

EA-Anglian LEAPS Box 3



H U M B E R E S T U A R Y

S T A T E O F T H E E N V I R O N M E N T 1 9 9 8



foreword

Management of the Humber Estuary is a major task for the Environment Agency, which has a duty to work towards sustainable management of land, air and water. The Humber Estuary presents one of the greatest challenges in this country in maintaining the balance between economic development and environment protection. Alongside nationally important industries and ports, the Estuary is also internationally important for the birds it supports during their migrations. In addition, flood defences protect 500 000 people and very large tracts of productive farmland from flooding by the sea.

Good management of any environment depends upon a sound understanding of that environment, the pressures placed upon it and the interactions of its various components: good management decisions must be based on good science.

How to use this report

This report summarises the state of the Humber environment by addressing the following questions.

PRESSURE ● Are there any environmental causes for concern and any problems predicted in the near future?

“What are the problems?”

STATE ● What is the state of the water, air, land and ecology in the Humber area, and has it improved or deteriorated over time?

“What’s it like?”

RESPONSE ● What are the priorities for action and investment in the future?

“What can be done about it?”

There is a vast amount of data available on the Humber environment that has been used to produce this summary. The data itself is not included in this report but is available in the form of a Technical Report.

I hope you will find this report useful and informative. If you have any queries or would like further information, please contact Marion Justice on 01482 651446 or Suzanne Davies on 0115 945 5722.



Peter Barham
Humber Strategies Manager

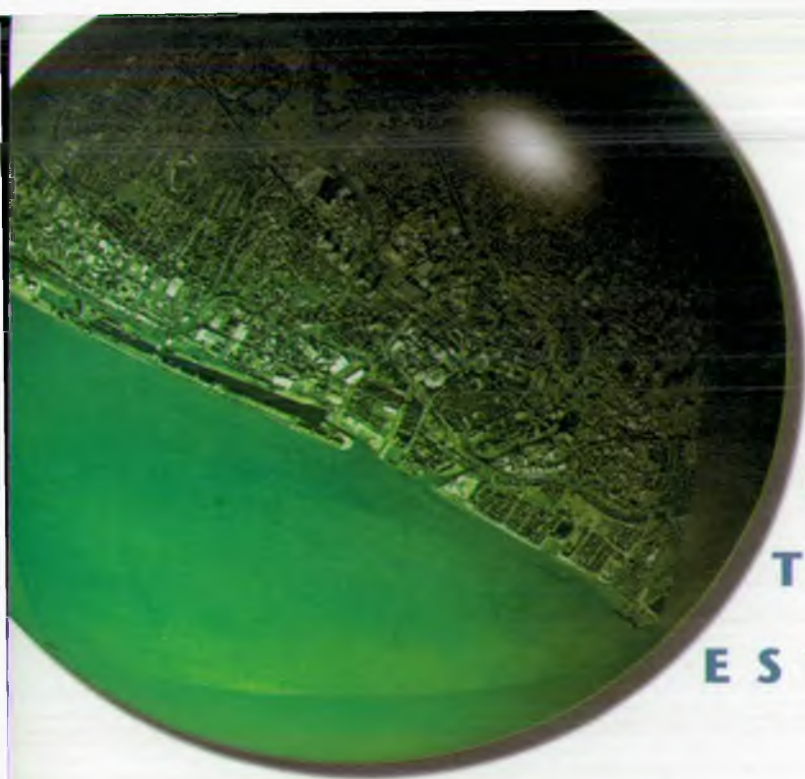
ENVIRONMENT AGENCY



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BACKGROUND TO THE HUMBER ESTUARY

The Natural System

The Humber Estuary catchment is the largest in the British Isles, covering an area of approximately 26 000 sq km or one-fifth of the land area of England. The major tributaries include the Rivers Trent, Ouse, Aire, Don, Derwent, Wharfe, Hull and Ancholme.

The River Humber is entirely estuarine and refers only to that part of the system lying seawards of Trent Falls (the confluence of the Rivers Trent and Ouse). The Humber Estuary system is, however, much more extensive and includes substantial lengths of the tidal tributaries. The total length of the tidal waters is 207 km and the longest tidal run is the 145 km from Spurn Point to Cromwell Weir on the Trent.

West of the Humber Bridge, the course of the River Humber has changed little since at least the penultimate glaciation. The outer part, to the east of the Bridge, was created only about 14 000 years ago when the land area known as Holderness was formed. The tidal Estuary is even younger, having been formed only when sea-level rose after the last glaciation to flood the river valley about 6 000 years ago. Since then, deposition of sediment has reduced the width of the Estuary and created the Spurn Bight mudflats that are protected by Spurn Point.

The Humber has the largest tidal spring tide range on the east coast of the British Isles: 5.7m at the mouth, increasing to 6.9m at Hessle, then progressively decreasing upstream. On a spring tide, the total volume of water between low and high water in the Estuary is 1300 million cubic metres. Water moves a total distance of 25 km upstream of the mouth on a spring tide.

The salinity at any point in an Estuary depends not only on the position but also on tidal state, tidal range and freshwater flow. The Humber is a well-mixed estuary with the freshwater influence causing a marked reduction in salinity around Trent Falls.

The Humber Estuary has a muddy appearance because the very mobile bottom sediments lead to a high concentration of sediment suspended in the water.

Regulation

The regulation of the Humber environment needs to reflect all the different pressures on it, and therefore many organisations have obligations or interests in its regulation and management.

Under the Water Resources Act 1991, the Environment Agency has powers to carry out work to protect low-lying land against flooding. In doing so, the Agency must adhere to certain conservation duties imposed upon them by the Land Drainage Acts of 1991 and 1994 and the Environment Act 1995. These conservation duties cover natural, historical and cultural features.

The Agency is responsible for regulating salmon and sea trout fisheries and has joint responsibility (with the Sea Fisheries Committees) for the environmental effects of all fishing activities out to six nautical miles.

In 1991, regulation of discharges was further improved through Integrated Pollution Control under which the UK's environment protection agencies issue a single authorisation covering releases to air, water and land. The system was established under the Environmental Protection Act 1990 and is administered in England and Wales by the Environment Agency. The Water Resources Act 1991 has provision for the control of abstractions and the effluent discharges that do not come under Integrated Pollution Control.





P R E S S U R E S O N T H E H U M B E R E N V I R O N M E N T

Social factors create pressures on the environment through the need for improved standards of living, creation of wealth, improved quality of life, better health and a clean and varied environment. How these pressures impact upon the environment depends upon their nature, what creates them and how effectively they are managed.

Climate Change

It is unclear how much of the recently measured changes in climate are due to human activities and how much are part of natural variation. The potential effects of climate change include:

- changes in the amount of water available for use;
- increased demand for water for irrigation;
- changes to habitats and potential loss of wetlands;
- increased flooding and erosion;
- changes in dilution and dispersion of pollutants; and
- rise in sea level.

The Humber Estuary is currently experiencing a rise in sea level relative to the land. This is at least partly due to the downward movement of the land as it recovers from the last glaciation, but may also be influenced by climate change. Current predictions for sea level rise for the Humber Estuary over the next 50 years are for rates of up to 6 millimetres a year. Estimates of future sea level rise, taking into account the effects of global warming, suggest that the rate of rise will continue to increase.

Societal Influences

These are the greatest pressures on the environment. They include the size and distribution of the population, the number of households in the country, the pattern of energy consumption, the nature and frequency of transport, planned changes in land use, recreational practices and activities, plus changes in public attitudes and perception of environmental matters. Accompanying these is the expectation of better standards of living and an increased demand for goods and the subsequent increase in the production of waste.

Due to historical development, much of it on reclaimed intertidal areas, it is estimated that 500 000 people now live in areas where the land is lower than the level of mean high spring tide (Figure 3.1). Approximately 570 sq km of land behind the defences would be flooded if the defences were removed.

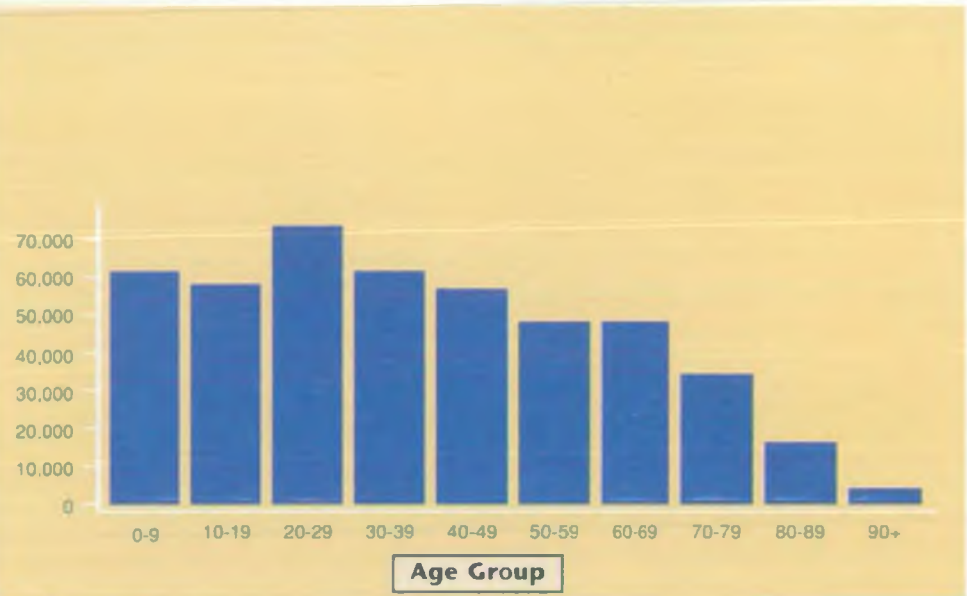


Figure 3.1 Population in Area Below Mean High Spring Tide.

