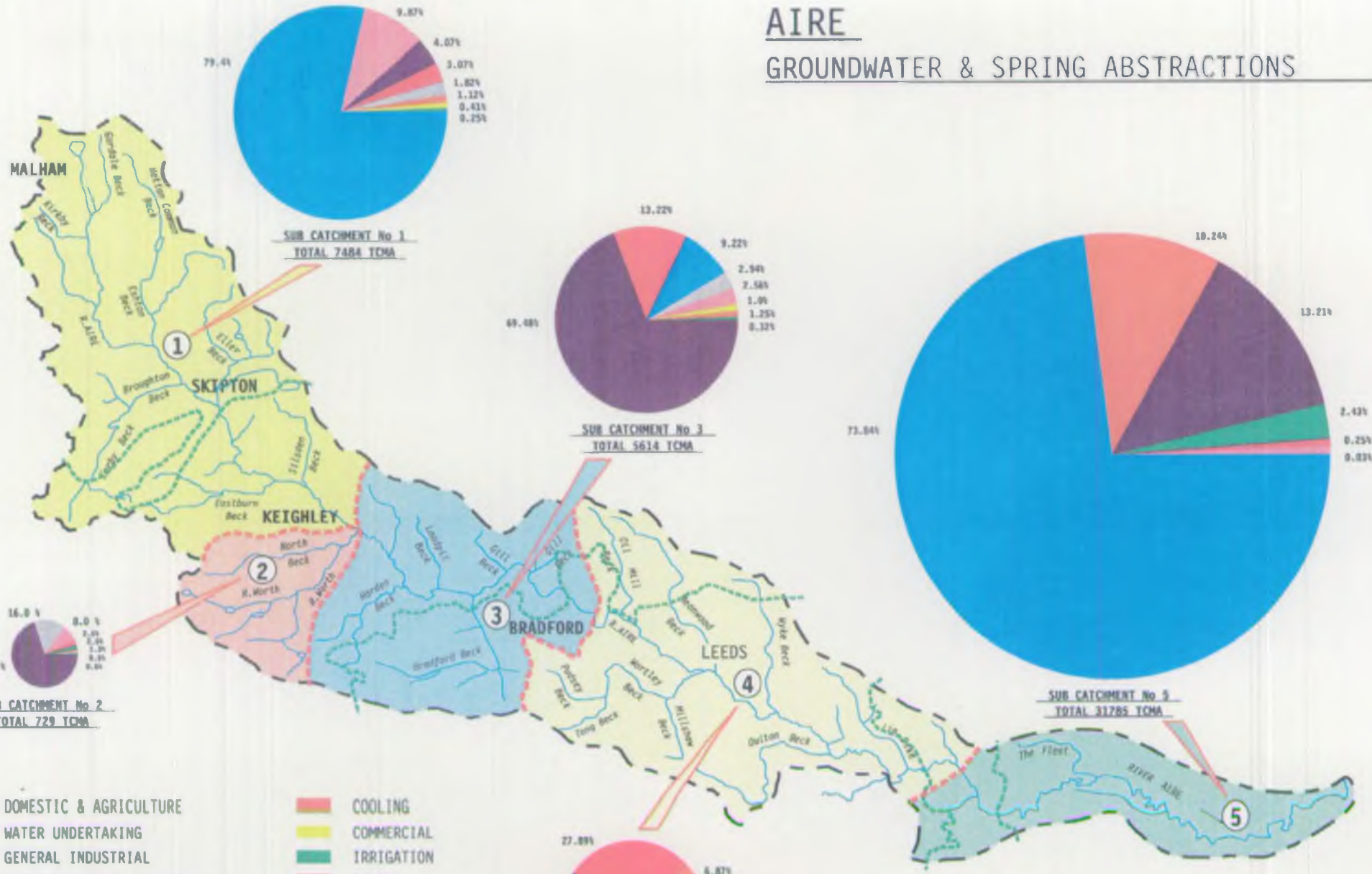
GROUNDWATER & SPRING ABSTRACTIONS



MAP No 8

needs of all users. There is a statutory compensation release from Winterburn Reservoir into the Winterburn and Eshton Becks near Gargrave associated with the supply for the Leeds and Liverpool Canal. In the past there have been reports of low flows downstream of the canal intake on Eshton Beck possibly affecting the ecology.

Water is vital for domestic use, industry, agriculture, recreation and as a habitat for wildlife. The use of water can put the resource under considerable strain, particularly at times of drought. Conserving water is essential if the rising pressure from abstraction, at a time of climate change (see section 2.1), is to be reduced. The Agency encourages water conservation in industry through our waste minimisation initiatives and regulation under Integrated Pollution Control which promote more efficient use of raw materials, energy and water.

In 1994 the Agency's North East Region published its Regional Water Resources Strategy. Since then, the Region has experienced extreme variations in rainfall, including a very wet winter in 1994/95 and the drought of 1995/96. As a result of the drought, additional resources identified in the strategy have been brought forward by Yorkshire Water Services. Particular emphasis has been placed on leakage control and demand management as a sustainable approach to water management, rather than relying totally on new resources.

In 1995/96 approximately 33% of water put into the distribution system by Yorkshire Water Services was lost from supply by leakage from pipes (source - Office of Water Services (OFWAT)) (these figures ignore any leakage from customers' own pipes). This water is not permanently lost from the environment because it will eventually flow back to rivers or groundwaters but the time delay in this process implies that it is lost as a water resource and cannot be used. Furthermore, the water is not generally returned to where it was abstracted from. More water than necessary is therefore abstracted from the freshwater environment at times of stress.

The Regional Water Resources Strategy also sought to influence changes in water-use habits to bring long-term environmental benefits. It was, however, considered prudent management to have plans in place in case demand increased unexpectedly, and consequently the Strategy identifies potential schemes to deliver additional water. This includes the possibility of abstracting water for public supply from the River Aire after 2015.

The water charging system of the water companies is currently being reviewed and this could also be one opportunity to reduce the pressure from abstractions. The National Rivers Authority set out in a consultation report, *Saving Water*, the water-saving potential of a number of water conservation options and showed that leakage control, lower volume flush toilets, more efficient washing machines and fitting flush controllers to urinals can all be cheaper than developing new resources for equivalent volumes of water. The amount abstracted for public water supply could be reduced by as much as 42% if all demand management options were implemented.

Mineral abstraction

Although extensive mining no longer takes place in the Aire catchment (Knottingley and the Prince of Wales, Pontefract, are the last operational mines), the abstraction of minerals in the past has had a long-term impact on the area. Subsidence caused by former mining work has led to the permanent flooding of the Fairburn Ings washlands complex, which is now a designated Site of Special Scientific Interest of high conservation value (see section 3.1). The washlands also provide storage for flood water as part of the flood defence for Castleford.

2.4 Usage, releases and discharges

Point sources

Air quality is an important factor influencing the standard of human life. Air pollution can cause serious problems for people with asthma, bronchitis and other respiratory diseases. It can also damage flora, fauna and buildings, and have significant effects on soil, water and climate. Severe air pollution used to exist in heavily urbanised and industrialised areas. These problems have since been tackled by legislation and considerable progress has been made in improving air quality over the last 50 years. Further progress will probably be at a slower rate as the pollutant concentrations involved are much harder to measure and eliminate than in the past.

Concentrations of smoke and sulphur dioxide have generally declined in the UK as a whole over the last 20 years following the demise of domestic coal burning (see section 2.2). A major contribution to the reduction in sulphur dioxide from industrial sources was made at Drax power station, which is one of the most efficient coal burning power stations and has been fitted with flue gas desulphurisation. Transport is also a major source of air pollution. Both the quantity released and the concentration of lead in the atmosphere has declined since the mid 1980s following the introduction of lead free petrol.

However, the release of some pollutants such as nitrogen oxides, carbon monoxide and volatile organic compounds have remained relatively stable during this period although their source may have changed. For example, the release of nitrogen oxides from industrial sources has generally declined whilst emissions from road traffic have increased. Planned development in the Aire catchment (see section 2.2) will lead to an increase in vehicle movement and therefore increase the amount of polluting discharges, especially nitrogen oxides.

Europe now generally accepts that there is a high risk that some chemical emissions to the atmosphere may have a significant impact on the global environment (see section 2.1). Emissions of a range of gases, notably carbon dioxide and methane, are adding to the natural "greenhouse" effect which may cause global warming. Estimated emissions of carbon dioxide nationally reached 155 million tonnes in 1990. The international community is trying to get the major industrialised countries to sign up to achieving reductions of " greenhouse" gases. Currently Britain is committed to reducing emissions to 1990 levels.

The Agency will work closely with local authorities to help achieve these objectives, principally through our regulation of emissions to air from controlled (Part A) processes under Integrated Pollution Control. There are 95 Part A processes in the LEAP area, including Ferrybridge and Eggborough power stations. The sites of these processes are shown on map 9.

The Agency regulates the discharge of liquid effluents direct to surface or groundwater by issuing discharge consents or, from Part A processes, through authorisations. Sites of discharges to water by major industry and sewage treatment works are shown on map 4. There are more than 70,000 consented discharges to fresh waters ranging in size in England and Wales. 887 of these are in the Aire catchment. Discharges which have the greatest potential to affect the quality of the water environment have numeric limits attached to their consents. Consents are regularly monitored and anyone exceeding the limits written in their consent can be prosecuted. Industry nevertheless remains a source of pollution in the area.

The large sewage treatment works taking domestic and industrial wastes from Keighley, Bradford and Leeds are one pollution source in the Aire catchment. Recently local rivers have benefitted from additional investment in sewage treatment. Between 1990 and 1995, 74.11km of river in the catchment were upgraded from the poorest classes (Class E and F). However, there are still a number of works which need further improvement to meet the needs of rivers and their users.

During dry summers, more than two thirds of the river's flow through Leeds is treated sewage effluent. Investment by Yorkshire Water is set every five years by the Office of Water Services (OFWAT), in consultation with the Agency. The result is an Asset Management Plan (AMP) which determines what Yorkshire Water will spend on improvements and what they can charge for their services. The latest review, AMP3, is currently being negotiated, and will be vital for securing further improvements in water quality of the years 2000 to 2005.

Project IRIS (Integrated Regulation in Sewerage) is being trialed in the River Aire catchment around Esholt sewage treatment works. The aim of the project is to identify the Best Practicable Environmental Option for reducing levels of the most toxic substances in rivers from all sources in a sewerage catchment by promoting a holistic solution with the water company and key industries concerned.

Diffuse sources

As well as point discharges, freshwaters are affected by inputs from diffuse sources. These can cause pollution when, for example, runoff from land becomes contaminated before entering rivers and aquifers, or when rainfall becomes contaminated before reaching the ground. In urban areas, runoff from roads and paved areas is a potential source of contamination (see section 2.2). Runoff from these areas may become contaminated due to substances such as:

- particles (suspended solids) from construction sites, including road construction
- chemicals used for de-icing at airports;
- oil, diesel and chemicals washed off road surfaces;
- herbicides used beside roads, railways and in urban parks

AIRE AREA

LICENSED IPC SITES

MAP No 9

Eastbrook Beck in Bradford currently has very high levels of zinc (shown in figure 8). It is likely that contaminated land or contaminated groundwater is the source of this pollution. The beck is culverted which makes conventional sampling techniques inappropriate for identifying the exact source.

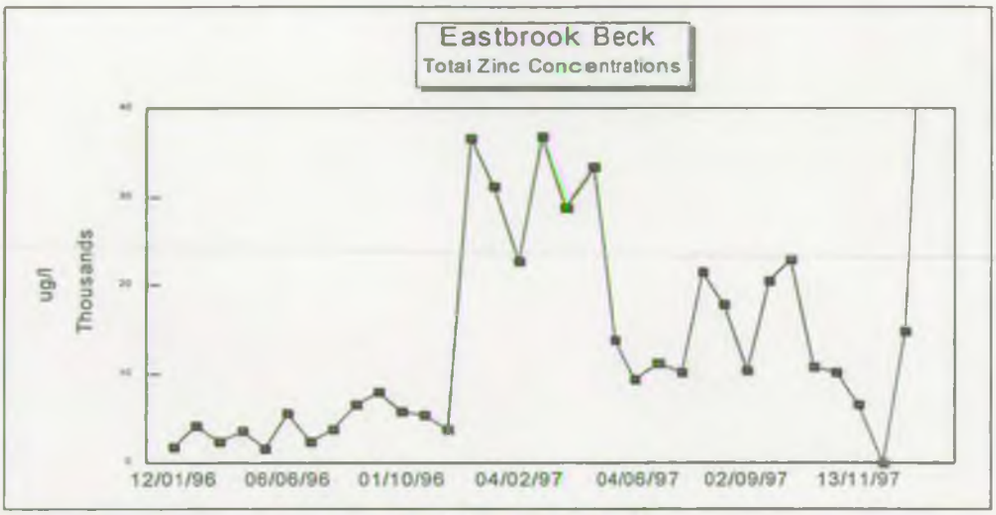


Figure 7. Zinc concentrations in Eastbrook Beck

Agricultural activities can lead to diffuse pollution, especially the use of fertilisers and pesticides. For example, there are often insufficient treatment and disposal facilities for organophosphorus sheep dip pesticides (such as propetamphos, diazinon and chlorfenvinos) which often enter watercourses and cause pollution. Sheep which have been treated could also have an impact by paddling in streams. Concern about the effects of organophosphorus compounds on human health has led to their replacement with synthetic pyrethroids for sheep dips. Although less hazardous to humans than organophosphorus, synthetic pyrethroids are extremely toxic to aquatic life. Discharges of sheep dip chemicals have affected the ecology of tributaries of the upper Aire catchment, and fish populations in Earby Beck are also restricted.

Soil erosion is a natural process caused by the action of wind or water, but rates of erosion may be increased due to land management. The ploughing and cultivation of land close to the banks of watercourses can lead to bank erosion which leads to increased sediment loads in rivers and siltation of the riverbed. Where the risks are high, buffer strips can be very effective in minimising soil loss. There is also a concern that overgrazing of permanent grassland due to increasing sheep stocking rates is exacerbating erosion in upland areas of the Aire catchment.

2.5 Waste arisings and disposals

Management of wastes

Waste poses a threat to the environment and to human health if it is not managed properly, or recovered and disposed of safely. It is essential, therefore, that everyone in the waste disposal chain from production and transport, through to final disposal or recovery, manages waste in a safe and proper manner. Legislation places a 'duty

of care' on everyone who must, by law, take all reasonable steps to look after any waste they have and also prevent its illegal disposal by others. This duty includes the requirement to store waste in a safe and secure manner.

A control system of licensing and inspections for waste sites is implemented and enforced by the Agency. There are 211 licensed waste disposal facilities in the LEAP area, which are shown on map 10. Landfill is the main disposal method used in the area and there are 72 operational landfill sites in the Leeds and Bradford districts alone. The chart below shows the proportion of waste types going to landfill in the Leeds and Bradford districts in 1995/96. Approximately 95% of collected household waste goes to landfill, while around 5% is incinerated in Huddersfield, outside the Aire Plan area (see section 2.2).

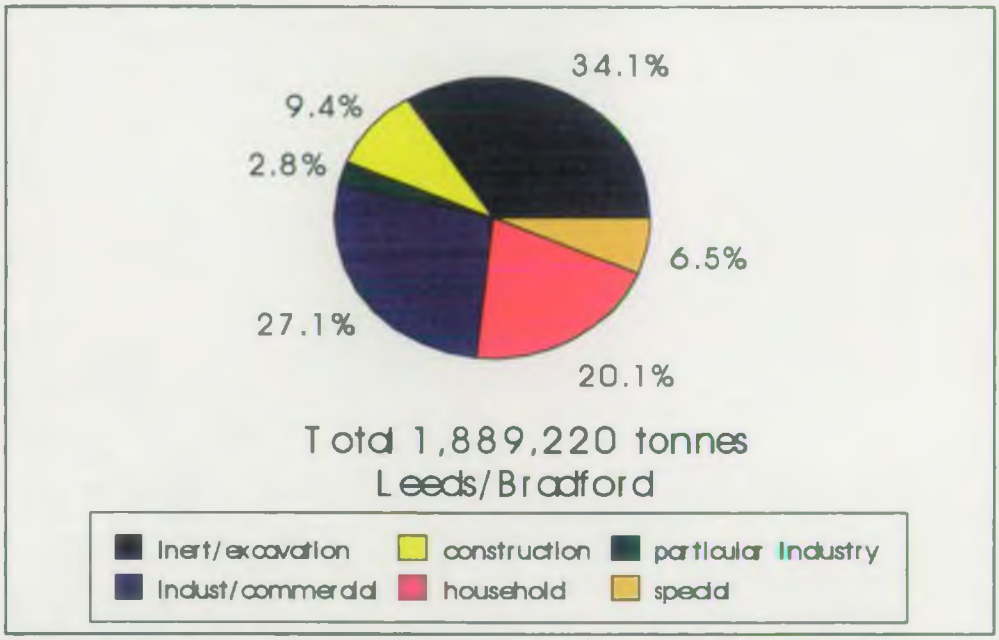


Figure 8. Waste types going to landfill in Leeds and Bradford 1995/96

A substantial proportion of industrial and commercial waste passes through intermediate waste handling or treatment facilities before being finally disposed of. There are 89 transfer stations in West Yorkshire handling industrial or commercial wastes. In addition to this, waste is disposed of and treated at an additional 305 unlicensed registered sites.

Landfill sites can be unattractive, resulting in noise, smells and wind-blown litter. As waste breaks down in a landfill site it produces a polluting liquid (leachate) and landfill gas. Methane and carbon dioxide are the main gases produced at landfill sites as the waste decays. The impact of methane on climate change (see section 2.1) is 25 times greater than that of carbon dioxide. This can be reduced by burning methane, although this does result in the production of further carbon dioxide. This burning of methane, known as flaring, can be used to generate power.

As well as reducing the environmental impact of emissions, using landfill gas to generate power also reduces the amount of fossil fuels consumed - further enhancing the environmental benefits. There are approximately 110 licensed landfill sites

AIRE AREA

MAJOR WASTE MANAGEMENT FACILITIES

MAP No 10

within the Leeds and Bradford districts producing landfill gas (including closed sites). Two sites are already making use of landfill gas and the feasibility is currently being assessed at three others.

To ensure that the real cost of producing, using and disposing of packaging falls directly on those who produce or use it, the EC Directive on Packaging and Packaging Waste requires that no later than 2001 the UK recovers or recycles at least 50% of its packaging waste. Companies obligated must submit returns to the Agency showing how much packaging they handled over a year, and calculate the tonnage they are required to recover (currently 38%). In the Plan area there are 74 companies obligated under the Directive, and 30 of these are registered with the Agency.

West Yorkshire has long history of recycling scrap metals, through scrapyards and vehicle dismantlers. There are 140 scrapyards in the county, with a total throughput of 652,484 tonnes of metal in 1995/96.

Some industrial effluent and solid wastes are applied to land for beneficial purposes, e.g. to provide valuable nutrients to the soil without the addition of artificial fertilisers. When properly controlled, landspreading is an economical and environmentally safe way of recovering a variety of organic wastes If it is not properly controlled, however, landspreading can result in the contamination of groundwaters and soil. The Ministry of Agriculture, Fisheries and Food (MAFF) guidance on landspreading is contained in the Code of Good Agricultural Practice for the Protection of Soils. Landspreading is exempt from waste management licensing, but monitoring and regulation of landspreading activities are the Agency's responsibility. There are 18 exemptions for landspreading in the Plan area.

Failure to adequately handle and dispose of wastes classified as special wastes carries the greatest potential environmental risk. The Agency enforces special waste legislation which tracks the movement of these wastes from the points of production to their final disposal or recovery. Special waste is generated from a whole range of chemical, engineering and manufacturing industries within the Plan area. The main producers are the chemical companies in and around Bradford and Leeds. In 1995/96, 194,100 tonnes of special waste were produced and 205,850 tonnes were disposed of in West Yorkshire.

Waste minimisation

The Agency and its predecessors have sponsored a number of successful projects on waste minimisation. These projects have demonstrated how waste minimisation techniques can reduce operational costs, save on raw materials, water and energy, and reduce work outputs. The Aire and Calder project ran from 1992 to 1995, and its aim was to demonstrate the benefits of a systematic approach to waste minimisation, using cleaner technology rather than 'end-of-pipe' solutions. Eleven companies took part in the project, and the results showed clear improvements in economic and environmental efficiency.

Waste management options can be ranked in a hierarchy according to their potential risk to the environment:-

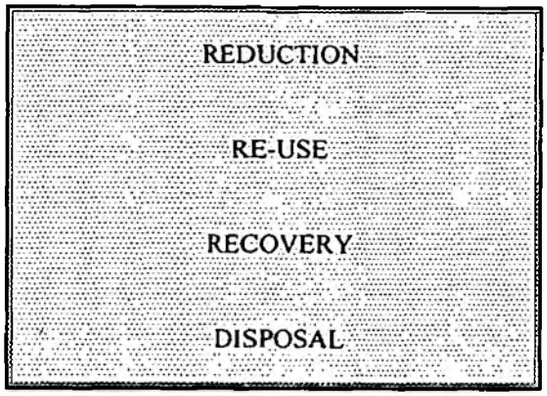


Figure 9. The waste hierarchy

Sustainable development generally requires that waste management practice moves towards the top of this hierarchy (reduction). Figures for waste disposed of in West Yorkshire do show a general decrease from 1994/95 to 1995/96.

year	total controlled waste	non-special commercial and industrial waste	household waste
1994/95	5,337,300 tonnes	4,300,000 tonnes	790,000 tonnes
1995/96	3,755,300 tonnes	2868700 tonnes	621,700 tonnes

Figure 10. Waste disposed in West Yorkshire

2.6 Illegal practices

Flytipping

Illegal tipping, or "flytipping" is a widespread problem that affects the rural moorland environment as well as that of inner city estates. It detracts from the visual appeal of the environment and in some cases can cause land and water pollution.

There is evidence that flytipping is increasing in the LEAP area. This may, in part, be a result of the Landfill Tax which was introduced in October 1996. Waste is tipped illegally to avoid paying the disposal charge and this has increased significantly recently because of the addition of Landfill Tax. Often the problem is made worse by the general public being unaware that their household wastes can be disposed of for free either by the collection authorities or through household amenity sites.

The materials that are flytipped most are household and builders' wastes. However, there are occasions when industrial and commercial wastes such as tyres, drums and "Special Waste" (for example, asbestos) are tipped. There are certain waste types that are now being routinely tipped in the same area.

The table below shows sites in the Plan area which are known flytipping blackspots:-

Location	Problem
Leeds	Osmanthorpe Area Brown Lane West, Gelderd Road Headingley Squash Club, Bridge Road, Kirkstall Gibraltar Island Road, Hunslet Cross Green Area Lindale Lane, Kirkhamgate Clayton Wood Road, Horsforth Union Place, Holbeck Ivory Street, Holbeck
Bradford	Birkshall Lane, Bowling Back Lane Ainsbury Avenue, Thackley Bolton Hall Road, Bolton Woods
Shipley	Briggate Dockfield Road Leeds Road
Keighley	Halifax Road, Crossroads

Figure 11. Known flytipping blackspots in the Aire catchment

The Agency has teams of enforcement staff who carry out investigations, and where necessary surveillance, to identify and prosecute offenders. However, it is often difficult to identify and find culprits and in many cases the tipping is cleared at considerable expense by the local authority or landowners. The Agency is currently working towards a common understanding with local authorities to resolve their respective responsibilities to establish who takes the lead in specific circumstances. The Agency will give advice and undertake enforcement at sites where flytipping is a persistent problem.

Water pollution incidents

In 1997 there were 1246 water pollution incidents in the Aire and Calder catchment areas (it is not possible to split incidents between these catchments). Pollution incidents are categorised by both source and type of pollution. Utility companies and industry account for the highest proportion of incidents (see the graph below).

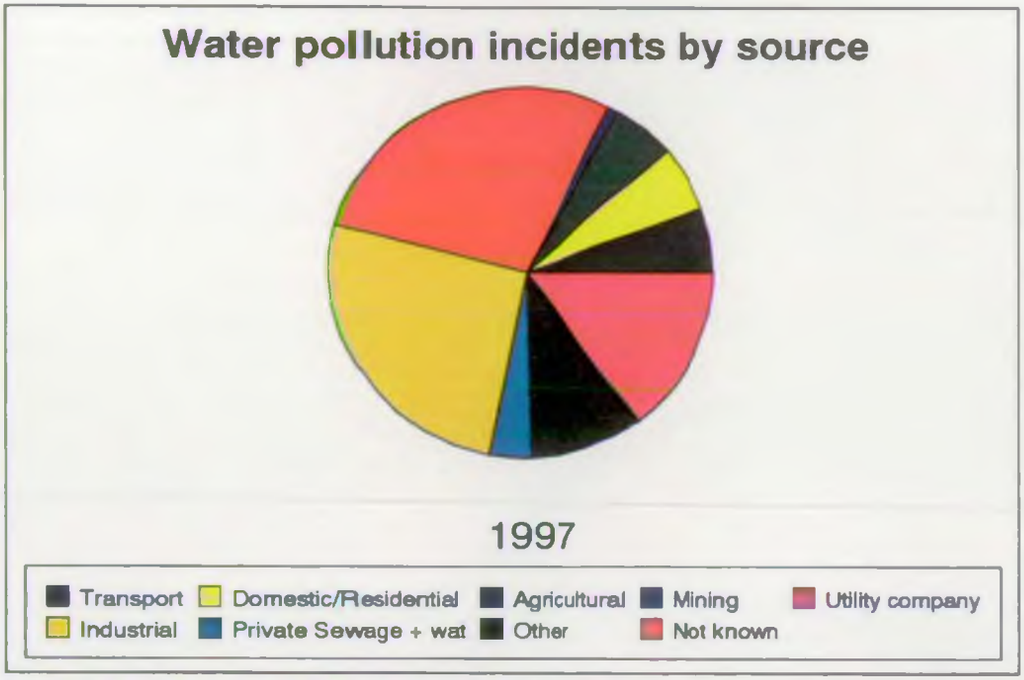


Figure 12. Water pollution incidents by source

Sewage was the most common type of pollutant, followed by oil and general and chemical pollution (see the graph below).

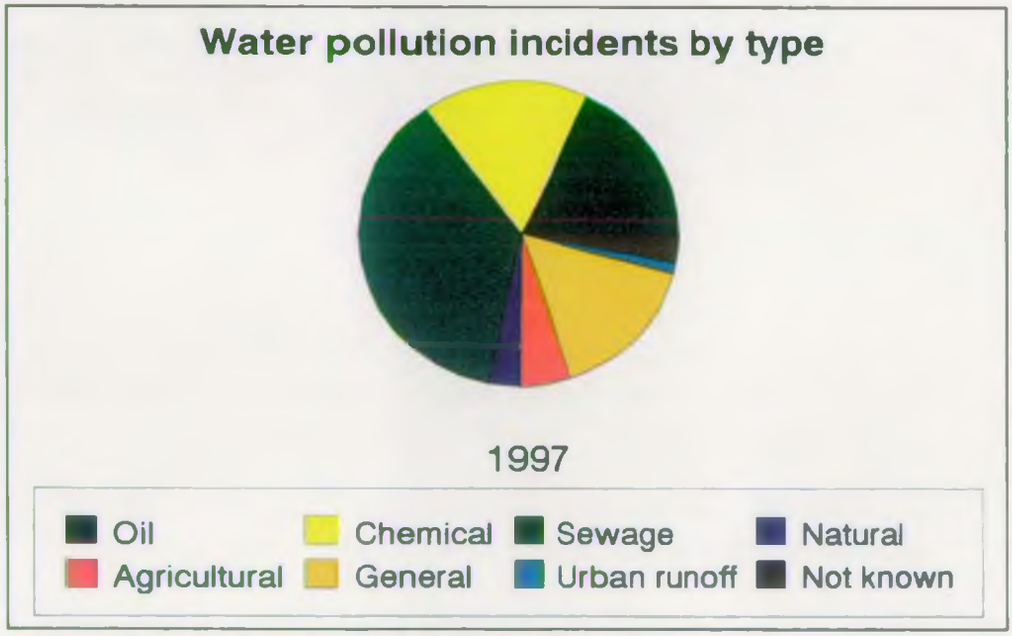


Figure 13. Water pollution incidents by type

The number of pollution incidents in the two catchments has fallen in recent years. The following chart shows the number of substantiated and unsubstantiated incidents between 1995 and 1997, and highlights that the numbers of both categories have fallen during this period.