Households

Households put pressure on the environment directly (being responsible for most of the waste water entering sewage treatment works and much of the waste being deposited in landfill sites) and indirectly (by consuming resources that involve abstraction from and discharge to the environment).

The number of households in England and Wales is projected to grow at a faster rate than the population in the next 20 years because of a predicted increase in the proportion of smaller households. More land will be needed for urban use, probably resulting in habitat loss and changes in the nature of drainage systems. Run-off from urban areas and development in floodplains are a particular concern as this water will not soak into the ground and recharge aquifers, causing a reduction in available groundwater resources. Floodplain development causes an acceleration of run-off following rainfall, leading to higher flow peaks and a depletion of lower flows, unless measures are undertaken to build storage into urban drainage systems.

Aspirations and lifestyles have also changed in recent decades, placing additional pressure on the environment in terms of increased water demand and pollution loads from sewage and domestic waste.

Recreation

Although enjoyment of the environment can contribute to the quality of life, recreation can cause pressure on the environment, particularly where there is local conflict between different activities. Use of the Humber for recreation is comparatively undeveloped partly because shifting sand banks, high levels of commercial shipping and strong tidal currents make the waters difficult to navigate. Another reason is the mistaken perception that its characteristic reddish-brown colour (caused by mud suspended in the water) reflects pollution.

Locations such as Cleethorpes Beach, the Humber Bridge Country Park, the Humber Bridge, Spurn Head and Far Ings Nature Reserve attract significant numbers of visitors. Sea-angling and coarse fishing are popular pastimes. Organised wildfowling takes place at a number of locations in the lower Estuary and in the upper reaches adjacent to the Wildfowl Refuge. Designated routes have been set up for informal walking and picnicking. Waterborne activities include sailing, canoeing, surfing, water skiing, windsurfing and rowing, and the Estuary is an established venue for power boat racing.



Recreational activities can cause damage to the environment directly, e.g. through trampling, accidental fires, spillages of boat fuel and erosion of river banks, and indirectly through habitat disturbance.

Navigation

The combined Humber ports of Hull, Grimsby, Immingham and Goole form one of Britain's largest shipping complexes handling over 17 per cent of the UK's sea-borne trade. This could grow to 25 per cent as the Humber becomes the main artery for rapid trade between mainland Europe and the UK. The size of vessels using the Humber is also set to increase, and this growth must occur without unacceptable environmental damage.

The Estuary is a major navigation in its own right with approximately 15 000 ship arrivals per year. Navigation is possible on the River Trent as far as Nottingham and on the Ouse beyond York but, for sea going vessels, only as far as Gainsborough and Selby respectively. The length of the navigable waters is also extended by the system of inland canals that connect with the Estuary.

Environmental damage can be caused by erosion of river banks by the wakes from boats and ships, and through accidental spillages of fuels and cargo, particularly from oil tankers.





Abstractions and Removals

Peat Extraction

Large areas of Thorne and Hatfield Moors (now part of a National Nature Reserve) have historically been used for peat-digging, which resulted in substantial habitat loss. In 1994, more than 2500 ha of worked land was handed over to English Nature for conservation purposes.

Water Abstraction

More than 7500 licences issued by the Environment Agency control the abstractions from the surface and groundwaters of the rivers feeding the Humber Estuary. Due to the tidal nature of the Estuary, however, abstractions have little impact on the overall water balance.

Power Generation

Historically, power stations have been situated near the coalfields of Yorkshire and the Midlands. The recent increase in gas-fired power stations has been concentrated on the Humber. At present, six power stations are operating, under construction or planned for the Estuary. These stations use large amounts of water from the Estuary for cooling purposes, although this water is returned to the system and, therefore, has little impact on the overall water balance.

Dredging

The Estuary bed is dredged to create and maintain channels for safe navigation. It is possible that dredging could affect natural sedimentation patterns, and result in erosion which could both damage flood defences and destroy habitat.

However, there are potentially beneficial uses for dredged materials, including coastal defences, habitat creation, material for land reclamation and prevention of erosion. None of these are currently used on the Humber but are being investigated.

Usage, Releases and Discharges

Point Sources

Sewage Discharges

Sewage discharges to the Humber Estuary (Figure 3.2) include those from sewage treatment works operated by the water companies and (generally smaller) private discharges, all of which are licensed and monitored by the Environment Agency.

Such discharges can contain high levels of nutrients and organic material that can affect water quality and the biology of the receiving waters. At times of exceptionally high rainfall, storm overflows can cause short spells of contamination including toxic levels of ammonia and aesthetic pollution. Discharges from sewage treatment works have been improving and this will be continued by the changes being made under the Urban Waste Water Treatment Directive.

Although it is generally accepted that improving sewage effluent quality is beneficial to the environment, loss of organic input could adversely affect the ecology of the area. The Agency will monitor these effects in future years.



Figure 3.2 Point Discharges in the Humber area

Industrial Effluents

As well as the release of cooling water from power stations, the Humber is also a focus for petrochemical and chemical industries. Discharges to water and air are controlled and monitored by the Environment Agency.

Industrial discharges can affect the quality of both water and air by releasing metals and organic substances into watercourses and smoke and greenhouse gases into the atmosphere. There is also a risk from the storage of oils and potentially hazardous chemicals on sites.

Diffuse Sources

Agriculture

Agriculture can lead to diffuse pollution, especially by fertilisers, pesticides and animal slurry entering the water cycle. Nitrate from agricultural land has long been recognised as a major source of pollution in rural rivers. In recent years, the

designation of Nitrate Sensitive Areas and Nitrate Vulnerable Zones (under the EC Nitrates Directive) has attempted to reduce this pollution by changing the times of fertiliser application and cereal planting.

Emissions of ammonia and methane from livestock can contribute to climate change as well as having local impacts on air quality in areas of intensive livestock farming.



Urban Area Run-off

Run-off from hard or paved surfaces in urban areas may be contaminated with 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; and
- pesticides and fertilisers used in parks, gardens and homes.



The environmental impact can be minimised through good design of urban drainage. Many road systems are now designed with gully-pots, filter drains, or oil interceptors to catch these substances before they enter surface or groundwaters.

Abandoned Mines and Historical Industry

Diffuse and point discharges from mines can have a significant local impact on water quality and contribute to the input of metals to the Humber. Some metals in Humber sediments can be traced to long-ceased lead mining activities in the Pennines and to industrial smelters no longer operating. Many of the coal mines in the catchment are now closed, but there are still working mines in both the Ouse and Trent catchments. Iron-rich discharges from abandoned mines can be highly polluting and the Agency is trying to reduce this 'orphan' source of pollution. A minewater treatment plant for the discharge from the old Bullhouse Colliery near Sheffield was commissioned in 1998 and others are now being provided.

Road Traffic

Nationally, between 1984 and 1994 the number of cars increased from 16 million to 20.5 million: the distance they were driven increased significantly and is projected to continue growing. Until the 1980s, the increase in road traffic was accompanied by similar increases in the main air pollutants. However, the introduction and promotion of unleaded fuel and tighter vehicle standards, especially the introduction of catalytic converters, are reversing this trend. As well as contributing to air pollution, road traffic increases the risks of water pollution through accidents and spillages, and through contaminated run-off from road surfaces.

Total Contaminant Loads

In general, the largest loads of metals entering the Humber come from the mainland rivers. The exceptions are chromium and zinc, the major loads of which come from industrial effluents discharged directly to the Estuary. Overall, metal loads from all sources (tidal rivers, industrial effluents and sewage outfalls) continue to decrease as discharges from sewage and industrial outfalls both within the Estuary and upstream of its tidal limits are improved. Some reductions can be traced to specific changes and improvements. A huge decrease in arsenic loads

from industry in the early 1990s was a result of the closure of the Capper Pass smelting works on the North Bank of the Humber in 1991 and previous reductions in operations in the run-up to the closure. Decreases in zinc loads from industry are due to improvements in those industrial processes from which this metal is a waste by-product.

Pollution Incidents

Pollution incidents are short-term events or accidents which create a temporarily high pollutant load in the environment and which are usually diluted and dispersed or assimilated within hours or days (although they may persist longer and can have an impact for decades if groundwaters or soils are affected). Many minor incidents have a local effect that may be difficult to detect, although repeated pollution can cause cumulative long-term damage. Major incidents can threaten human health and cause extensive biological damage.

Watercourses can be damaged by physical effects, e.g. high loads of suspended solids from construction sites may smother stream beds. Chemical effects occur through the spillage of substances that are directly toxic, such as paints, pesticides and many industrial chemicals. Other organic substances that are relatively harmless in small quantities, such as milk, beer, sugar and more obviously sewage, have equally serious effects when large quantities are released into watercourses. Biodegradation uses up oxygen dissolved in the water, suffocating fish and other organisms. Oil is the most visually obvious and most commonly reported substance polluting watercourses.

The Agency uses a standard pollution incident classification system which discriminates major pollution incidents (category 1) from others (categories 2 and 3) and those which were reported but not substantiated by Agency staff (category 4). The types and categories of pollution incidents reported in 1997/98 are shown in Table 3.1.

Pollution Incidents by Category and Type 1997/98

Category	Number	Type	Number
1	0	Sewage	14
2	5	Chemical	14
3	102	Oil	49
4	34	Agricultural	13
TOTAL	141	Other	25
		Unsubstantiated	26
		TOTAL	141

Table 3.1



Waste Production and Disposal

The industrial activity in the Humber area generates high quantities and many types of waste. In addition, waste is created by every household in the area. The financial cost of disposing of waste is increasing and society is becoming more aware of its environmental impact. It is becoming more challenging to find suitable landfill sites, or other means of disposal including incineration, in locations which match waste generation trends and do not pose a threat to the environment. Future generations will face an even harder task.

In order to reduce the financial and environmental burdens associated with waste, both industry and society should analyse the 'consequences' of producing the goods used and then disposed of. They must analyse the life cycle of products and production methods, with a special emphasis on minimising waste, both in terms of quantity and its potential to pollute.

Waste disposal sites within the area are indicated in Figure 3.3.



Figure 3.3 Waste Disposal Sites

Summary of Pressures

Table 3.2 summarises the information presented in this chapter and draws together the information related to the major economic activities of farming and industry. The table highlights the pressures that are increasing and need attention, and shows where pressures have been successfully reduced.



Pressures on the Humber Environment

Pressure	Nature of pressure	Trend in pressure + increasing - decreasing = stable
Climate change and drought	Affects temperature, rainfall and run-off. Likely to affect habitats, frequency of flooding, water demand, water stocks and distribution. Predicted rise in relative sea level of 6 millimetres per year over next 50 years.	+ Awareness + Sea level
Urbanisation (including transport and households)	Increase in paved areas gives rise to less infiltration, more rapid run-off, contamination from roads to surface waters, more storm overflows. Pesticides and fertilisers used in parks, homes, roadsides and gardens cause diffuse pollution. More roads result in loss of habitat. Car emissions contribute to climate change and poor air quality. Increasing number of households puts pressure on water supply, sewerage systems and waste disposal sites. Development in floodplains increases risk of flooding and need for defence schemes. Flood defence works to protect property can result in loss of habitat but can also provide opportunities for enhancement.	+ Road and urban run-off + Habitat loss by urbanisation + Flood defence schemes + Demand for water + Traffic pollution incidents + Demand for waste disposal
Recreational activity	Boats can cause erosion of banks and streamside habitats, countryside activities can disturb wildlife, and litter reduces aesthetic quality.	+ Recreational demands
Abstractions and removals	Peat-digging has historically caused habitat loss - some worked areas are now being conserved. Water abstractions can cause low flow rivers and loss of wetland habitats and aquatic life, as well as less dilution for discharges. Dredging works can result in erosion and have potential effects on ecology.	- Peat extraction + Power generation = Dredging
Releases and discharges	Sewage and industrial discharges can affect water quality, but organic and nutrient loads from sewage treatment works are decreasing. Intermittent discharges from storm overflows cause episodic pollution, such as short spells of high toxic ammonia at a toxic concentration and aesthetic pollution. Industrial discharges can affect air quality.	- Pollution from sewage treatment works. = Pollution incidents - Industrial discharges
Farming	Excess fertilisers (especially nitrate), pesticides and slurry affect water quality. Emissions of ammonia and methane from livestock contribute to climate change.	- Fertilisers - Pollution incidents
Industrial activity (including waste disposal)	Pollution can affect water and air quality and greenhouse gases can influence climate change. Leachate from landfills (industrial and households), contaminated land, and storage of chemicals and oil cause pollution. Abandoned mines cause problems in surface waters. Industry has high demand for cooling water, though some of this is returned downstream. Potential hazard from storage of oil and chemical on sites - accidents have devastating effects.	+ Water demand - Indirect discharges + Closure of mines +/= Waste disposal +/= Pollution incidents - Emissions affecting climate change

Table 3.2



THE STATE OF THE HUMBER ENVIRONMENT

A fundamental role of the Environment Agency is to report on the state of the environment: a sound scientific understanding of it at any one time, and how it responds to pressures placed upon it, is critical to performing this role. It provides the basis for assessing priorities for action, charting progress and producing information on the environment. It also helps assess our progress towards sustainable development. We must adopt an integrated view of the environment, since its elements are all interdependent; improvement in one aspect could be at the expense of deterioration in another. We need to ensure that all available relevant information about the environment is considered in making decisions. We also need to accept that there may be gaps and inconsistencies in the data.

Land Use and Resources

Water Resources

The Humber Estuary receives run-off from a fifth of the area of England through the River Trent, the Yorkshire Ouse and the smaller rivers that discharge directly into the Estuary. The major rivers have a significant impact on the water resources in the Humber.

The major abstractions from the Estuary and main rivers are for cooling water for industry. Depending on flow conditions, high levels of sediment within the water can cause problems for these users. On the South Bank, low flow conditions can cause problems with the intrusion of saline water into tributary streams. This is being managed to reduce its impact.



Table 4.1 Standards of Flood Defences

Region	Total length of Defences (km)	Condition of Defences (km)		
		V. Good/Good	Fair	Poor/V. Poor
North East	120.7	67.2	46.0	7.4
Midlands	36.3	25.0	11.3	0.04
Anglian	131.4	19.0	111.6	0.8
TOTAL	288.4	111.2	168.9	8.3
% of TOTAL		38.5	58.6	2.9

Flood Defence

The Environment Agency is responsible for over 280 km of flood defences within the Humber Estuary. Table 4.1 shows the current conditions of the defences. Within the Estuary, the Agency's aim is to provide (as a minimum) protection against the once-in-20-year flood and, in heavily populated areas, protection against the once-in-200-year flood. The standard of protection actually delivered is decided on a site by site basis.

The Agency continues to invest in and maintain the existing defences, and a programme of urgent flood defence works has been put in place (Figure 4.1).



Figure 4.1 Urgent Works Locations

The Agency also provides a flood warning service to pass general and specific flood warnings to people who are at risk, so that they can take action to protect themselves and their property (Figure 4.2).

Figure 4.2 Flood Warning Zones



Contaminated Land

From mid 1999 local authorities are able to designate land as contaminated if it could cause, or is already causing, water pollution or significant harm because of the substances it contains. Sites designated as 'Special Sites' are the responsibility of the Environment Agency to gain remediation.

Three sites in particular are well known in the area:

- The Waters Edge site is a former agrochemical manufacturing site adjacent to the Humber Bridge in Barton upon Humber. North Lincolnshire Council have been working with English Partnership and the Environment Agency in developing a remediation plan for the site.
- The Macaulay Lane site is a former waste disposal site on the outskirts of Grimsby. North East Lincolnshire Council have been working with developers to remediate the site.
- The Capper Pass site is a former smelting works to the west of Hull. The area is attracting interest with regard to possible future development but this is dependent upon the resolution of issues connected with residual land contamination.





Key Habitats

Agriculture is the main land use in the area with the majority of agricultural land classed as grades 1 and 2. Cereal production is the dominant type of agriculture, combined with intensive pig, poultry and dairy farming.

The 1400 ha of saltmarshes in the Estuary represent approximately 10 per cent of the total intertidal area. This figure is relatively low in relation to other estuaries where the marshes usually represent around 14 per cent of the intertidal area. In addition, because the marshes have historically been subject to extensive reclamation, there are very few upper marsh communities and well-developed marshes are rare. The Estuary's main saltmarsh area is at Welwick near Spurn Head. If the build-up of intertidal habitat does not keep pace with the predicted rate of sea level rise, then the area of intertidal mud flats and saltmarshes is likely to reduce, especially where sea walls provide a demarcation between these and reclaimed land. This process is known as Coastal Squeeze (Figure 4.3).



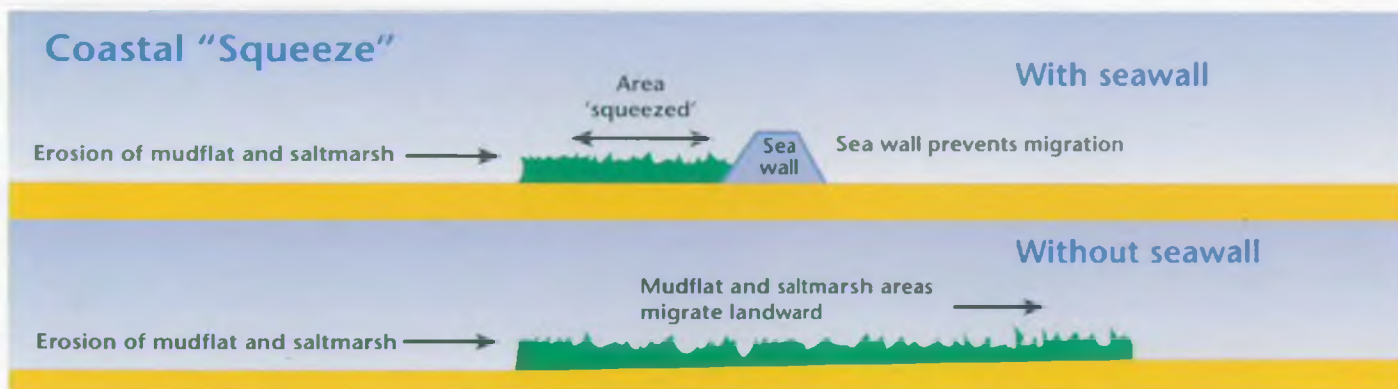


Figure 4.3 Coastal Squeeze

Sand dunes are found around Spurn, Cleethorpes and Humberston, and the North Lincolnshire Coast, supporting a number of nationally scarce plants and animals.