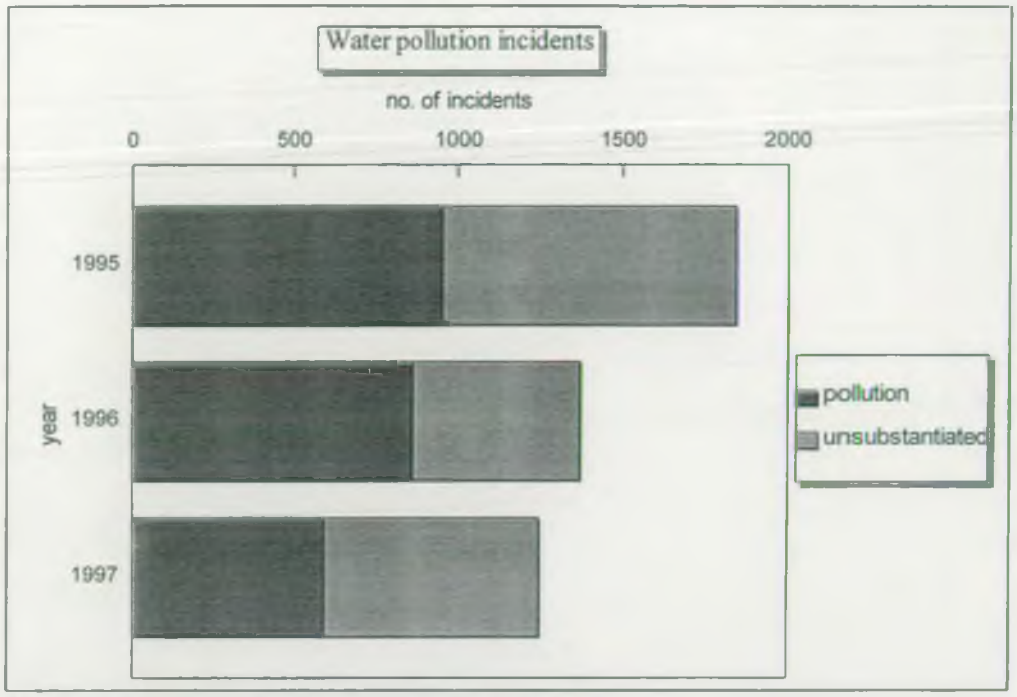


Figure 14. Trends in water pollution incidents

3.0 STATE (VIEWPOINTS) OF THE LOCAL ENVIRONMENT

3.1 Land use and environmental resources

Geology

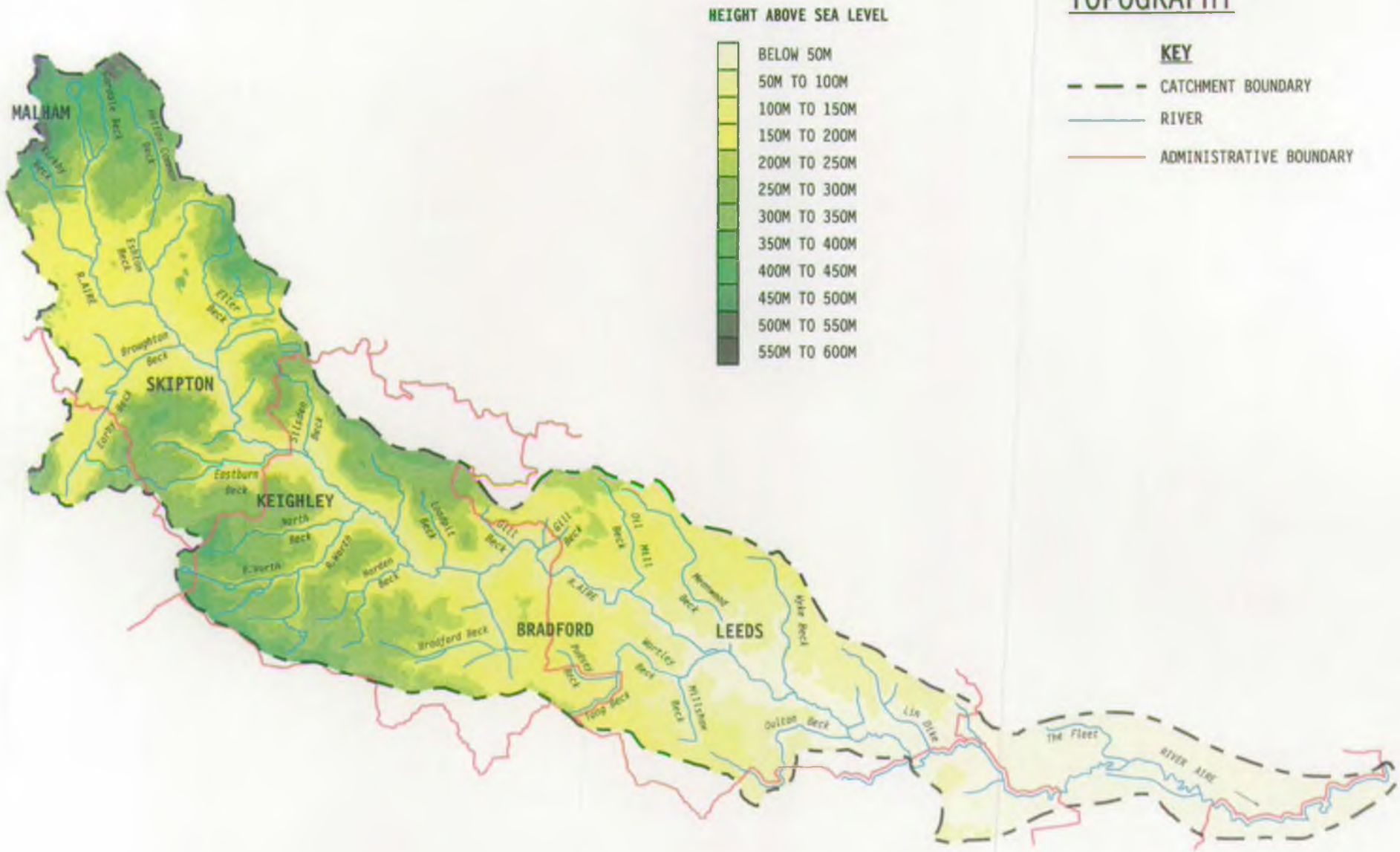
Simplified maps showing the topography and geology of the LEAP area are provided as maps 11 and 12. The Carboniferous Limestone of the headwaters of the Plan area produces the characteristic limestone scenery of the Yorkshire Dales in the Malham area. The Millstone Grit, a sequence of shales and grits, stretches from Skipton to Bradford to form the higher moorland areas, such as those around Keighley.

The Coal Measures, also of Carboniferous age, are made up of shales, grits and coal seams. Though less prominent than the Millstone Grits, these grits form the higher ground in the Bradford and Leeds area. The coal has been extensively mined in the past, although more recently coal mining has moved eastwards.

A low north-south ridge, roughly along the line of the A1, is formed by Magnesian Limestone, which overlies the Coal Measures. These rocks dip gently eastwards and are overlain by the Sherwood Sandstone which increases to more than 300m thick towards Goole. This soft sandstone forms the Vale of York and is extensively covered by up to 20m of glacial and alluvial material.

AIRE

TOPOGRAPHY



MAP No 11

AIRE AREA

GEOLOGY

MAP No 12

Water resources

Map 13 provides a geological cross section of the Plan area, which clearly shows the different aquifer bands (an aquifer is a water-bearing rock below ground level). The Sherwood Sandstone is the most important aquifer in the Plan area. A major public water supply well field is centred on the sandstone outcrop south of Selby. A total of 7 boreholes (with three more just outside the Plan area) are licensed to abstract nearly 24 million cubic metres of water per year for public supply, with 8 million more abstracted for agriculture, manufacturing and cooling. Monitoring of water levels in the Sherwood Sandstone has shown that groundwater levels have decreased over many years due to abstraction, and this may have long-term implications for the resource. A computer model is being developed to predict the implications of continuing to abstract water at current rates.

A significant quantity of water is abstracted for industry, cooling and agriculture from the narrow band of Magnesian Limestone in the Plan area.

The Millstone Grit is a locally important source of groundwater although faulting may reduce the effectiveness of the rock as an aquifer. Nevertheless, high yields are possible and the gritstone layers are potentially valuable sources of water for the many industries between Keighley and Bingley. Water is abstracted mainly for manufacturing and cooling but domestic and agricultural sources still represent a large proportion of abstracted groundwater.

The Carboniferous Limestone is characterised by large numbers of fairly small groundwater sources. These are mainly used for domestic and agricultural purposes in a very rural part of the Plan area where large yields, often unobtainable from Carboniferous Limestone, are not required. The Coal Measures are less important as a resource since the yield and quality are unpredictable and the demand of water for industry in Leeds has declined.

There are many small reservoirs in the Plan area, particularly on the upland tributaries around Keighley, Skipton and on Rombalds Moor. However, these do not provide sufficient water to meet the needs of the Plan area. As a consequence, much of the water is imported from reservoirs and rivers in the Wharfe, Nidd, Ure, Ouse and Derwent catchments.

Flooding

Flooding is a natural process. However, society's use of the environment has reduced the available floodplain (see section 2.2) and resulted in the need to control flooding to protect life and property. Major washlands in the catchment area are shown on map 14. Restoration of opencast sites has provided opportunities for additional washland capacity, also offering recreation and conservation benefits - for example at the Allerton/Newton/Fairburn Ings complex (see section 2.2, 2.3). The Agency is involved in the preparation of Water Level Management Plans (WLMP) for Sites of Special Scientific Interest such as this complex to ensure that the water level requirements for a range of activities can be balanced and integrated.

To ensure that flooding risks that might arise from a development are recognised and made an integral part of development control, the Agency prepares Section 105

AIRE

GEOLOGY CROSS SECTION

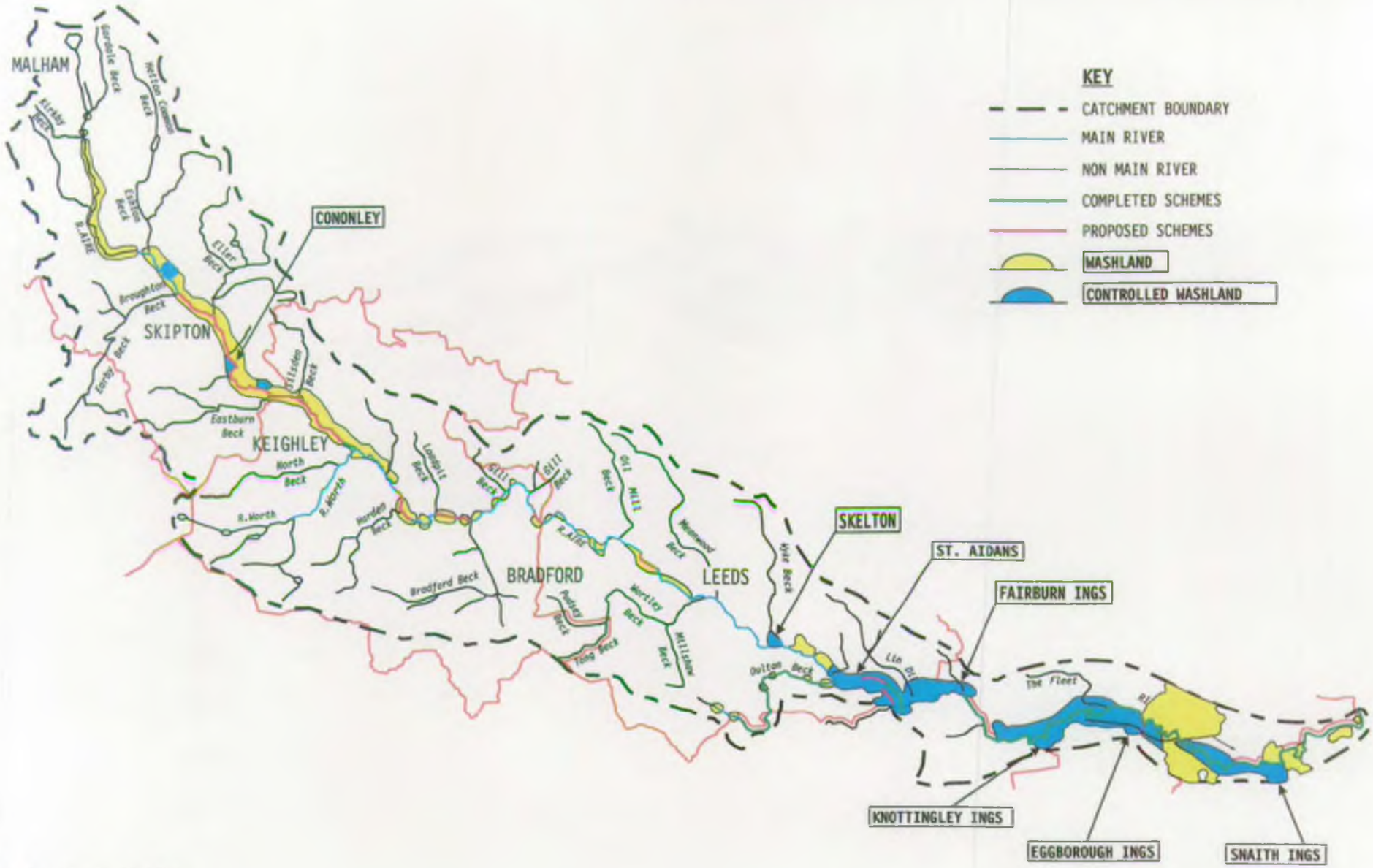
WEST

EAST

MAP No 13

AIRE

MAJOR FLOOD DEFENCE SCHEMES & WASHLANDS



MAP No 14

surveys to define the nature and extent of flood risks. In the LEAP area, Fryston Beck is currently being surveyed, and there are also plans to survey several other sites. Flood events are described in terms of the frequency at which, on average, a certain severity of flood is exceeded. This frequency is usually expressed as a return period in years, eg 1 in 50 years. Different types of land use require different levels of protection, for example people and property have a higher standard of protection than agricultural land. There are five land use bands which are shown in the following table.

Land Use Band	Description	Return period in years
A	Contains residential and non-residential properties distributed over a significant proportion of its length. Amenity uses may be prominent	1 in 50 - 1 in 100 years
B	Reaches containing residential and non-residential property over some or all of the reach length but at lower density than band A. Intensive agriculture may be present.	1 in 25 - 1 in 100 years
C	Isolated rural communities at risk with limited numbers of residential and non-residential properties. Agricultural interests will be more apparent than in bands A & B	1 in 5 - 1 in 50 years
D	Isolated properties at risk. Agricultural use will probably be the main use with arable farming a feature.	1 in 1.25 - 1 in 10 years
E	Very few properties at risk. Agricultural use will predominate with extensive grassland the main feature.	< 1 in 2.5 years

Figure 15. Flood defence land use classifications

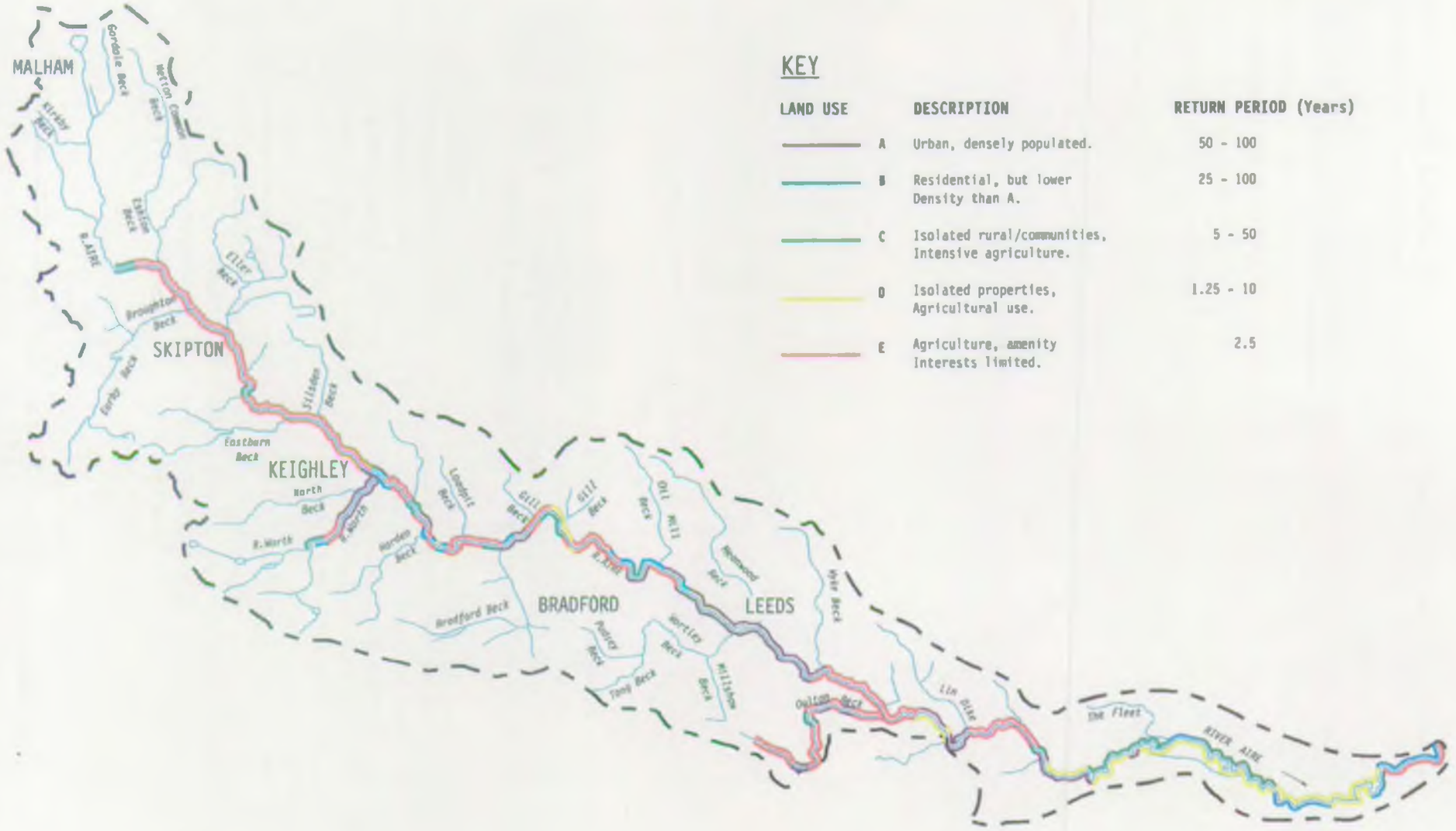
Proposed standards of service for the Plan area are illustrated on map 15. There are areas that are identified as being subject to flooding that have no defences, but as there have been no large floods since 1946, there has been very little pressure to protect these sites, which include the Bingley area and Kirkstall Road in Leeds (see section 2.2).