Wetlands consist of several habitat types including reedbeds, such as those at Blacktoft Sands near Trent Falls, and saline lagoons as well as saltmarshes. There are two types of reedbed around the Humber: those seaward of the flood defences and the more brackish/freshwater reedbeds which occur on the landward side. Saline lagoons are a priority habitat under the EC Habitats Directive (92/43/EEC) and the plants and animals that occur in them are highly specialised to cope with variable salt concentrations.

Small areas of plantation woodland are located intermittently around the Estuary, but the majority of woodland communities comprise hawthorn scrub, particularly alongside drains and field boundaries. Some areas of carr woodland have developed adjacent to the Upper Estuary, notably at Asselby Island in the River Ouse.

Archaeology and Cultural Heritage

There are a number of Scheduled Ancient Monuments within the area which receive statutory protection under the Archaeological Areas Act 1979 and the area surrounding Spurn Point is a designated Heritage Coast site (Figure 4.4).



Figure 4.4 Scheduled Ancient Monuments and Heritage Coast

Biological Resources

Monitoring the invertebrates, birds and fish living in tidal rivers and the Humber is an important part of assessing the Estuary's health. Many invertebrates live on or in the sediment and are exposed to contaminants in the sediment and/or water column. The variety and numbers of these organisms give an indication of the state of the estuarine system. Tidal rivers and estuaries can be harsh environments presenting organisms with soft, shifting sediments, variations in salinity and daily drying in the intertidal zones. Human influences such as pollution and reclamation may exacerbate these effects. Analysis of biological data must attempt to separate the effects of natural and anthropogenic stresses and to assess the health and productivity of the Estuary.

Macroinvertebrates

Macroinvertebrates are collected regularly throughout the Humber system, including the tidal rivers and the intertidal and subtidal areas. Throughout the Estuary, organisms are under natural stresses from variations in salinity and temperature, fluctuations in water level, and the scouring action of tides.

In the tidal rivers, worms are common and molluscs and caddisfly larvae are found at the most upstream (least saline) site. Within the Estuary there is a general increase in the number and variety of organisms downstream. Local areas exist where fewer creatures are found because of physical factors such as mobile sediments and strong currents. Crustaceans, molluscs and various types of worms are common in the Estuary and provide food for birds and fish.

Fisheries and Fish Communities

The Humber supports a diverse community of fish that is typical of estuaries subject to varying salinity and tidal scour. Over the last 10 years or so 72 species of fish have been recorded in the Humber. The Estuary supports a number of important sport and commercial fisheries and the Outer Estuary is a significant nursery area for several commercially important species including cod, whiting and flatfish (with an estimated 3 per cent of North Sea juvenile plaice utilising the Outer Estuary). In addition, the rich food supply supports large numbers of adult and juvenile marine fish. There are also commercial brown shrimp and cockle fisheries around Tetney, Humberston and Cleethorpes. Eels are fished commercially throughout the Estuary and in most of the adjacent rivers and drains.

A trawl survey of the Humber is carried out in conjunction with the Centre for Environment, Fisheries and Aquaculture Science (CEFAS) in September each year, sampling at 14 locations covering the length of the Estuary.





Birds

The Humber is recognised internationally for its breeding, passage and wintering birds. In winter, the Humber supports over 167 000 waders, ducks and geese. In summer, it supports nationally important breeding populations of several scarce or declining species. Of over 150 British estuaries, the Humber is in the top five for migratory waterfowl. The Estuary regularly supports 19 species of waders and waterfowl in national or internationally significant numbers (see Table 4.2). Knot and dunlin appear in the greatest numbers and the Humber supports more of the national population of golden plover than any other UK estuary.

Nationally and Internationally Important Birds in the Humber

Birds of national importance	Birds of international importance
Brent Goose	Shelduck
Widgeon	Golden Plover
Teal	Grey Plover
Mallard	Lapwing
Pochard	Knot
Goldeneye	Dunlin
Oystercatcher	Bar-tailed Godwit
Ringed Plover	Redshank
Sanderling	
Black-tailed Godwit	
Curlew	

Table 4.2

Mammals and Amphibians

A seal colony exists on the Lincolnshire coast at Donna Nook.

A group of porpoises exist at the mouth of the Estuary and whales have been seen in the Estuary during their passage down the North Sea.

Although otters tend to favour freshwater environments, they are known to use the Estuary for feeding.

Most heathland and coastal colonies of the Natterjack Toad have become extinct in Britain. It is now found mainly at isolated, widely separated coastal sites including sand dunes on the Lincolnshire coast.

Biodiversity

Biodiversity refers to the variety of life forms that exists. It encompasses the whole range of mammals, birds, reptiles, amphibians, fish, insects and other invertebrates, plants, fungi and micro-organisms. The importance of biodiversity is summed up in the following quotation:

“Our Planet’s essential goods and services depend on the variety and variability of genes, species, populations and ecosystems. Biological resources feed and clothe us and provide housing, medicines and spiritual nourishment.... The current decline in biodiversity is largely the result of human activity and represents a serious threat to human development.” (DoE, 1994)

The diversity of species cannot be separated from habitat diversity. Large areas of the Humber Estuary are protected through various environmental designations (Table 4.5). These are sites which support rare, endangered or vulnerable species or which support outstanding examples of habitats, characteristic of the region.



Figure 4.5 Environmental designations on the Humber



The Habitats and Wild Birds Directives (92/43/EEC & 79/409/EEC) are being implemented under British legislation through the Conservation (Natural Habitats & Co) Regulations 1994. This is the most significant piece of nature conservation legislation since the Wildlife and Countryside Act 1981. It introduces special conservation measures for habitats of certain types and supporting certain rare species. It also sets out a more general requirement to maintain rare species and protect threatened habitats. The Environment Agency has an agreed programme and procedures with English Nature to review existing and new consents on the Humber and to assess their impact on the Special Protection Areas (SPAs).

Compliance with Existing Standards and Targets

Many environmental standards exist to protect human health and the environment. They arise from EC Directives, national legislation and international agreements. The Agency undertakes extensive monitoring to provide data for assessing compliance with these standards.

There are also classification schemes that are non-statutory but provide a way of comparing quality both spatially and through time; they determine whether environmental quality is being maintained or improved.

Environmental Quality Standards

The Agency's chemical monitoring programme measures the levels of metals, organic compounds, dissolved oxygen and other determinands in the tidal rivers and Estuary, and those entering the system via effluent discharges. Water samples are collected from shore-based sites along the tidal rivers and in the Estuary. The analytical results are compared to the relevant Environmental Quality Standards (EQSs) - see Table 4.3.

In 1996, the water quality of the tidal reaches of the Humber system complied with all but a few EQSs. A number of dissolved oxygen failures in the Rivers Ouse and Don are thought to have been a result of the drought-induced low freshwater flows experienced during the year. Copper levels have been a historical problem in the Estuary but, since there was only one failure in 1996, the Agency is confident of continuing improvements.



Environmental Quality Standards

Temperature	Carbon tetrachloride	Mercury
Dissolved oxygen	DDT	Cadmium
Unionised ammonia	pp DDT	Lead
pH	Pentachlorophenol	Chromium
	Total 'drins (Aldrin, Dieldrin, Endrin, Isodrin)	Zinc
	Endrin	Copper
	Hexachlorobenzene	Nickel
	1,2 dichloroethane	Arsenic
	Trichloroethylene	Boron
	Perchloroethylene	Iron
	Trichlorobenzene	Vanadium

EC Directives relating to water

Table 4.3

Bathing Waters

In accordance with the EC Bathing Waters Directive (76/160/EEC) the Agency monitors water quality every summer at designated bathing beaches. The only one within the Humber Estuary is at Cleethorpes which, historically, has consistently failed to comply with the mandatory standards set out in the Directive. Major improvements to the local sewage treatment works in 1995 and improvements to other sources of bacterial contamination in 1996 have resulted in the bathing water at Cleethorpes complying in 1997.

Dangerous Substances

EC Directive 76/464/EEC on "pollution caused by the discharge of dangerous substances to the aquatic environment" aims to reduce the pollution of waters by seeking to eliminate the most dangerous substances in terms of persistence, toxicity and bioaccumulation (List I or Black List substances) and by reducing the input of others (List II or Grey List substances) - see Table 4.4.

The Environment Agency samples the appropriate industrial and sewage discharges (at least once per month) and the receiving water (four times per year) to monitor these substances and to assess their compliance with the relevant EQSs. Samples of sediments, fish and shellfish are also collected once per year to check that levels of List I substances are not increasing in these materials.