For locations where there remains a significant flood risk, a flood warning system has been developed. The Agency operates a flood warning service to people who are at risk so they can take action to protect themselves and their properties. Warnings are issued when river level gauges or a computer forecasting model of the river system show that flooding is likely. The Agency is currently refining all existing warnings to ensure that they are still relevant and are correctly focused. Prepared flood warning statements are presently available for the following locations:-

Allerton Bywater	Apperley Bridge	Beal
Bingley	Castleford	Cottingley
Gowdall	Ferrybridge	Keighley
Kellington	Kildwick	Kirkstall Road, Leeds
Shipley	Snaith	Temple Hirst
West Marsh		

AIRE

FLOOD DEFENCE STANDARDS OF SERVICE



KEY

LAND USE		DESCRIPTION	RETURN PERIOD (Years)
	A	Urban, densely populated.	50 - 100
	B	Residential, but lower Density than A.	25 - 100
	C	Isolated rural/communities, Intensive agriculture.	5 - 50
	D	Isolated properties, Agricultural use.	1.25 - 10
	E	Agriculture, amenity Interests limited.	2.5

0 2 4 6 8 10km

Scale

MAP No 15

Flood warnings are colour coded, and the colour of the warning tells organisations and the public how severe the threat of flooding is. Definitions for these are given in the table below.

Warning Type	Meaning
Yellow	A warning of flooding to some low lying farm land and roads near rivers or the sea.
Amber	A warning of flooding to isolated properties, roads and large areas of farm land near rivers or the sea.
Red	A warning of severe flooding affecting many properties, roads and large areas of farm land.

Figure 16. Flood warning classifications

Wildlife habitats

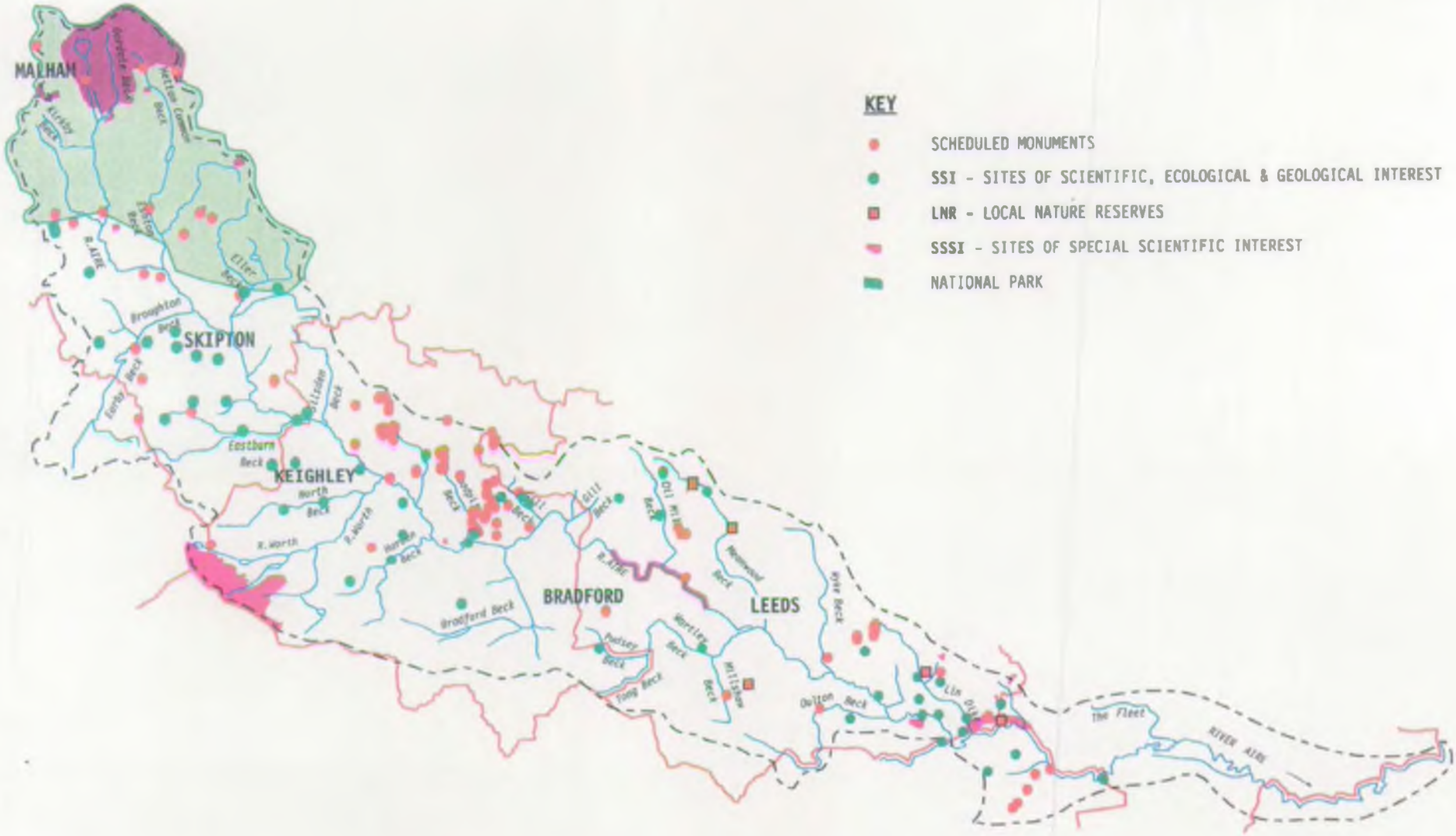
Much of the upper catchment above Malham is a designated Site of Special Scientific Interest (SSSI) due to its rural nature which provides habitats for many plant and animal species. This area also lies within the Yorkshire Dales National Park. Further down the catchment, mining subsidence has led to the permanent flooding of Fairburn and Newton Ings (see section 2.3), which is now an important nature conservation site and designated SSSI, providing wetland habitat for a variety of birds. The Plan area contains five Local Nature Reserves (designated by English Nature), and many non-statutory sites of scientific, ecological or geological importance. There are also many Scheduled Ancient Monuments, including medieval settlement sites and roman camps. Sites of scientific, ecological or geological importance are highlighted on map 16.

Map 16 shows that many sites in the catchment are already afforded protected status. However, many valuable sites remain unrecognised and are therefore vulnerable to damage. These sites have great potential for the regeneration and renewal of urban area. In particular, stillwaters within urban areas could be promoted for angling and other recreational use to benefit the disabled and disadvantaged.

There are parts of the more industrialised and urban districts that are also valued for conservation. Between Bingley and Leeds, the river corridor provides a "green lung" for the urban population living nearby. However, from Skipton to Bingley and also in the lower tidal part, the River Aire and some of its tributaries have been significantly modified for flood defence purposes or navigation which has restricted their conservation value.

The River Habitat Survey is a system the Agency uses for assessing the habitat quality of rivers and streams based on their physical structure. The Survey was conducted throughout the UK, with over 4,500 sites in England and Wales being surveyed between 1994 and 1996. Map 17 shows the sites surveyed within the Plan area, the characteristics assessed and the results.

AIRE
CONSERVATION



KEY

- SCHEDULED MONUMENTS
- SSI - SITES OF SCIENTIFIC, ECOLOGICAL & GEOLOGICAL INTEREST
- LNR - LOCAL NATURE RESERVES
- SSSI - SITES OF SPECIAL SCIENTIFIC INTEREST
- NATIONAL PARK

0 2 4 6 8 10km
Scale

MAP No 16

AIRE

RIVER HABITAT SURVEY

MAP No 17

Modern agricultural land use practices such as the removal of hedgerows can result in an increase in soil erosion, especially on vulnerable soils (eg sandy soils). This, in turn, can result in increased sediment load to watercourses. Changes in the natural input of sediment into watercourses can have significant effects on stream habitats and may result in drainage problems and harm to wildlife. River sediments were recently the focus of a national research and development project which identified them as important habitats for a number of rare species (R & D projects numbers 525, W1011 and W1034).

Riverside trees and shrubs provide habitat and cover for birds and other wildlife, as well as shade for fish. However, between Knottingley and Chapel Haddlesey there is very little bankside vegetation, which restricts the value of the river as a wildlife corridor. There is also concern about the lack of natural floodplain or washland alongside the river corridor, which should provide valuable habitats for wildlife (see section 3.1) From its source at Malham downstream to Keighley, the riverside land along the Aire and its tributaries (eg Otterburn and Crosber Becks) are largely unprotected from the damaging effects of both sheep and cattle. There are extensive lengths of river bank that are suffering from erosion caused by grazing, trampling and the input of faecal matter (see section 2.4).

3.2 The status of key biological communities and populations, and of biodiversity

Wildlife, Biodiversity and Conservation

Biodiversity, the variety of life on earth, is declining at an alarming rate. In the UK alone, more than 100 species are thought to have become extinct this century. In June 1992, at the Earth Summit in Rio, the Convention on Biological Diversity was signed by the UK and over 150 other countries. The UK response to this commitment was launched in January 1994 with "Biodiversity: The UK Action Plan" and the Agency will play an important role in implementing the plan.

The UK Biodiversity Plan identifies "contact points" for threatened and declining species. The Agency has a leading role in 19 species and 4 habitats, including chalk rivers, the otter, water vole and rare species of fish. We will be developing action plans to help protect these species and habitats and will report on their progress.

Of these species, those found in the Aire catchment are the white-clawed crayfish and the water vole. The current status of populations within the Plan area is not known, but survey work is being done to assess them. Studies of native and introduced crayfish are being carried out at Meanwood Beck, and a crayfish database will be set up.

Non-native plants such as giant hogweed, himalayan balsam and japanese knotweed, and animals such as signal crayfish and mink are established in the Plan area. These species may form a threat to the native wildlife , and the Agency has a duty to protect species dependent on the aquatic environment. More accurate information is needed on the extent of the populations of the alien species in the Plan area and their impact. The Agency's interim policy on alien plant species states that we will raise awareness of alien species in order to minimise their spread, and undertake control measures where the species are threatening native

wildlife. Primarily, however, it is the responsibility of the landowner to control nuisance alien plant species.

Trees and shrubs provide a variety of habitats, cover for birds and shade for fish and other wildlife. Their roots can also help to stabilise river banks. There are few riverside trees and shrubs along the lower Aire between Knottingley and Chapel Haddlesey. There are also no records of native black poplar in the Aire catchment.

Freshwater fisheries

In the headwaters of the River Aire downstream to Skipton the fishery is predominantly trout. This is not unusual and is directly related to the available habitat. The stretch of river from Skipton to Keighley represents the transition from trout zone to coarse fishery zone. Here the fishery should be populated by a diverse range of coarse fish species, eg chub, dace, gudgeon, pike, roach, perch and possibly barbel.

However, fisheries survey results for this section of river (shown on map 18) reveal a poor variety of coarse fish, and suggest that the river does not respond to potentially good recruitment years as well as other Yorkshire rivers. Major investment, especially in discharges from sewage treatment works, has resulted in improved water quality in this stretch from grade D (equating to 'fair' water quality) in 1990 to grade B ('good') in 1995 (see section 3.3), and this improvement should have permitted some recovery of fish populations.

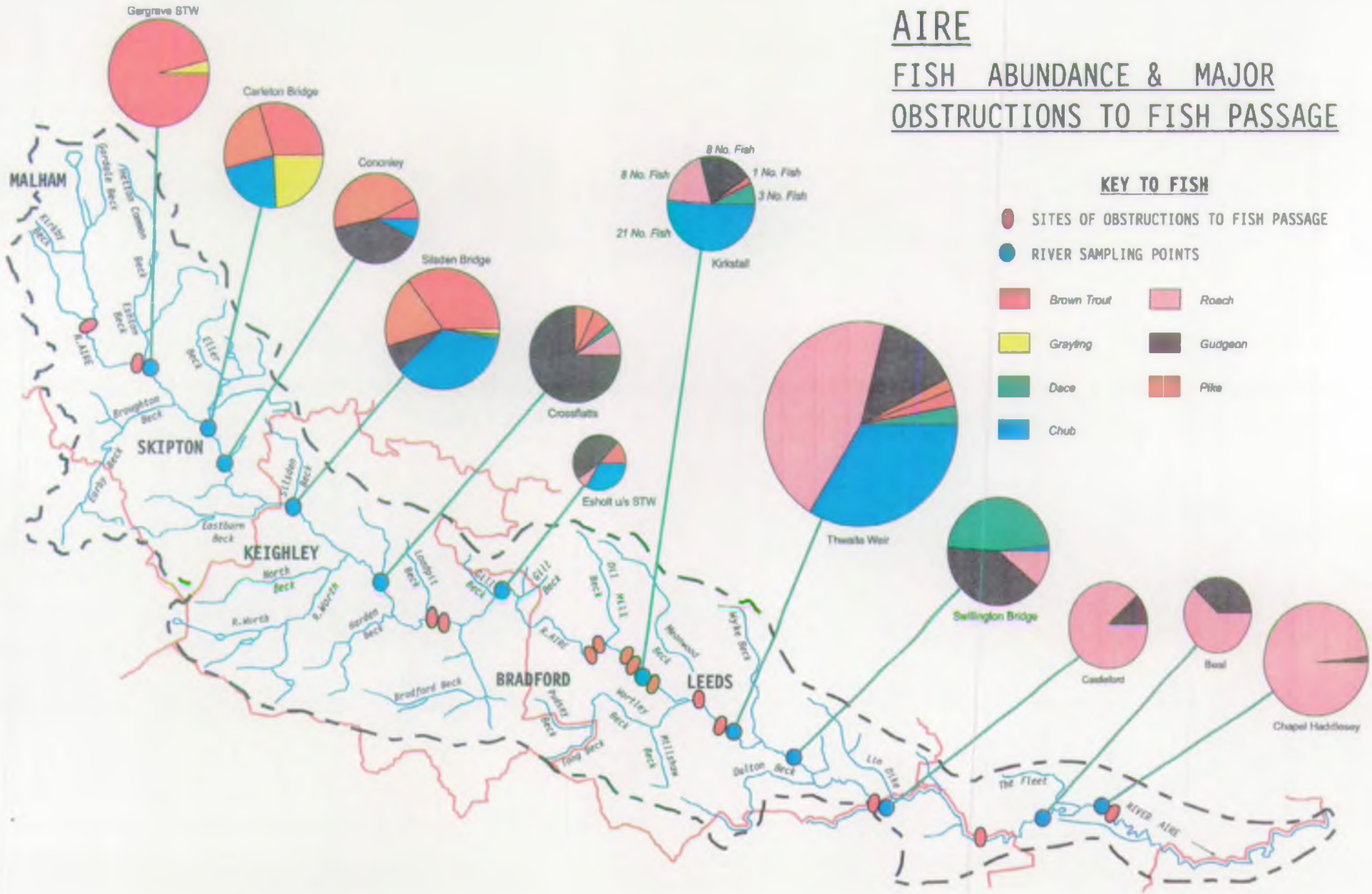
Populations of some species, such as roach may now be at such low levels that they cannot sustain their numbers. This impacts on the river's natural recovery process and stocking will have to be undertaken to restore populations. This could only be undertaken on a large scale after other potential limiting factors such as habitat have been examined in detail.

The middle and lower river is predominantly a coarse fishery, but some of the tributaries in the middle reaches, (eg the River Worth and Harden Beck), are trout fisheries for all or part of their length. Projected water quality improvements for the River Aire are unlikely to restore salmon runs within the next 5 years. However, as water quality improves further, the return of salmon may become a reality, which could be an issue for subsequent Local Environment Agency Plans (LEAPS).

There is a long history of stocking fish into rivers and stillwaters, some of which have been successful while others have not proved to be effective and, in some instances, have been ecologically damaging. Stocking fish carries some risks of introducing disease, and the Agency's fisheries team continues to operate routine health checking of all transferred fish stocks as this represents good fisheries management. Fish stocking is a management tool which must be considered alongside other options, and the Agency's stocking policy for its own operations is now prioritised to ensure that stocking is only undertaken in appropriate circumstances, that maximum benefit is gained, and to avoid detrimental effects.

AIRE

FISH ABUNDANCE & MAJOR OBSTRUCTIONS TO FISH PASSAGE



The table below shows the numbers of fish introduced into the River Aire over the last few years. Most of the restocking has taken place above Keighley, as poorer water quality restricts opportunities further downstream.