Dangerous Substances

List I	List II
Mercury	Lead
Cadmium	Chromium
Hexachlorocyclohexane	Zinc
Carbon tetrachloride	Copper
DDT	Nickel
pp DDT	Arsenic
Pentachlorophenol	Boron
Total 'drins (Aldrin, Dieldrin, Endrin, Isodrin)	Iron
Endrin	pH
Hexachlorobenzene	Vanadium
Hexachlorobutadien	Tributyltin
Chloroform	Triphenyltin
1,2 dichloroethane	PCSDs
Trichloroethylene	Cyfluthrin
Perchloroethylene	Sulcofuron
Trichlorobenzene	Flucufuron
	Permethrin

Table 4.4

Titanium Dioxide

Two of the country's three Titanium dioxide production plants are located on the South Bank of the Humber Estuary. These plants produce acid-iron waste and several EC Directives exist to reduce this pollution (78/176/EEC, 82/883/EEC, 83/29/EEC and 92/112/EEC). The Environment Agency monitors these two discharges and their effects on the local biology: there currently appears to be very little impact on the level of metal pollutants in the water column and sediments and no impact on the biology.

Urban Waste Water Treatment

Under the Urban Waste Water Treatment Directive, adopted in 1991, sewerage systems and treatment plants for urban waste water (i.e. domestic waste water with or without trade effluent and rainwater run-off) must be provided. Five discharges within the Humber Estuary will have secondary treatment by the end of 2000: Hull, Hedon, Immingham, Barton and Pyewipe. Seven other discharges are in the programme for 2000 to 2005: Winteringham, New Holland, Ellerker, Brough, Howdendyke, North Ferriby and Gilberdyke.

Radioactivity

There are no significant sources of radioactivity in the Humber Estuary area.

International Agreements

As a signatory to the Oslo and Paris Commission and the various international North Sea Declarations, the UK Government has agreed to reduce contaminants entering the North Sea. To monitor this reduction, river, sewage and industrial sites around the Humber are regularly sampled for various substances, including certain metals, PCBs, nutrients, pesticides, etc.. In 1996, most metals loads were lower than in previous years.



Figure 4.6 Classification of the Humber Estuary based on the Dissolved Oxygen Profile:



Classification

The Humber Estuary is classified in accordance with the Classification of Estuaries Working Party Scheme (see Appendix 1). This scheme assesses the Estuary in terms of biological, aesthetic and water quality, with points awarded for each of the criteria met. In the Humber Estuary, the classification has recently been updated using the Humber Mathematical Model resulting, in broad terms, in the classification of the Estuary as Class B (fair quality) to the west and Class A (good quality) to the east of the Humber Bridge (Figure 4.6). This grading is an average of conditions along the banks of the Estuary, and localised areas on either bank may be above or below these grades.

Figure 4.6 also predicts the changes to the Humber Estuary resulting from the current programme of water quality improvements outlined in the Humber Estuary Action Plan.

The Environment Agency is currently involved in research to develop a new General Quality Assessment scheme for estuaries



Health of Environmental Resources

Whereas standards are usually based on physical or chemical criteria, it is also useful to look at their effects as an indication of environmental quality. In other words, how 'healthy' is our environment? There are not yet many ways of measuring 'health' so this section concentrates on specific related issues of concern.

Bioaccumulation

Ragworms, seaweed and brown shrimp are collected from the Estuary annually and analysed for a range of metals and organic substances. In 1996, the results for organic substances and many metals were below the limit of detection, suggesting very little accumulation of these substances in the organism tissues.

Endocrine Disruption

Endocrine disrupters are substances that can interfere with the hormonal systems of invertebrates, fish, birds and mammals (including humans) and which can affect reproduction. Some examples are shown in Table 4.5.

The Environment Agency is conducting an extensive research programme to assess the environmental effects of endocrine disrupters. Additionally, we will work with industry groups and others to reduce the discharge of substances linked with this effect in the environment.

Hormone Disrupting Substances

Natural	Synthetic
phyto-oestrogens from plants steroids excreted by animals	some pesticides some industrial detergents plasticisers polychlorinated biphenyls found in old electrical components bisphenol A used in lining tin cans and in dental fillings synthetic steroid used in the oral contraceptive pill

Table 4.5

Humber sediments

Sediments have a high ability to collect and store pollutants liberated into the water column. Samples are collected twice per year from river, intertidal and subtidal sites in the Estuary and are analysed for metals and organic substances.

Most 1996 results were the lowest for the past five years. Concentrations of most metals currently tend to be highest in the North Bank intertidal sediments. For some metals this may be due to historical concentrations on the North Bank, particularly of arsenic (originating from the now closed Capper Pass smelter) which is still present in the sediments.

Long-term Monitoring

Environmental processes often act over very long time periods and the effect of human activities may not be noticed for several years or decades. Furthermore, natural changes may evolve over hundreds of years. There is a need to take a long-term perspective if sustainable development is to be achieved, and if long-term changes are to be detected.

Dissolved Oxygen

Dissolved oxygen (DO) is a long-standing problem in the Estuary and is therefore continuously monitored at sites on the Humber and its tidal rivers. The data supplements the spot sampling and gives a more detailed picture of the changing conditions in the Estuary throughout the day, particularly for DO which varies with both the tidal cycle and temperature and is critical in sustaining fish-life.

The low concentration of DO in the Humber Estuary is a partially natural phenomenon resulting from high suspended sediments load (which gives the Humber its characteristic reddish-brown colour). The natural DO 'sag' has, however, been considerably exacerbated by organic material from polluting discharges entering the system via the tidal rivers. Over the past few decades, much investment has gone into reducing these polluting discharges through enforcement by the Environment Agency and its predecessors and investment by water companies and industry (Figure 4.7). Further improvements are expected with the enforcement of the Urban Waste Water Treatment Directive. Although the DO sag will never be completely eliminated, its reduction has helped begin to remove the major barriers to fish migration in the Humber, and salmon have recently begun to return to the tidal River Ouse.

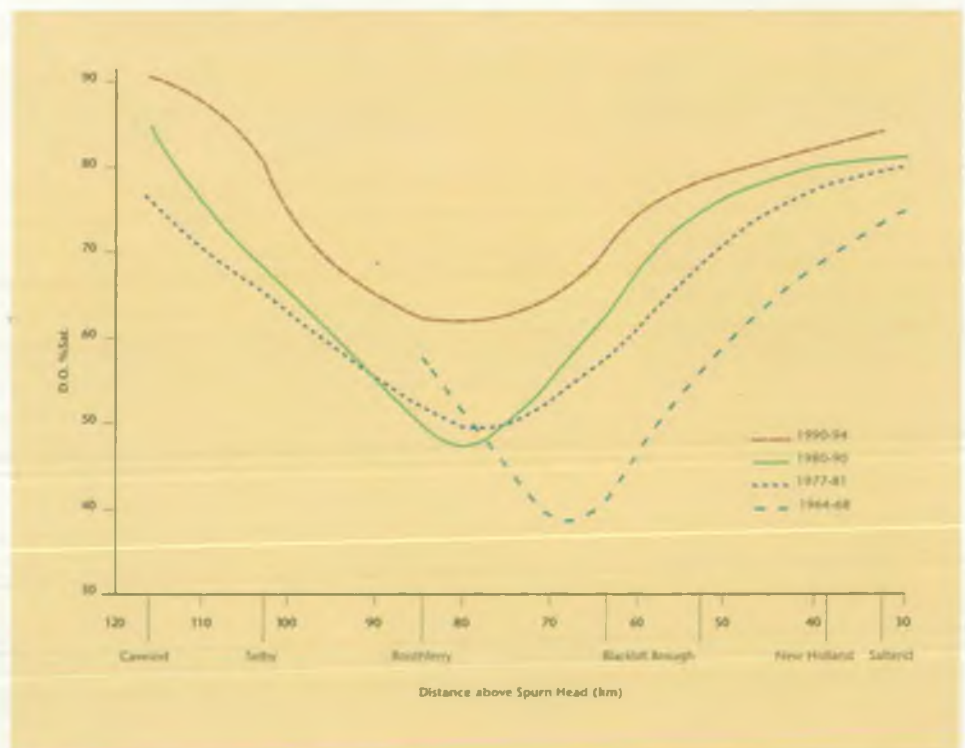


Figure 4.7 Comparison of Dissolved Oxygen Profiles in the Ouse-Humber System

Macroinvertebrate Monitoring

Annual biological surveys have been undertaken in the tidal rivers since 1973, in the intertidal areas since 1971 and in the subtidal areas since 1979. This long-term monitoring shows that the biology of the Humber follows a typical estuarine pattern with an increase in the number of species towards the mouth of the Estuary. (The exception is the most upstream sampling site on the tidal rivers which, because it is hardly affected by salt water, contains a variety of freshwater species.) The areas around sewage outfalls contain high numbers of worms that are associated with organic enrichment. Other variations in ecology are caused by physical factors such as strong currents and mobile sediments. Overall the macroinvertebrates provide an abundant food supply for birds and young fish.

Long-term Bioaccumulation Monitoring

As part of the Humber Estuary Environmental Quality monitoring programme, levels of metals in seaweed have been measured since 1981.

In August 1988 new arrangements were implemented for the discharge of the large quantities of acid-iron waste from the two Titanium dioxide factories situated between Immingham and Grimsby. Figure 4.8 shows how the levels of iron were substantially reduced in the seaweed and that this improvement has been sustained.

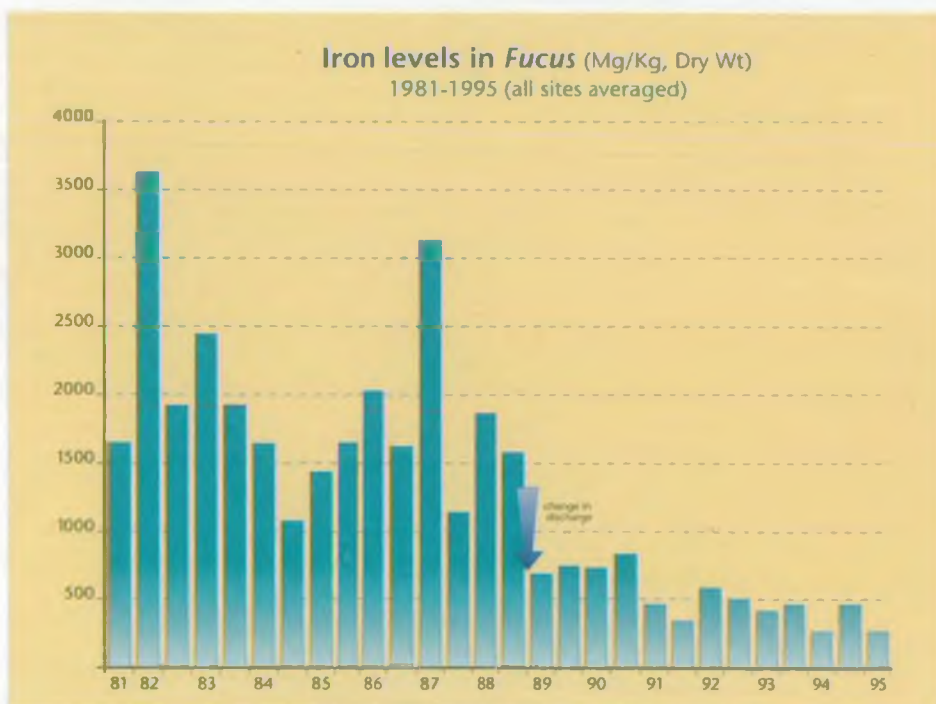


Figure 4.8 Mean Iron Concentrations for each Survey (1981 - 1997)



Aesthetic Quality

What the Estuary looks like is the measure by which most people will initially judge it. Issues such as litter, the presence of odours, and the general aesthetic quality are the first things noticed by the public. The Environment Agency is working with other organisations on schemes for assessing the aesthetic quality of the environment and is aiming for solutions through both enforcement of legislation and through education.

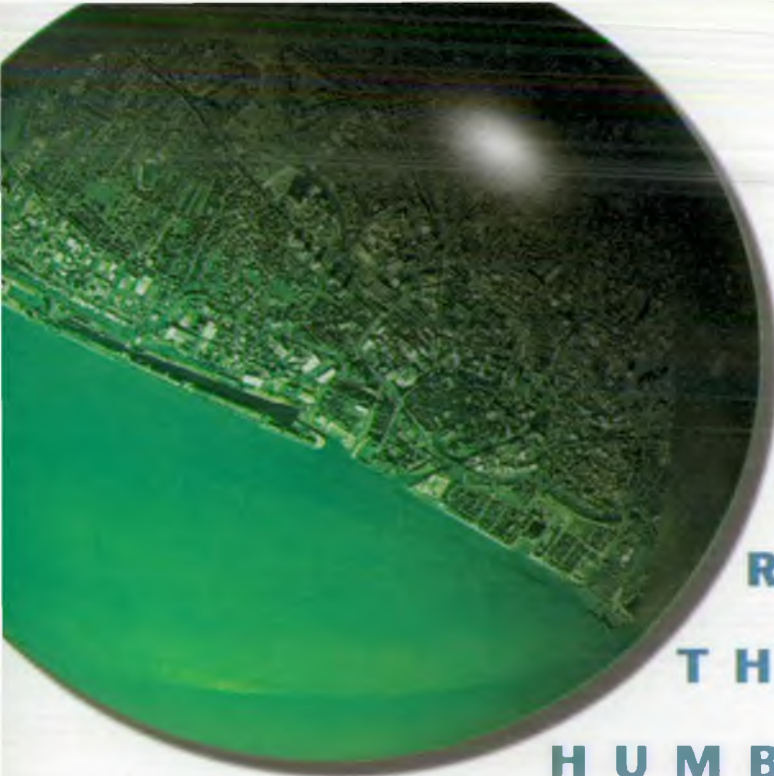
Summary of the State of the Humber

Summary of the State of the Humber

Heading	Aspect	State
Land use and environmental resources	Water resources:	The Humber receives run-off from a fifth of the area of England. High sediment levels can cause problems for industrial cooling water abstractions. Saline intrusion in the South Bank tributaries is being managed.
	Flood defence:	Over 280 km flood defences within Humber Estuary. Around 40% of the defences are in either good or very good condition. Of the remaining 60%, most are in fair condition. Ongoing programme of urgent works is addressing the most critical problem sites.
	Contaminated land:	At least three sites exist within the Humber study area. Many more in the catchment have an impact on water quality.
	Key habitats:	Agriculture (cereal production and intensive livestock) is the main land use, with good quality land. 1400 ha of saltmarsh account for 10 per cent of the total intertidal area of the Estuary. New areas are developing although other areas are potentially at risk through coastal squeeze from flood defence works and rising sea-levels.
	Archaeology and cultural heritage:	There are a number of Scheduled Ancient Monuments within the study area. The area surrounding Spurn Point is a designated Heritage Coast site.
Biological resources	Macroinvertebrates:	The number of species increases seawards following the typical Estuarine pattern. Appreciable densities of all species provide food for birds and young flat fish.
	Fisheries and fish communities:	The Humber supports a diverse community of fish including a number of important sport and commercial fisheries. The Outer Estuary is a significant nursery area for several commercially important species such as cod and plaice. The rich food supply supports large numbers of adult and juvenile marine fish. There are commercial brown shrimp and cockle fisheries and eels are found throughout the Estuary and in most of the adjacent rivers and drains.
	Birds:	The Estuary regularly supports 19 species of waders and waterfowl in national or internationally significant numbers. In winter, the Humber supports over 167 000 individual waders, ducks and geese. Of over 150 British estuaries, the Humber is amongst the top five in importance for migratory waterfowl.
	Mammals:	A seal colony exists on the Lincolnshire coast at Donna Nook. Otters are known to use the Estuary for feeding.
	Amphibians:	The sand dunes of the Lincolnshire coast support Natterjack Toads.