Year	Numbers of trout stocked	Numbers of coarse fish stocked
1995	3050	2800
1996	3730	2120
1997	4575	4500
3 year total	11355	9420
mean	3785	3410

Figure 17. Fish stocked in the River Aire

Some of the headwaters and enclosed waters of the catchment have not been stocked with farm-reared fish. These areas could contain genetically unique populations that are adapted to specific environmental conditions. Currently the special protection of fish populations within Malham Tarn Site of Special Scientific Interest is being addressed to establish a self-sustaining fishery without the need for artificially introduced fish stocks.

A recent search of available literature has revealed that there is now evidence to support the claimed historical presence of barbel (Barbus barbus) in the River Aire. Documented evidence prior to 1850 to prove that this species was once indigenous was absent until now and the species had therefore been regarded as non-native and unsuitable for stocking. In line with the introduction of barbel into other Yorkshire rivers, it is suggested that this species could prove to be an asset for the River Aire.

3.3 Compliance with existing standards and targets

Air quality

It is vital that we protect the air since it affects the future health of mankind and the environment. Among the main air quality issues are acid rain, stratospheric ozone depletion, ground level ozone formation, photochemical smogs and global warming (see sections 2.1 and 2.4).

The Environment Act 1995 provides a framework within which local authorities have responsibility for the overall management of local air quality. In March 1997, the Government published a national strategy for air quality. The Strategy sets out standards and objectives to control and reduce the eight air pollutants of most concern. These are given in Figure 19. The source of these pollutants and their effects on release to atmosphere are described in Appendix 1.

Pollutant	Standard		Specific Objective
	Concentration	Measured as	
Benzene	5ppb	running annual mean	achieve by 2005
1.3 Butadiene	1ppb	running annual mean	achieve by 2005
Carbon Monoxide	10ppm	running 8 hour mean	achieve by 2005
Lead	0.5 ug/m^3	annual mean	achieve by 2005
Nitrogen Dioxide	104.6 ppb	1 hour mean	99.9th percentile by 2005
Ozone	50 ppb	running 8 hour mean	97th percentile by 2005*
Particles PM_{10}	50 ug/m^3	running 24 hour mean	99th percentile by 2005*
Sulphur Dioxide	100 ppb	15 minute mean	99.9th percentile by 2005*

Figure 18. National air quality standards and specific objectives

The Agency will work closely with local authorities to help achieve these objectives, principally through our regulation of emissions to air from controlled (Part A) major industrial processes under Integrated Pollution Control. Local authorities have the main responsibility for managing air quality through the regulation of smaller less complex (Part B) industrial processes and reducing traffic pollution.

Air Quality is monitored by local authorities using two networks of over 1500 monitoring sites across the country. There are two types of site - automatic and non-automatic. The automatic sites produce hourly pollutant concentrations, while non-automatic sites measure less frequently and samples are collected by physical means and concentrations calculated later. The only automatic site within the Plan area is in Leeds city centre, which monitors all the pollutants in the Air Quality Strategy. There are 7 non-automatic sites for monitoring nitrogen dioxide and 94 sites for sulphur dioxide.

Sulphur dioxide emissions are of particular concern in the Plan area. Leeds city centre especially suffers from poor air quality, and lies north east of three major power stations. Ferrybridge and Eggborough are within the Plan area while Drax is just outside, but only 37km from Leeds. Together these three power stations form the largest group of coal fired power stations in the UK, and under certain meterological conditions cause a combined plume of emissions. The wind direction in the Plan area is predominantly from the west, blowing from Leeds towards the stations. In summer and autumn, however, there are episodes when the wind comes from the south east, and this can lead to exceedences of the UK standard in Leeds city centre.

Episodes when pollutants exceed the threshold values are now given out as public

information and investigated. There is still considerable room for improvement in the monitoring of air quality as cause and effect relationships for these episodes are not as yet well understood. For each pollutant, there is a maximum of exceedences of the national standard allowed, based on a target of compliance by the year 2005 . The chart below shows the maximum allowable exceedences and the number of exceedences per year from 1993 to 1996 at the Leeds City Centre automatic monitoring site. There were no exceedences for nitrogen dioxide. All data is from the National Environmental Technology Centre.

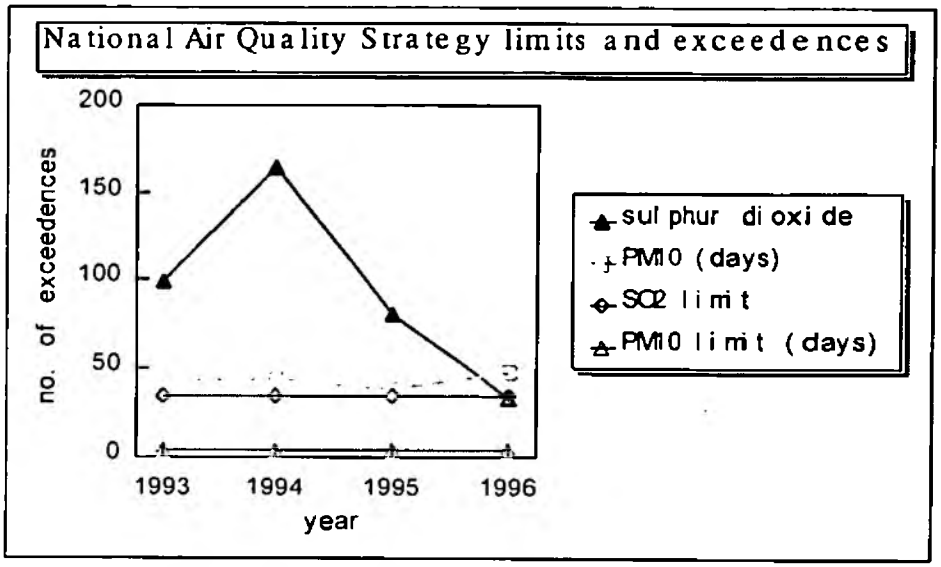


Figure 19. Exceedences of National Air Quality Standards

Surface water quality

EC Directives

There are a number of EC Directives that apply to the aquatic environment. On the River Aire sampling is carried out to monitor against the following Directives:-

Freshwater Fisheries Directive

The EC Directive on the *quality of waters needing protection or improvement in order to support fish life* (78/659/EEC) ensures that water quality in designated stretches of water is suitable for supporting certain types of fish. Along the Aire there are 17 sample points designated under the Freshwater Fisheries Directive. In 1996, 8 of these failed to meet the requirements of the Directive due to low dissolved oxygen. The cause of this is thought to be low drought flows. Investigations are currently being carried out to determine whether these conditions have affected fish populations. The table below shows the sites which failed.

Sample point
Eastburn Beck at A629 Bridge
Eller Beck near confluence with the River Aire
Eller Beck by Leatt's Mill
Embsay Beck upstream of confluence with Haw Beck
Eshton Beck at confluence with River Aire
Haw Beck at confluence with Embsay Beck
Lothersdale Beck by Post Office
Aire at Carleton

Figure 20. Sample points that failed the Freshwater Fisheries Directive 1996

Nitrates Directive

The EC Directive *concerning the protection of waters against pollution caused by nitrates from agricultural sources* (91/676/EEC) protects waters from pollution by nitrates used in agriculture. The Directive requires Member States to identify waters that are or could be affected by nitrates. The land draining to these affected waters must be designated as Nitrate Vulnerable Zones, and action plans must be established to reduce existing nitrate pollution and prevent further pollution. There are 2 Nitrate Vulnerable Zones in the Aire catchment, at Pollington and Carlton in the Selby area where the land use is predominantly agricultural.

Regular reviews must be carried out of existing and potential new Nitrate Vulnerable Zones; the first were by December 1997, and then at four year intervals. Outside Nitrate Vulnerable Zones, member states must establish and promote a code of good agricultural practice. The Agency is responsible for advising on the selection and boundaries of Nitrate Vulnerable Zones, but the designation of Zones and the measures to be adopted is the responsibility of Government.

Dangerous Substances Directive

The EC Directive on *pollution caused by certain substances discharged in the aquatic environment of the community* (76/464/EEC) protects the water environment by controlling discharges to rivers, estuaries and coastal waters. The Directive describes two lists of compounds. List I contains substances regarded as particularly dangerous because they are toxic, they persist in the environment and they bioaccumulate. Discharges containing List I substances must be controlled by Environmental Quality Standards (EQS) issued through daughter directives. List II contains substances which are considered to be less dangerous but which still can have a harmful effect on the water environment. Discharges of List II substances are controlled by EQS set by individual Member States.

The Agency is responsible for authorising, limiting and monitoring dangerous substances in discharges. We are also responsible for monitoring the quality of waters receiving discharges which contain dangerous substances and reporting the results to the Department of the Environment, Transport and the Regions who decide whether the standards in the Directive have been met. Where they are not, we are responsible for identifying sources and making sure improvements are made.

Proposed EQS limits for the mothproofers permethrin and cyfluthrin were exceeded during 1997 at several sites along the River Aire. At Apperley Bridge the limit for permethrin was exceeded in January, September, October and November 1997, and the limit for was also exceeded in October 1997. At Crossflatts the limits were also exceeded several times. The following graph shows the concentrations of both chemicals plus cypermethrin, another mothproofer not included in the Dangerous Substances Directive, but also found in high levels in the catchment.

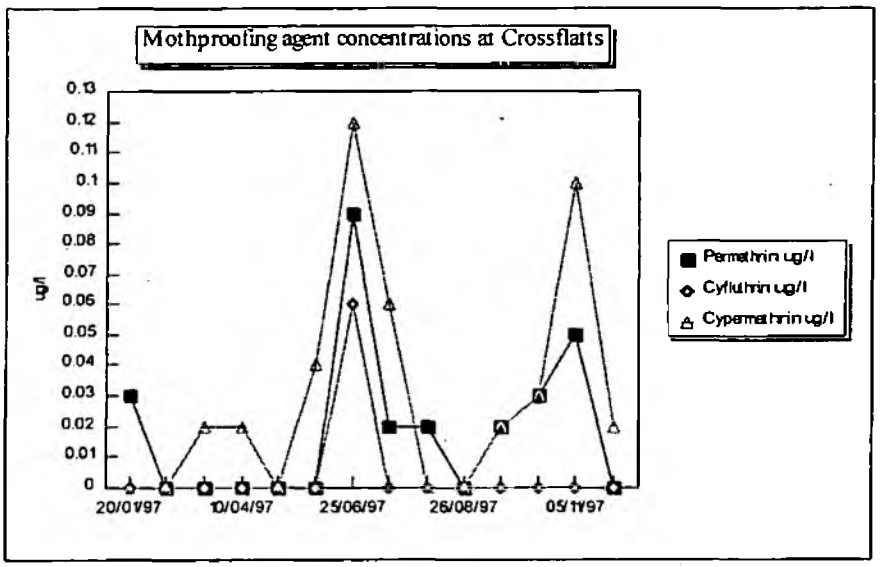


Figure 21. Mothproofing agent concentrations at Crossflatts

There are chemicals currently being discharged into the River Aire that are not covered by Environmental Quality Standards (EQS) limiting concentrations. In particular, herbicides from the local chemical industry, organophosphorus pesticides from the textile and farming industry and some of the new mothproofers from the textile industry are not covered. Levels of organophosphorus pesticides (OPs) in the River Aire downstream of Marley (Keighley) and Esholt (Bradford) sewage works are currently high. Levels have exceeded those proposed as an EQS. OPs have been found to exhibit toxicity in studies carried out at Marley sewage works. The following graphs show OP concentrations at Salts Weir (below Marley sewage works) and further down at Apperley Bridge (below Esholt sewage works, Bradford), in 1997. Levels of diazinon and propetamphos are clearly much higher than their operational EQS of 0.01 micrograms per litre.

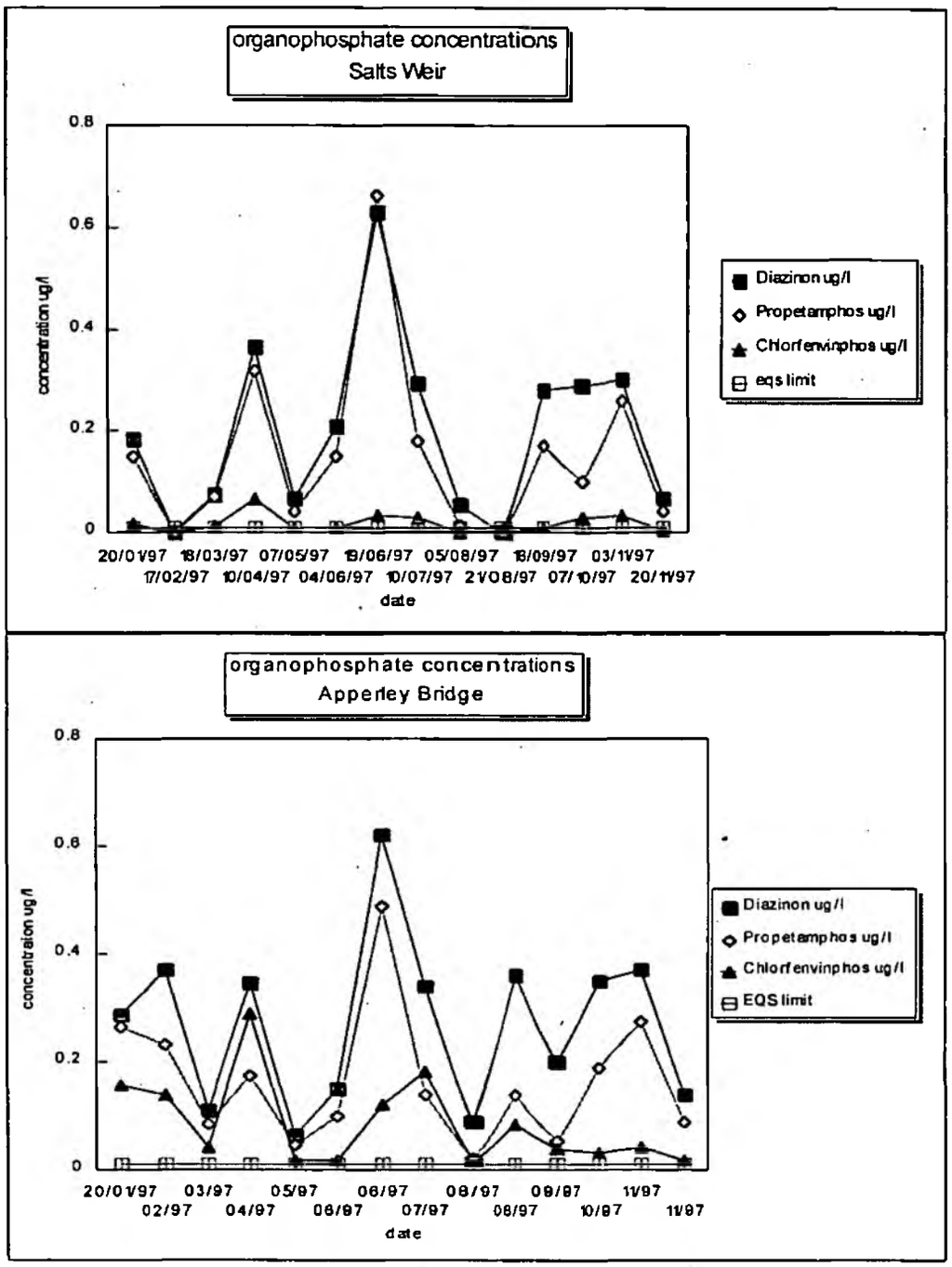


Figure 22. Organophosphate concentrations below Marley and Esholt sewage treatment works

These and other pesticides are also contained in effluents from the wool processing and textile industries which are not treated specifically to remove pesticides but discharged to rivers via sewage treatment works. Some of these pesticides can also arrive on imported fleeces.

Dissolved copper concentrations in the River Aire rise as the river passes downstream. The EQS limit for copper is 10μgl dissolved copper expressed as an annual average and though this limit has not been exceeded since 1995 the limit is approached as the river passes Snaith and also in its lower reaches. The potential

exists for the EQS to be breached again and further work is required to explain the levels to determine where any improvements might be necessary. Work is ongoing to assess the impact discharges and other factors have on the dissolved copper concentration of the lower reaches of the Aire.

The Agency has a national method for classifying the water quality of rivers and canals, known as the General Quality Assessment Scheme (GQA). This scheme is used to monitor trends over time and also to compare rivers in different area. It consists of separate "windows" to cover a range of ways of describing water quality - chemical, biological, nutrients and aesthetics. Currently the chemical and biological aspects are routinely monitored. Windows for nutrients and aesthetics are still being developed.

The chemical GQA describes quality in terms of three chemical measurements (ammonia, dissolved oxygen and biochemical oxygen demand) which detect the most common types of pollution. It is made up of six grades (A to F) defined as follows:-

Grade	Water Quality
A	very good
B	good
C	fairly good
D	fair
E	poor
F	bad

Figure 23. Water quality classifications

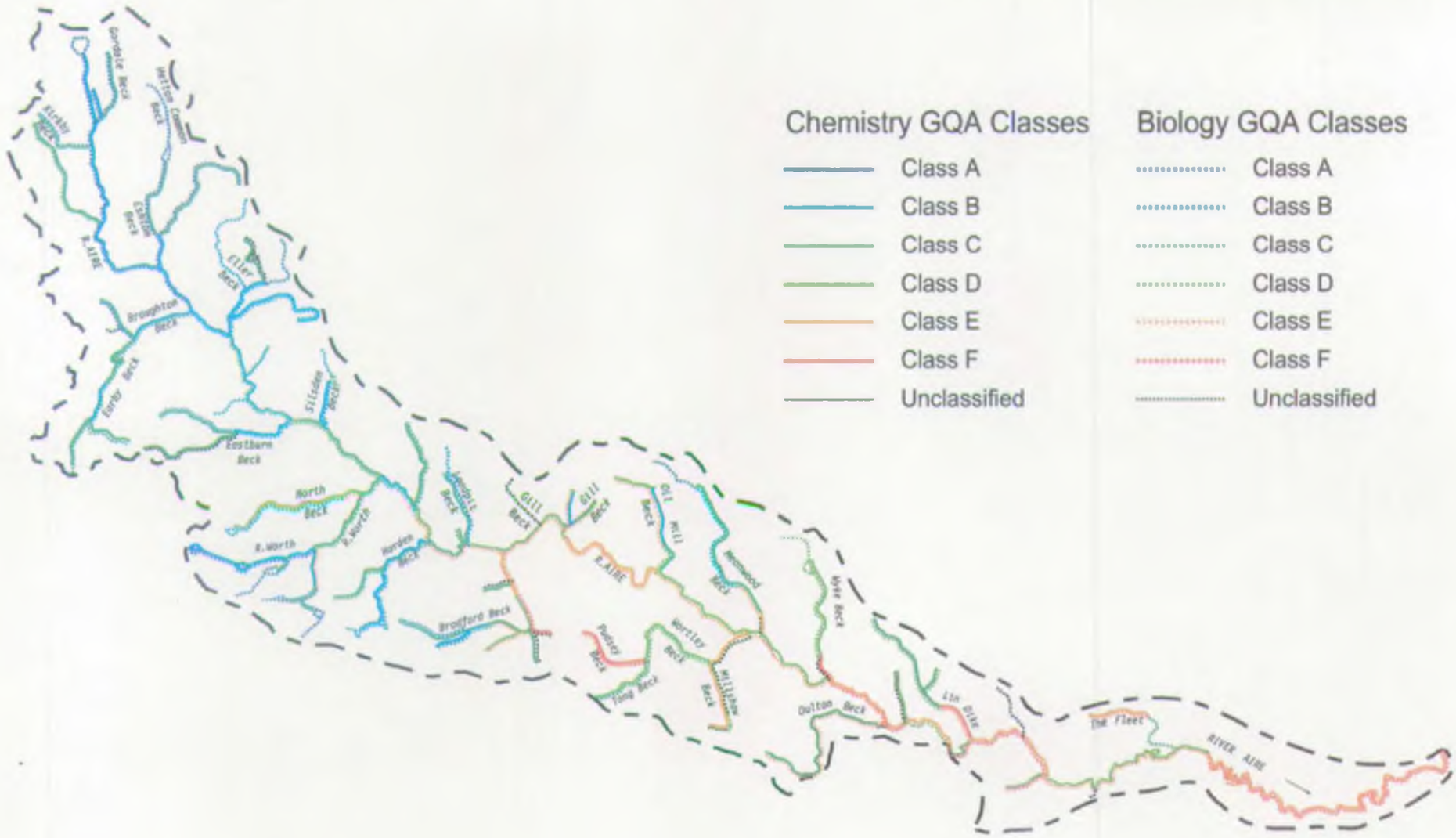
The biological GQA system also has classes A to F, based on the match between target values for biotic scores and actual results. Biological classification is assigned to a site following a detailed assessment of the animals found in the river at the site. These animals reflects not only the habitat but also the water quality over a long period. As different animals can tolerate different types of chemicals, the biological results can give an indication of the type of pollution that may have occurred.

Map 19 shows the chemical and biological GQA classifications for the Aire catchment.

The GQA replaces a former scheme developed by the National Water Council which reported every five years (Quinquennial Survey). There have been major improvements in water quality in the catchment since the GQA scheme began. The chart below shows the length of river and tributaries in each GQA class in 1990 and 1995. Between 1990 and 1995, 74.11km of river in the catchment were upgraded from the poorest classes (Class E and F).

AIRE

GQA CHEMISTRY & BIOLOGY 1995



0 2 4 6 8 10km

Scale

MAP No 19

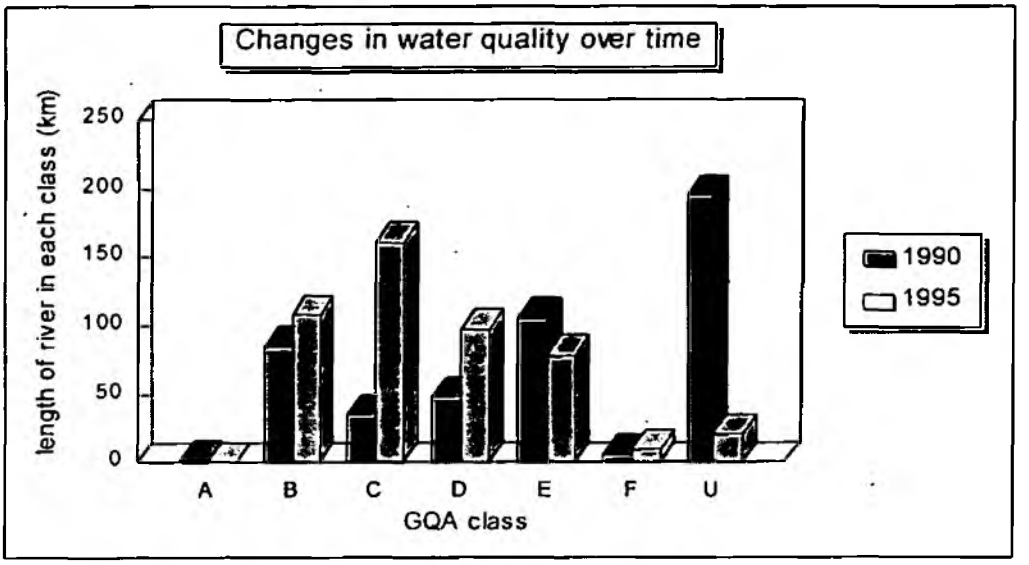


Figure 24. Changes in water quality

There are a number of sites in the Aire catchment where the good water quality implied by chemical classification is not matched by the biology. The principal mismatches are shown in the table below.

Watercourse/ location	Chemistry GQA 1995	Biology GQA 1995	Possible causes
Aire/ Castleford	D	f	Poor biology could be attributable to historical contamination of river sediments as well as the presence of micro pollutants such as pesticides and other substances which exhibit toxicity.
Aire/ U/S South Accommodation Bridge	D	f	as above
Aire / U/S Cottingley Bridge	C	e	as above
Aire/ Crossflatts	B	e	as above
Aire/ U/S Cononley Beck	B	d	Reason not known.
Fryston Beck/ Ferrybridge Power Station	D	f	Intermittent discharges from Combined Sewer Overflows (CSOs) and urban run-off could be responsible for chemical/biology mis-match
Oulton Beck/ U/S Farrah Lane Pumping Station	C	e	Minewaters at the head of this system and ochreous deposits could explain mismatch
Meanwood Beck/ Buslingthorpe Lane	C	e	Intermittent discharges from CSOs and urban run-off could be responsible for chemical/biology mis-match
Guisley Beck/ Keepers Hill	B	e	Intermittent discharges from CSOs and urban run-off could be responsible for chemical/biology mis-match
Bradford Beck/ U/S West Brook	C	e	Intermittent discharges from CSOs and urban run-off could be responsible for chemical/biology mis-match
Bridgehouse Beck/ U/s River Worth	B	e	as above. Relocation of a trader from the locality could result in biological improvements.

Figure 25. Biology/Chemistry mismatches

There are many more chemicals than those analysed for GQA classification that can be present and have a detrimental impact on the biology of a watercourse, eg herbicides, insecticides and heavy metals. In some cases chemical water quality may be good but river sediments, upon which the animals live, may be contaminated and may remain so for many years.

The Agency uses Water Quality Objectives which are targets for water quality that are based on use. Objectives are proposed using a scheme called River Ecosystem (RE) which has five classes as summarised below.

Class	Description
RE1	Water of very good quality suitable for all fish species
RE2	Water of good quality suitable for all fish species
RE3	Water of fair quality suitable for high class coarse fish populations
RE4	Water of fair quality suitable for coarse fish populations
RE5	Water of poor quality likely to limit coarse fish populations
Unclassified	Water of bad quality (fish are unlikely to be present) or insufficient data available by which to classify water quality

Figure 26. River Ecosystem classifications

Until Water Quality Objectives become statutory, they will be applied on a non-statutory basis, with appropriate RE classes and target dates when the objectives are to be achieved. Map 20 shows the current Water Quality Objectives and compliance within the Aire area. Where only the actual RE grade is shown, the water quality meets the objective.

Standards for further Use Classifications are still under development. They are likely to include Special Ecosystem, Abstraction for Potable Supply, Agricultural Abstraction and Watersports.

Groundwater quality

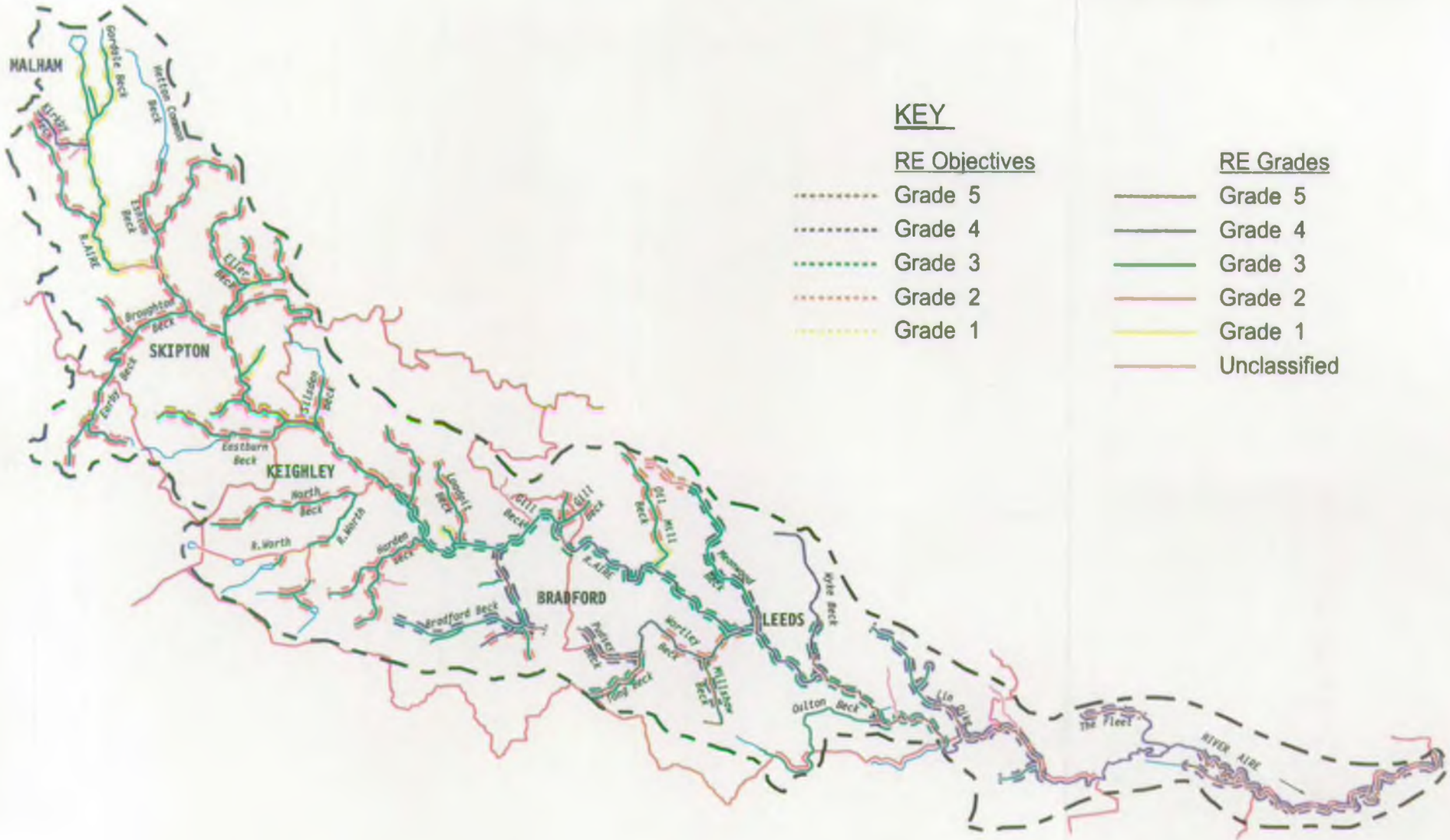
Groundwater often requires little or no treatment before being put into drinking water supply. It also provides the baseflow of many river systems which may be used for drinking water, industrial and agricultural purposes as well as for fishing and other recreational activities. The quality of this baseflow is therefore an important aspect of maintaining surface water quality. Groundwater pollution is particularly serious because of its long-term nature. Naturally it can take decades for pollutants to move through the ground and effective clean-up of groundwater pollution is difficult and costly. Prevention is better than cure.

The Agency is therefore establishing a groundwater quality monitoring network across both the Plan area and the North East Region as a whole. The network was initiated in 1995 and will be used both to assess current groundwater quality and to identify trends that may occur in the longer term. Data may also highlight areas where groundwater has become polluted and further investigation is required.

At present, no Water Quality Objectives have been set for groundwater. However, in order to set targets at some point in the future, and to comply with the Agency's general duty under the Water Resources Act to monitor controlled waters, it is important that baseline data is available on groundwater quality.

AIRE

WOO & COMPLIANCE 1996



KEY

RE Objectives	RE Grades
Grade 5	Grade 5
Grade 4	Grade 4
Grade 3	Grade 3
Grade 2	Grade 2
Grade 1	Grade 1
	Unclassified

0 2 4 6 8 10km

Scale

MAP No 20

3.4 The "health" of environmental resources

Traditional methods of assessing the quality of the environment have relied on monitoring against established criteria. The state of the environment is then determined by whether levels of certain substances are "acceptable". Although useful quality indicators, such methods do not provide a direct measure of the "health" of the environment.

There are not yet many ways of measuring 'health' so this section concentrates on specific issues of concern. The evidence for bacterial contamination is also considered because this is of concern to human health if certain uses of fresh water are to be promoted.

Eutrophication

Eutrophication (nutrient enrichment) is a sign of poor 'health' in rivers and lakes. This can result in excessive growths of algae (simple microscopic plants) and changes in plant communities. Excessive algal growth can affect water clarity and therefore reduce the amount of light penetrating the water. This can result in the disappearance of rooted plants and a consequent reduction in biodiversity. Such suspensions of algae can interfere with water treatment for water supply by blocking filters and affecting taste and odour. Too much algae can also lead to low oxygen concentrations at night which affects fish life. The decay of algal blooms and other plants can further deoxygenate water, killing fish and other wildlife.