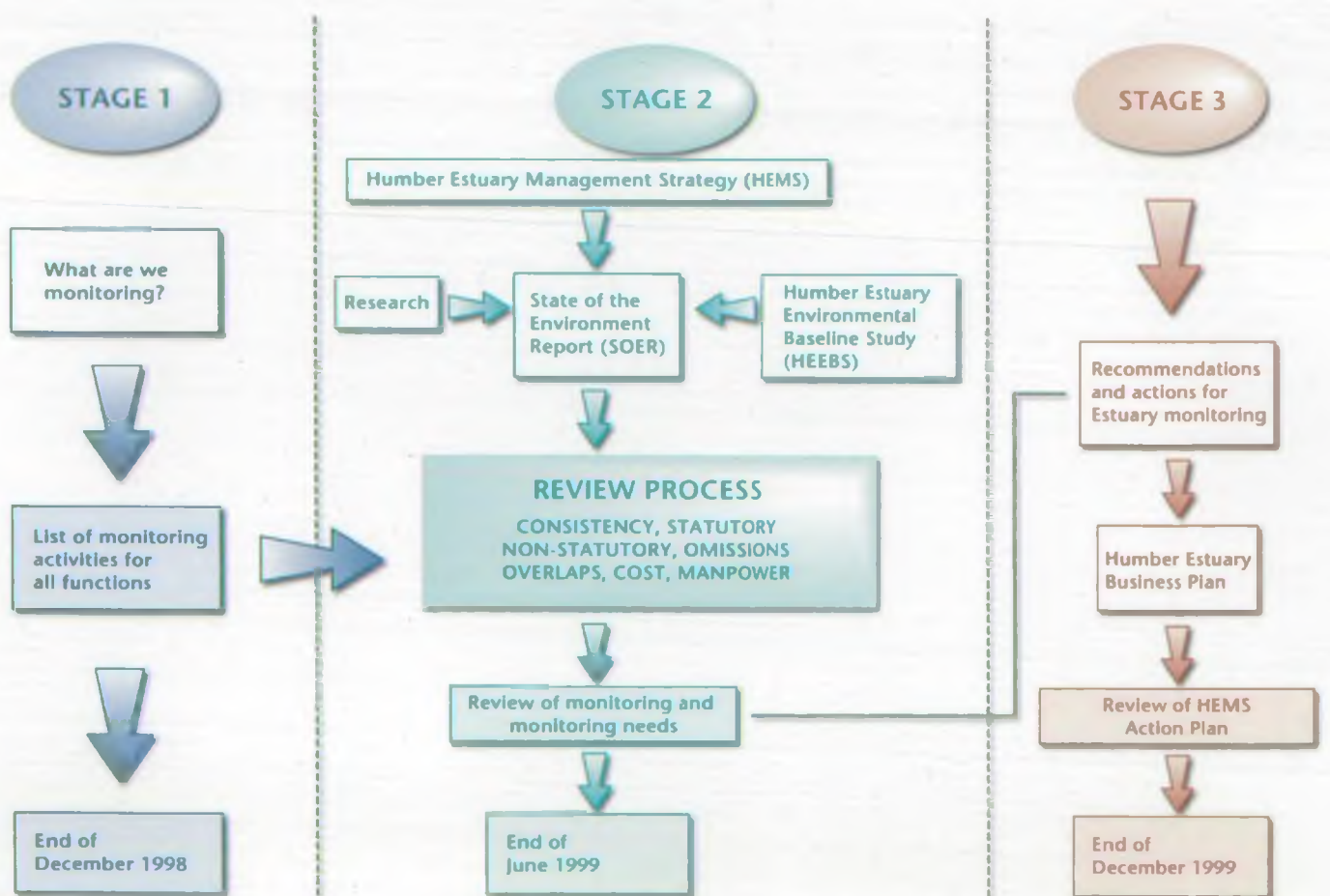
Table 4.6

Biological resources continued	Biodiversity:	Large areas of the Humber Estuary are protected through various environmental designations
Compliance with existing standards and targets	Environmental Quality Standards:	The Estuary generally meets most of the Environmental Quality Standards. The dissolved oxygen failures in 1996 are likely to have been a result of the drought-induced low freshwater flows experienced during the year. Copper levels have been of ongoing concern in the Humber but the single failure in 1996 continues the improvements seen in recent years.
	EC Directives: Bathing Waters:	The only bathing beach in the area (Cleethorpes) complied in 1997.
	Dangerous Substances: Titanium Dioxide:	No failures were reported in 1996. There is little observable impact on the water and sediment chemistry and none on the biology.
	Urban Waste Water Treatment:	Five discharges require secondary treatment by the end of 2000: Hull, Hedon, Immingham, Barton and Pyewipe. Seven other discharges to be reviewed: Winteringham, New Holland, Ellerker, Brough, Howdendyke, North Ferriby and Gilberdyke.
	Radioactivity:	There are no significant sources of radioactivity in the area.
	International Agreements:	Loads calculated for commitment to North Sea agreements were lower in 1996 than in previous years.
	Classification:	The Humber Estuary is classed as either 'good' or 'fair' quality along its entire length. The Environment Agency is involved in research to develop a new General Quality Assessment scheme for estuaries.
Health of environmental resources	Bioaccumulation:	Most metals and organics results were undetectable in 1996, suggesting little accumulation in Estuary organisms.
	Endocrine disruption:	Research programme in progress.
	Humber sediments:	Metal levels in sediments in 1996 were lower than during the previous five years. Levels of some metals may be affected by historical concentrations on the North Bank, particularly arsenic (originating from the now closed Capper Pass smelter) which is still present in the sediments.
Long-term monitoring	Dissolved oxygen:	The natural dissolved oxygen sag will never be completely eliminated but improvements to polluting discharges have already begun to remove the major barriers to fish migration in the Humber, and salmon have recently begun to return to the tidal River Ouse.
	Macroinvertebrates:	The number of species increases seawards following the typical Estuarine pattern. Appreciable densities of all species provide food for birds and young flat fish.
	Bioaccumulation:	New arrangements for the discharge of acid-iron waste from two Titanium dioxide factories in 1988 resulted in a substantial reduction of iron levels in seaweed.
Aesthetic quality		The Agency is currently working with other organisations on schemes for assessing aesthetic quality.



AGENCY RESPONSE TO THE STATE OF THE HUMBER

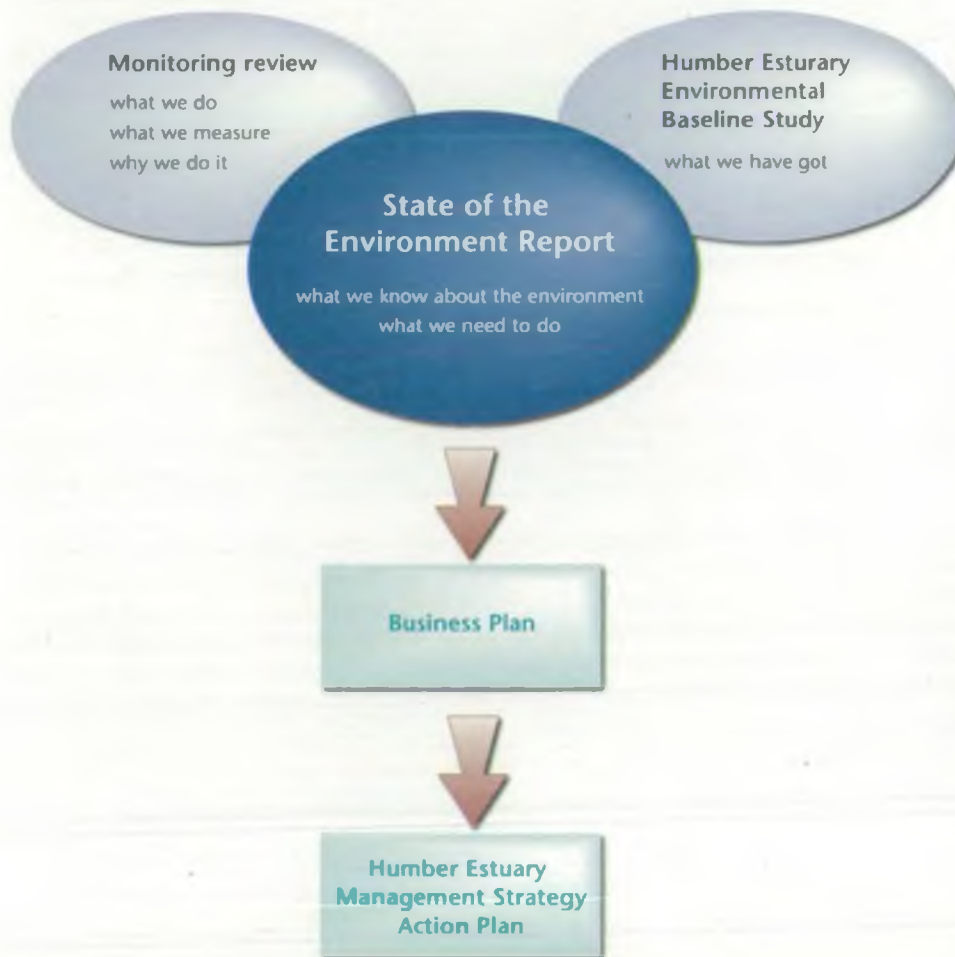
Measuring the state of the environment provides the basis for assessing priorities for action and for charting the progress of environmental management plans and targets. The pressures and states causing the greatest concern need to be identified, as do the issues to which strategies and actions need to be targeted.



The Agency is currently reviewing the monitoring of the Estuary to ensure that all work is co-ordinated and cost-effective. The diagram shows the process and the timetable for review and indicates the role of this State of the Environment Report.

This process, in conjunction with the Humber Estuary Environmental Baseline Study, will help clarify the issues that need addressing and provide the basis upon which the Agency:

- targets and monitors activities to estuary-wide needs;
- identifies gaps in knowledge in order to gather the information needed for making correct decisions;
- determines the most appropriate actions;
- targets resources to the appropriate areas; and
- charts the progress of environmental management plans and targets.



The Environment Agency carries out much work in the Humber Estuary. This reflects the enormous economic and environmental importance of the Estuary and the wide range of duties of the Agency in maintaining and improving the overall quality of the Estuary.



In addition to nationally important industries and ports, the Estuary is also important for the birds it supports during their migrations. In addition, flood defences protect 500 000 people and very large tracts of productive farmland from flooding from the sea. The pressures on the Estuary mean that there is a real need for management to ensure that the needs of one do not harm the needs of others. The Estuary has many uses and users and the Agency, together with others, aims to allow these to coexist without negative impacts. For example, continued improvements to water quality are essential to improve the well-being of the animal life in the mudflats which is the foodstuff of migrating birds. Equally, improvements to flood defences must not cause damage to the habitats or species which make the Estuary so important and attractive for wildlife.

To help the Agency meet all its objectives, it has adopted a number of approaches to ensure that it is also contributing to the continued and future well-being of the Humber Estuary. These include:

- managing the Estuary as a single and sustainable entity and not on a piecemeal basis;
- identifying clear targets for work and operating in an open and business-like way; and
- working in consistent ways across all the functions of the Agency.

This means that the Environment Agency is committed to being a full and active partner of the Humber Estuary Management Strategy (HEMS), working for the benefit of the whole Estuary to targets which are not just those of the Agency but of all those involved. The Humber Estuary Action Plan (1998) sets out the actions which the Agency is, or will be, taking to address the issues identified by the HEMS partnership and these are listed in Table 5.1. Each action has been determined in response to the issues and the Agency's responsibilities, hence they cover the whole range of Environment Agency functions.

Key Issues from the Humber Estuary Action Plan

A Strategic Planning framework to guide co-ordination and co-operation between all organisations with responsibilities for planning and management of land and water use activities in the HEMS area.

Key Issue 1

Improve our understanding of the physical and sedimentary processes at work in the Humber Estuary so that it is managed in a sustainable way.

Key Issue 2

Ensure that the physical processes linking the Estuary and adjacent open coastlines are understood and considered in strategy development and land use planning.

Key Issue 3

Respond to predicted rates of sea level rise and coastal squeeze.