Some of the most well known algae that can produce excessive growths are the blue-greens (cyanobacteria). These are potentially toxic and pose a risk to recreational users of waters as well as to livestock and domestic animals. The table below shows the sites in the Aire catchment that have been reported to the Agency as having blue-green algae present over the last 3 years.

Year	Location	Species
1995	St Aidans	Anabaena sp
	Chellow Dean upper lake	Oscillatoria sp.
1996	Glucose ponds, Rawcliffe Bridge	Aphanizomenon sp.
1997	Pond by 105 Dockhouse, Leeds	Anabaena sp.
	Leeds - Liverpool Canal, Apperley Bridge	Anabaena sp.
	Leeds - Liverpool Canal, Barnoldswick	Microcystis sp.
	Chellow Dean upper lake	Oscillatoria sp.

Figure 27. Sites in the Aire catchment with blue-green algae present

Eutrophic Sensitive Areas are specified in the Urban Waste Water Treatment Directive. Where these are identified there is a requirement for nutrient (usually

phosphorus) reduction in discharges from sewage works exceeding a size of 10,000 population equivalence, unless it can be shown that this will have no impact. The River Aire from Carleton to Cononley is being assessed and could be designated as a Potential Sensitive Area under the Urban Waste Water Treatment Directive (Eutrophication) if it meets the relevant criteria.

Bioaccumulation

Many organochlorines such as polychlorinated biphenyls (PCBs) and certain pesticides are persistent in the environment and accumulate in biological tissues where they may exert toxic effects. For these reasons, DDT was banned from use in the UK in a phased approach between 1964 and 1984, and dieldrin was banned in 1989.

In the early 1980s the River Aire contained relatively high levels of the pesticide lindane. The source was found to be the textile industry in West Yorkshire, which used lindane to replace the banned dieldrin. Since then there has been a steady decline in lindane concentrations (see the graph below) as this in turn has been replaced by less persistent organophosphorus compounds. The Aire now complies with Environmental Quality Standard levels for the pesticide.

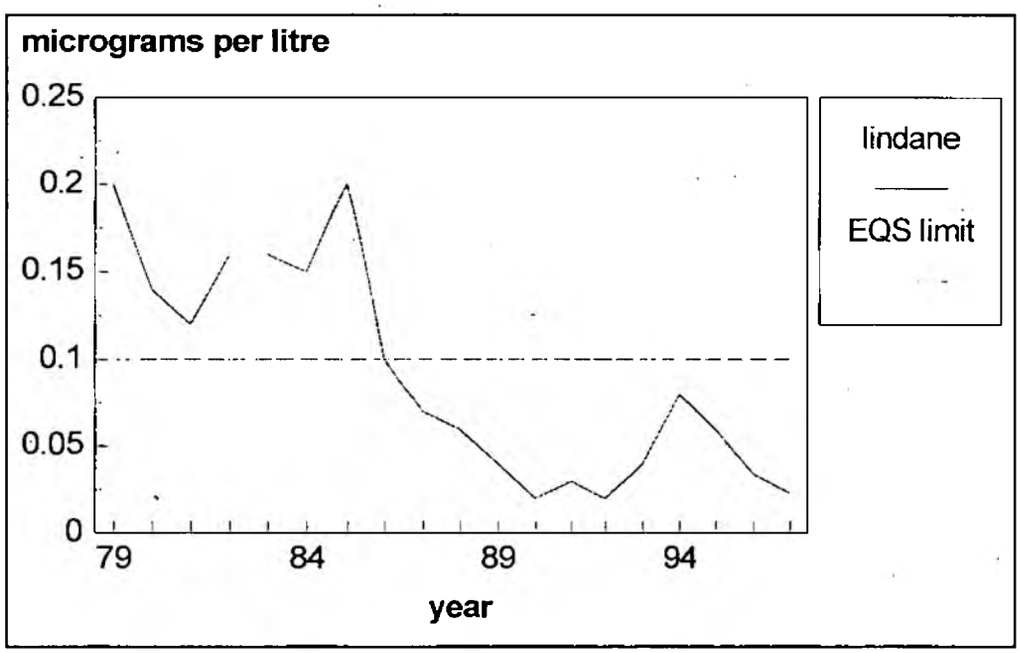


Figure 28. Concentrations of lindane in the River Aire since 1979

Endocrine disruption

Endocrine disruptors are substances which interfere with the hormonal systems of animals, causing physiological effects such as the impairment of reproduction. Invertebrates, fish, birds and mammals (including humans) may all be affected.

Laboratory tests indicate that many substances have hormone disrupting properties. These include naturally occurring substances as well as man-made substances. Figure 28 shows the main categories of hormone-disrupting chemicals.

Substance category	Examples	Uses
Naturally occurring		
Phytoestrogens	Isoflavones; lignans; coumestans	Present in plant material such as sprouts, cabbage, soya beans
Female sex hormones	17 - α oestradiol; oestrone	Produced naturally in animals (including humans)
Man-made		
Polychlorinated organic compounds	Dioxins Polychlorinated biphenyls (PCBs)	Arise as unwanted by-products from some incineration and industrial chemical processes. No longer manufactured or used, but some equipment (mainly electrical) containing PCBs remains in use.
Organochlorine	DDT; dieldrin; lindane pesticides	Insecticides (some now banned or phased out) used on crops and in some sheep dips
Organotins	Tributyltin	Anti-fouling agent on boats, wood preservative
Alkylphenols	Nonylphenol	Used in production of nonylphenol ethoxylates and polymers
Alkylphenol ethoxylates	Nonylphenol ethoxylate	Surfactants in wool scouring, laundries, car washing; also used as a plasticiser
Phthalates	Dibutyl phthalate (DBP) and butylbenzyl phthalate (BBP)	Plasticisers; some used in paints and lacquers or pesticide formulation
Bi-phenolic compounds	Bisphenol-A	Component in polycarbonate plastics and epoxy resins; used for lining pipes, cans, and teeth fillings
Synthetic steroids	Ethinyl oestradiol	Contraceptives and hormone replacement therapy

Figure 29. The main categories of hormone disrupting chemicals

The most widely reported effect from endocrine disruption is a feminising (oestrogenic) response to these substances although other effects have also been identified, for example masculinising.

Detailed investigations on the River Aire have shown that indicators of feminisation of male fish were significantly higher downstream of the discharge of sewage effluent that contained detergents - alkylphenol ethoxylates (APEs) - from the textile industry. The former National Rivers Authority secured a voluntary agreement with the textile industry for the use of APEs in wool scouring to be discontinued. This agreement has been respected by the majority of companies who are now using

alternative products. The Agency is continuing a surveillance programme to assess the effects of these measures on river quality.

Ecotoxicological studies

Developments in the science of ecotoxicology are opening new avenues for more direct assessment of environmental health. This means actually assessing the health of plants and animals rather than the levels of substances that can affect them. The Agency has commissioned a series of research and development projects to investigate the suitability of ecotoxicology tests for both effluent control and for monitoring receiving water quality. Eight sampling stations on the River Aire were selected for the research on the basis of their proximity to known sources of inputs and to previously selected biological sampling points. A variety of tests were evaluated together with benthic macroinvertebrate survey data.

This research is at an early stage, with initial results indicating that the tests may be used as indicators of general water quality and to help determine the toxic impact of both point source and diffuse inputs. The programme is associated with the initiative to introduce toxicity based criteria for improved control of toxic waste discharges and the need to demonstrate environmental benefit. More extensive testing and detailed method development are required in future projects before the tests can be adopted as part of the Agency's routine investigation and assessment tools.

Bacterial contamination

Organic pollution can contaminate water with micro-organisms which are not usually pathogenic (disease-causing). However, these organisms can serve as useful indicators of faecal pollution from human and other animal sources and hence possible contamination by pathogens.

River water abstracted for drinking water must be treated to standards that ensure coliform numbers are below prescribed values (coliforms are bacteria used to indicate the presence of sewage). This is the responsibility of the water companies.

There is no statutory requirement for the Agency to monitor microbiological contamination in freshwater but, because most rivers carry effluents it is inevitably widespread.

Bathing water standards apply only at sites designated by the Government. Currently there are no inland waters in the Aire catchment that have been nominated for designation under the Bathing Waters Directive. There is concern among people who use rivers, reservoirs and lakes for immersion sports and paddling about possible adverse effects from pathogenic contamination. If Bathing Water standards were to be applied on a non-statutory basis at such sites, a full cost benefit appraisal would need to be done, as well as a technical feasibility study to determine how the standards could be met. Extra treatment at sewage works would be necessary and likely to be a substantial cost. The impact of contamination from more diffuse sources would also have to be considered.

Tree Health

Root Alder (*Phytopthora)* disease is now known to be widespread through much of England and Wales. Most of the affected trees are in riverside areas or on land that is subject to flooding; however the disease has been found on some alders well away from any watercourse. Although there are currently no reports of the disease within the LEAP area at present, there is a risk that it could spread to the catchment.

Radioactivity

The Agency regulates the use and disposal of radioactive material. The use of radioactive materials is widespread and covers everything from nuclear reactors and weapons manufacture to domestic smoke detectors. There are no nuclear installations in the catchment.

Aqueous releases of radioactive materials are routinely made from the hospitals and universities of Leeds (eg barium meals). A full radiological assessment is to be undertaken to verify that there is no risk to the environment or human health. The Agency is to model the radioactivity through a sewerage system and Leeds could be selected for trial.

3.5 Environmental changes at long-term reference sites

To achieve sustainable development we need to take a long-term perspective. Many environmental processes, such as climate change and water quality improvements take place over timescales of many years. They can only be properly assessed through long-term time series measurement. The following long-term monitoring programmes are currently in place.

Rainfall and river flows

The Agency manages a rainfall monitoring network which includes 28 rain gauge sites in the Plan area. These enable the long-term average, and variations from it, to be calculated. The annual rainfall ranges from a high of 1485mm at Malham to 588mm at Hook (near Goole). The Aire catchment as a whole has a long term rainfall average of 963mm per year. In the lower Aire, low rainfall means that the effective rainfall after evaporation is zero. The figure below shows the annual average, maximum and minimum rainfall along the Aire.

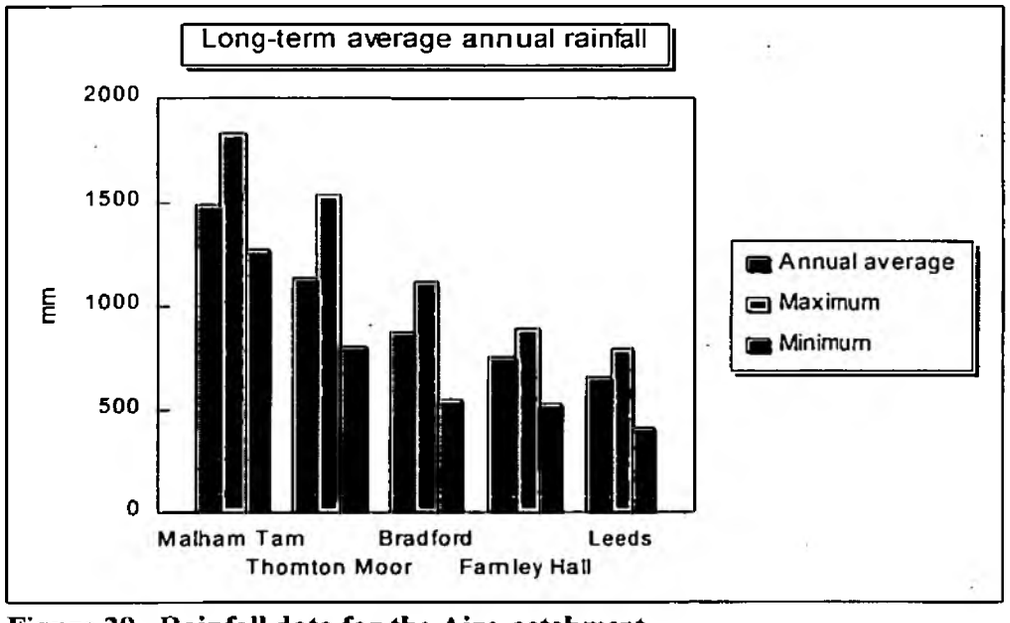


Figure 29. Rainfall data for the Aire catchment

There is also a network of ten river gauging stations which provide information on river flows and levels throughout the Plan area. These are used to produce flow statistics both on a long-term and annual timescale. Most of the river gauging and level sites and also four rain gauges are connected to the Regional Telemetry System which allows up-to-the-minute information to be gathered by computers at Agency offices.

Flows in the upper catchment are largely natural since there is little development. The baseflow comes from the numerous springs and upland peat in the area. Further downstream the baseflow comes from discharges from sewage treatment works and remains consistent over the years (see section 2.4). The large amounts of water imported for public supply from catchments outside the Aire valley means that these flows are often greater than would be expected from rainfall alone. The final 26km of the river are tidal with flows reflecting this (see section 3.1). The graph below shows the variation in flow rates at four points along the river over the last 20 years.

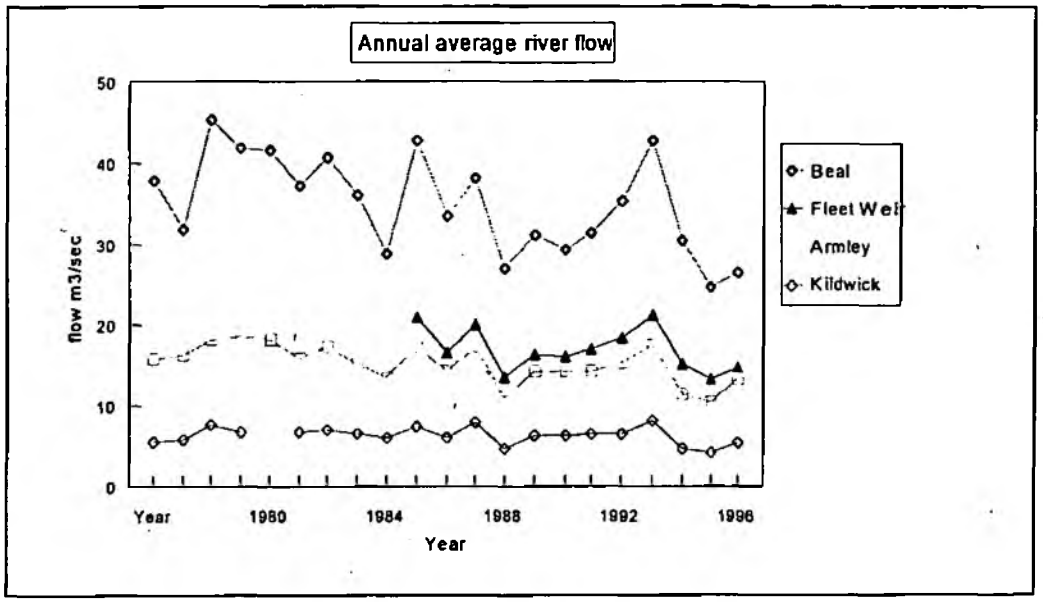


Figure 31. Annual average river flows

Harmonised Monitoring Scheme

The Harmonised Monitoring Scheme was set up in 1974 to provide a network of sites at which river quality data could be collected and analysed in a nationally consistent way. The scheme allows measurement of the loadings of materials that are carried down river catchments into estuaries. The data can also be used to assess long term trends.

There are 230 harmonised monitoring sample points in Great Britain. Two of these are in the Aire catchment, one at Fleet Weir (above the confluence with the River Calder) and the other at Beal (at the tidal limit below the confluence).

A core set of determinands are measured at each site (biochemical oxygen demand (BOD), ammonia, phosphate, nitrate and dissolved oxygen) although the complete list of determinands is diverse and extensive covering some 115 parameters. Instantaneous and average flows are also measured at each site to allow calculation of loads. Data gathered for the Harmonised Monitoring Scheme is reported to the Department of the Environment, Transport and the Regions every six months.

The following graphs show the concentrations of dissolved oxygen, phosphates, ammonia and nitrates over the last 20 years at the two sites on the River Aire

Improvements in sewage treatment in the Aire catchment since the mid to late 1980s are reflected in a general decrease in ammonia levels. Removal of ammonia from the aquatic environment is desirable because ammonia is toxic to fish. This is accompanied by a general increase in nitrate levels. Conventional removal of ammonia at sewage treatment works relies upon the nitrification of ammonia (the oxidation of ammonia to nitrate).

River Aire at Beal

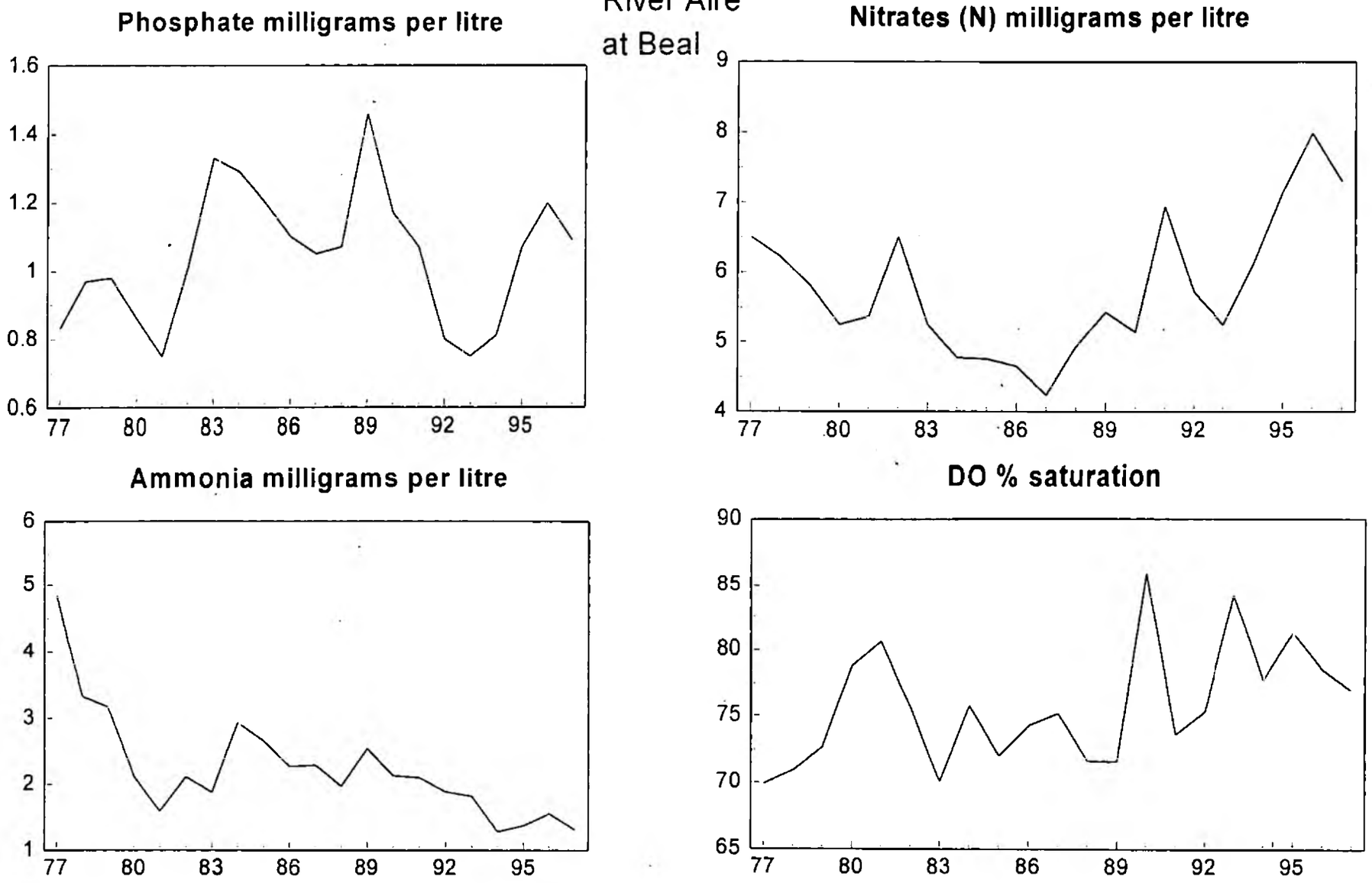


Figure 32. Harmonised Monitoring Scheme results 1977-1997

3.6 The aesthetic quality of the environment

The appearance of the river environment affects how it is valued. Litter, discoloured water, and the presence of sewage scum or foam are obviously unattractive, and people are less likely to visit such sites for recreational purposes. Recreation can benefit the local economy, even where no direct charge is made. It is important therefore that the amenity value of the environment is maximised. There are parts of the Plan area, particularly in the upper reaches of the Aire, that are popular with visitors due to their attractiveness, and these should be maintained. However it is predominantly the urban parts that are affected by aesthetic problems.

Despite the considerable importance that the general public attaches to the aesthetic qualities of the environment, there are relatively few national programmes used to assess progress and performance in bringing about improvements over time. The aesthetics component of the General Quality Assessment scheme is under development and measures proposed include litter, dog faeces, colour, odour, oil, foam, surface sums, sewage fungus and ochreous deposits. These will be rated as either percentage cover or actual quantity (in the case of dog faeces and litter).

Despite campaigns to raise public awareness and local (mainly voluntary) efforts to improve the situation, problems of litter in the aquatic environment persist and are increasingly reported. A wide range of litter items can be found strewn along bankside vegetation and also caught in tree branches, having been deposited after periods of high river flow. One of the most common litter types is plastic. The non-biodegradable nature of this material means it may persist indefinitely and this is probably one explanation for its abundance. The responsibility for clearing litter does not lie wholly with the Agency, but is shared with riparian landowners and local authorities. The Agency will give advice, seek to improve and educate and if necessary undertake enforcement at sites where the storage or collection of waste may result in the littering of watercourses.

Sewage litter entering watercourses through combined sewer overflows is a particularly unsightly problem. Litter discharged from the sewer system during periods of high rainfall becomes entrained in bankside foliage and often gives rise to public complaint. As part of the next Water Company's Asset Management Plan, covering investment for the years 2000 - 2005 (AMP3) (see section 3.1), surveys will be carried out in all sewerage drainage areas where there is a perceived aesthetics or water quality problem relating to combined sewer overflows. Schemes will be proposed to address these problems and then ranked using an analysis of the costs and benefits. Investment by Yorkshire Water Services will be targeted according to this prioritised list.

The following drainage area zones within the catchment have unsatisfactory combined sewer overflows and are being considered for investment under the AMP3 process.

drainage area zone	unsatisfactory overflows	watercourse
Meanwood	Meanwood	Meanwood Beck
Wyke Beck	Roundhay Seacroft Gipton Halton	Wyke Beck
Bingley	Gilstead	Little Beck
Gipton	Gledhow Valley	Gledhow Beck
Garforth	East Garforth	tributary of Kippax Beck
Middleton	Sheepscar	Sheepscar Beck

Figure 32. Unsatisfactory combined sewer overflow zones being considered for investment

Such schemes will include, where feasible, removing overflows by complete re-sewering or the installation of structures designed to minimise the discharge of litter items to watercourse. In an attempt to reduce the amount of non-biodegradable materials disposed of in the sewerage system Yorkshire Water have been involved in the National Water Industry wide "Bag It and Bin It" Campaign .

4.0 CONCLUSIONS

This Environmental Overview has briefly described aspects of the current state of the environment in the Aire catchment area. It has shown that indicators measuring some aspects of the state of the environment already exist, involving national programmes and periodic reporting arrangements. However, there are still important gaps that need to be filled. The Agency is investigating how the efficiency of existing programmes could be improved so that resources can de diverted away from programmes that have fulfilled their original purpose towards monitoring which addresses new priorities. Effective collaboration between the Agency and other key-player organisations (Government departments, regulatory agencies, local authorities, nature conservation and countryside bodies, and research organisations) will be critical to the future success of improved environmental monitoring programmes.

Most of the pressures on the state of the local environment are caused by human influences which affect different environmental media (air, land and water), natural resources (such as geological resources, water resources and wildlife), and features (including landscape and heritage). It is urbanisation that has the greatest impact. Like many other industrial areas of the country, the Aire catchment has suffered greatly over the past two centuries from its industrial heritage. This includes the use of natural resources, destruction of wildlife habitats and the discharge of polluting wastes into the environment. However, we cannot ignore the environment of the more rural areas which needs protecting from potentially adverse activities and, wherever possible, improving.

The environmental issues affecting the Aire catchment are complex and diverse. The Draft LEAP lists the major issues and proposes actions that could be taken to start addressing some of these. The period of formal public consultation on these proposals will end on 30 September 1998. During this time external organisations and the general public will have an opportunity to work with the Agency in planning the future of the environment of the Aire catchment area. The Final LEAP will take into account the results of consultation and will be produced by April 1999. It will contain a prioritised list of actions that take account of costs and benefits, identifying timescales and partner organisations. Agreed actions will be incorporated into the Agency's annual business plans.

Copies of the Draft LEAP can be obtained from:-

Aire LEAP Officer
Environment Agency
Phoenix House
Global Avenue
LEEDS LS11 8PG

The Draft Aire LEAP is also available on the Agency's Internet site. Our address is

http://www.environment-agency.gov.uk

AIR POLLUTANT SOURCES AND EFFECTS

APPENDIX 1.

Pollutant	Sources	Effects	Comments
Nitrogen Oxides (NOx) and Nitrogen Dioxide (NO_2)	- combustion process, mainly vehicular emissions closely followed by industrial processes	- irritant which can cause breathing problems and increase susceptibility to viral infection - reacts with water to form a weak acid or acid rain which damages trees, crops and building - contributes to global warming	- usually released as nitric oxide, which can be converted to the more toxic NO_2 in the presence of sunlight
Sulphur Dioxide (SO_2)	- sources both natural and human - 20% of the world's atmospheric SO_2 is produced by volcanic eruption - combustion of fossil fuels with a high sulphur content (coal and oil power stations) are the major source of SO_2 along with vehicles	- SO_2 is an irritant to both eyes and throat and can cause serious harm to those with respiratory problems -SO_2 also contributes to acid rain	- with less coal currently being burned, the Clean Air Act 1956 and improved technology to clean emissions, the release of SO_2 has declined dramatically in the last 40 years
Ozone	- created in chemical reactions between oxides of nitrogen and other VOCs in sunlight - vehicular emissions are believed to be the major contributor to the ozone problem	- the presence of ozone in the lower atmosphere is particularly dangerous for people who suffer from breathing difficulties	- of concern is the increase in both urban and rural levels of ozone, whilst essential to protect against damaging ultraviolet radiation
Particulate Matter	- sources both human or natural - principle human source is emissions from the combustion of fossil fuels, particularly coal and diesel fuel - 'secondary' particles can also be formed	- effects on human health and the environment depend upon the composition of the matter, it is believed that the release of fine particulates, particularly from diesel fuels can have an adverse effect on the human respiratory function	- particles of particular concern are those of a size less than or equal to 10 microns (ie one hundredth of a millimetre), which are known as PM10s
Carbon Monoxide (CO) and Dioxide (CO_2)	- largest source of CO is from petrol engine exhausts, particularly cars which are decelerating or stationery in traffic -CO_2 is also released during fossil fuel combustion	- CO causes cardiovascular and respiratory problems -CO_2 whilst not directly harmful to human health is a major greenhouse gas	
Lead	- released to the atmosphere during the combustion of leaded petrol	- research shows that its presence in the air could result in retarded learning or even brain damage, especially amongst children	- since the mid 1980s, leaded petrol has steadily been withdrawn and unleaded introduced. This has led to a reduction in emissions of almost 6000 tonnes per annum
Volatile Organic Compounds (VOCs)	- various sources including combustion processes, marketing and use of petrol and vehicle emissions	- a range of health effects - many of these are carcinogenic, effect the nervous system and cause eye and nose irritation - role in the formulation of ground level ozone	- umbrella name for a large number of chemical compounds (benzene, toluene, butadiene, xylene and formaldehyde) and the toxic micro pollutants (TOMPs)

WATER QUALITY CLASSIFICATIONS APPENDIX 2

GENERAL QUALITY ASSESSMENT CLASSIFICATION

Water Quality	Grade	Dissolved Oxygen (% saturation) 10 percentile	Biochemical Oxygen Demand (ATU) (mg/l) 90 percentile	Ammonia (mgN/l) 90 percentile
GOOD	A	80	2.5	0.25
GOOD	B	70	4	0.6
FAIR	C	60	6	1.3
FAIR	D	50	8	2.5
POOR	E	20	15	9.0
POOR	F	-	-	-

CHEMICAL STANDARDS FOR RIVER ECOSYSTEM CLASSIFICATIONS

Class	Dissolved Oxygen % Saturation 10 percentile	BOD (ATU) mg/l 90 percentile	Total Ammonia mg N/l 90 percentile	Un-ionised Ammonia mg N/l 95 percentile	pH lower limit as 5 percentile; upper limit as 95 percentile	Hardness mg/l $CaCO_3$	Dissolved Copper ug/l 95 percentile	Total Zinc ug/l 95 percentile
RE1	80	2.5	0.25	0.021	6.0 - 9.0	≤ 10 > 10 and ≤ 50 > 50 and ≤ 100 > 100	5 22 40 112	30 200 300 500
RE2	70	4.0	0.6	0.021	6.0 - 9.0	≤ 10 > 10 and ≤ 50 > 50 and ≤ 100 > 100	5 22 40 112	30 200 300 500
RE3	60	6.0	1.3	0.021	6.0 - 9.0	≤ 10 > 10 and ≤ 50 > 50 and ≤ 100 > 100	5 22 40 112	300 700 1000 2000
RE4	50	8.0	2.5	-	6.0 - 9.0	≤ 10 > 10 and ≤ 50 > 50 and ≤ 100 > 100	5 22 40 112	300 700 1000 2000
RE5	20	15.0	9.0	-	-	-	-	-

ABBREVIATIONS

APPENDIX 3

AMP3	Asset Management Plan review period covering the years 2000 to 2005
APE	alkylphenol ethoxylates
BOD	Biochemical oxygen demand
CPRE	Council for the Protection of Rural England
CSO	Combined Sewer Overflow
EC	European Community
EEC	European Economic Community
EQS	Environmental Quality Standard
EU	European Union
GQA	General Quality Assessment
IPC	Integrated Pollution Control
IRIS	Integrated Regulation in Sewerage
LEAP	Local Environment Agency Plan
LNR	Local Nature Reserve
LPA	Local Planning Authority
MAFF	Ministry of Agriculture, Fisheries and Food
mg/l	milligrams per litre
NAQS	National Air Quality Strategy
NO_2	nitrogen dioxide
NOx	oxides of nitrogen
OFWAT	Office of Water Services
OP	Organophosphorus Pesticide
PCB	Polychlorinated biphenyl
PM_{10}	Particulates
RE	Rivers Ecosystem classification scheme
RHS	River Habitat Survey
SAM	Scheduled Ancient Monument
SO_2	sulphur dioxide
SSI	Site of Scientific Interest
SSSI	Site of Special Scientific Interest
STW	Sewage Treatment Works
SWALP	Surface Water Abstraction Licensing Policy
TBT	tributyl tin
UK	United Kingdom
UWWTD	Urban Waste Water Treatment Directive
VOC	Volatile organic compounds
WLMP	Water Level Management Plan
WQO	Water Quality Objective
ug/l	micrograms per litre

MANAGEMENT AND CONTACTS:

The Environment Agency delivers a service to its customers, with the emphasis on authority and accountability at the most local level possible. It aims to be cost-effective and efficient and to offer the best service and value for money.

Head Office is responsible for overall policy and relationships with national bodies including Government.

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ENVIRONMENT AGENCY GENERAL ENQUIRY LINE
0645 333 111

The 24-hour emergency hotline number for reporting all environmental incidents relating to air, land and water.

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