Key Issue 4

Protect people, property, key areas of land and infrastructure from flooding and maintain conservation. Determine how to balance these requirements in providing long term effective and sustainable tidal defences.

Key Issue 5

Integrate the conservation and enhancement of the internationally important sites (Special Protection Areas - SPAs) on the Estuary with the development needs of ports and industry.

Key Issue 6

Ensure that water quality in the Humber Estuary is improved to comply with National and European standards, and encourage effluent dischargers to adopt the Integrated Pollution Control (IPC) concept.

Key Issue 7

Promote the benefits of waste minimisation more widely.

Key Issue 8

Promote the benefits of reclaiming areas of contaminated land more widely, to reduce pressure on green field sites, and to promote redevelopment for economic uses and environmental gain.

Key Issue 9

Ensure the sustainable economic development of the Estuary's ports, wharves and industrial base.

Key Issue 10

A framework to guide recreational management of the Estuary and its environs, ensuring integration with other Estuary interests.

Key Issue 11

Ensure the sustainability of current and future tourism on the Humber.

Key Issue 12

Improve education and establish information exchange initiatives based on the HEMS region, and to encourage research and development work on the many issues associated with estuary management.

Key Issue 13

Table 5.1

These actions also relate to the nine main themes set out in the Environment Agency's Environmental Strategy, aimed at dealing with the major problems needing to be addressed across all media in order to protect and improve the environment for the millennium and beyond. The nine main themes are shown in Table 5.2 along with the related key issues and some specific actions for the Humber.



Environmental Themes and the Humber Estuary










Environmental Themes	Key issues	Some key actions and objectives for the Humber Estuary
 Climate change	Key Issue 2 Key Issue 3 Key Issue 4 Key Issue 5	Develop an Estuary Shoreline Management Plan. Geomorphological studies including the building and verifying of models. Undertake urgent flood defence works. Participate in research with other key organisations to make sure we fully understand any new information on major concerns.
 Air quality	Key Issue 10	Support any move to promote environmental best practice, principles of sustainability and an environmentally aware and responsible attitude in all sectors of industry. Ensure the design and construction of new industrial sites minimises risk and that appropriate pollution prevention and control equipment is in place and tested. Reduce pollution by enforcing IPC authorisation and by encouraging industry to adopt waste minimisation.
 Biodiversity	Key Issue 5 Key Issue 6	Undertake Environmental Assessments of all our proposed works within the Estuary and produce Environmental Action Plans describing how our works will be carried out to avoid damage to the environment. Review all permissions which could be influenced by the Habitats Directive. Support the development of the Humber Biodiversity Action Plan. Promote conservation enhancement through strategic land use planning. Develop an Estuary-wide guidance note in conjunction with others on enhancement opportunities.
 Fisheries	Key Issue 11 Key Issue 12	Continue to improve the water quality of the Aire, Calder, Don, Rother and Dearne catchments. Reduce water pollution by enforcing discharge consents and IPC authorisations, and by improving effluent treatment. Develop opportunities for improving recreational facilities.
 Water resources	Key Issue 1 Key Issue 7	Continue to improve the water quality of the Aire, Calder, Don, Rother and Dearne catchments. Reduce water pollution by enforcing discharge consents and IPC authorisations, and by improving effluent treatment.
 Integrated River Basin Management	Key Issue 2 Key Issue 3 Key Issue 5 Key Issue 10 Key Issue 11	Produce Local Environment Agency Plans for river catchments around the Estuary. Identify Estuary-wide issues to ensure that they are properly addressed. Support any review of the transport infrastructure including development of shore sea shipping and inland waterways. Work with local authorities and developers to ensure the right balance is struck between social, economic and environmental considerations in taking forward sustainable development
 Conserving Land	Key Issue 1 Key Issue 9	Produce Environmental Action Plans which describe the way in which our works will be carried out to avoid damage to the environment and, where appropriate, to improve it, particularly for flood defence works. Promote conservation enhancement through strategic land use planning. Fund a farming and wildlife group advisory post to promote farming and land use practices minimising pollution. Work with local authorities to identify and report on the extent of contaminated land. Support any research into specific and remediation risks of contaminated land. Reduce the risk of further contaminated land sites developing in the future through planning advice.
 Managing Waste	Key Issue 8	Undertake a National Waste Survey and develop an overall database. Implement the "producer responsibility" regulations. Develop life-cycle assessment methodologies for dealing with waste. Ensure the achievement of the National Waste Strategy for the reduction of waste disposed of to landfill. Ensure the achievement of national targets for the recovery, recycling and composting of municipal waste.
 Regulating Industry	Key Issue 7 Key Issue 8 Key Issue 10 Key Issue 13	Reduce pollution by enforcing discharge consents and IPC authorisations. Carry out pollution prevention inspections at appropriate sites in the catchment.

Table 5.2

references

- Department of the Environment (1994) Biodiversity, The UK Action Plan.
Environment Agency (1997) An Environmental Strategy for the Millennium and Beyond.
Environment Agency (1998) Humber Estuary Action Plan.
Humber Estuary Management Strategy HEMS (1997).
National Rivers Authority (1994) The Implications of Climate Change for the National Rivers Authority.
Environment Agency (1999) The State of the Environment of England and Wales: Coasts.

glossary

200-year flood	A flood which can be expected to occur once in every 200 years.
50-year flood	A flood which can be expected to occur once in every 50 years.
Abstraction	The removal of water from surface or groundwater, usually by pumping.
Ammonia	A substance found in water often as the result of pollution by sewage or livestock effluent.
Amphibians	Soft-skinned vertebrates such as frogs, toads and newts.
Bioaccumulation	The build up of toxic substances in living organisms at concentrations often many times those of the surrounding environment.
Biodegradation	The process by which materials are broken-down by the actions of living organisms, e.g. bacteria, fungi, moulds or insects.
Biodiversity	The number of different plant and animal species in an ecosystem.
Brackish	Water which is saltier than freshwater but less salty than seawater.
Crustacean	Hard-shelled, mainly aquatic animals such as crabs and lobsters.
Effluent	Water discharged from a site that may be contaminated with sewage or industrial waste.
Endocrine disruption	Any disruption of the normal functioning of the hormonal system by artificial or natural chemicals.
Environmental Quality Standard	The acceptable level of substances in the environment (to protect natural or human uses).
General Quality Assessment	An Environment Agency classification scheme for water quality.
Groundwater	Water occurring in permeable underground rocks, e.g. chalk and sandstone.
Integrated Pollution Control	A system to control the most complex and polluting industrial processes across all media (air, land and water).
Intertidal	The part of the shore that lies between the highest and lowest tides.
Invertebrate	Animal without a backbone, e.g. insects, crustaceans, worms and molluscs.

Load	The quantity or mass of any substance transported in an effluent per unit time.
Macroinvertebrate	An invertebrate animal larger than about one millimetre.
Mollusc	A type of animal, usually with a fleshy body and chalky shell.
Nutrient	A substance such as nitrogen or phosphorus which provides nourishment to organisms.
pH	A measure of acidity or alkalinity.
Salinity	A measure of saltiness in water.
Secondary treatment	Biological treatment and secondary settlement of sewage effluent.
Subtidal	The area which lies below the low water mark and which is continuously covered by water.
Surface water	All streams, rivers and lakes at the ground surface.
Suspended sediment/solids	Particles suspended in water.
Sustainable development	Development that meets the needs of the present without jeopardising the ability of future generations to meet their own needs.
Tidal river	That part of a river between the tidal limit and the estuary: subject to tides but not saline.
Tributary	Any river which feeds into another.
Well-mixed estuary	An estuary in which salt and freshwater mix thoroughly.

appendix 1

CLASSIFICATION OF ESTUARIES WORKING PARTY SCHEME

Description	Points awarded if the estuary meets this description												
Biological Quality (scores under a, b, c and d to be summed)													
a) Allows the passage to and from freshwater of all the relevant species of migratory fish, when this is not prevented by physical barriers	2												
b) Supports a resident fish population which is broadly consistent with the physical and hydrographical conditions	2												
c) Supports a benthic community which is broadly consistent with the physical and hydrographical conditions	2												
d) Absence of substantially elevated levels in the biota of persistent, toxic or tainting substances from whatever source	4												
Maximum number of points	10												
Aesthetic Quality													
a) Estuaries or zones of estuaries that either do not receive a significant polluting input or which receive inputs that do not cause significant aesthetic pollution	10												
b) Estuaries or zones of estuaries that receive inputs which cause a certain amount of pollution but do not seriously interfere with estuary usage	6												
c) Estuaries or zones of estuaries that receive inputs which result in aesthetic pollution sufficiently serious to affect estuary usage	3												
d) Estuaries or zones of estuaries that receive inputs which cause widespread public nuisance	0												
Water Quality (score according to quality)													
Dissolved oxygen exceeds the following saturation levels:													
60%	10												
40%	6												
30%	5												
20%	4												
10%	3												
below 10%	0												
<p>The points awarded under each of the headings (biological quality, aesthetic quality, water quality) are summed. Waters are classified on the following scales:</p> <table border="0"> <tr> <td>Class A</td> <td>Good Quality</td> <td>24 to 30 points</td> </tr> <tr> <td>Class B</td> <td>Fair Quality</td> <td>16 to 23 points</td> </tr> <tr> <td>Class C</td> <td>Poor Quality</td> <td>9 to 15 points</td> </tr> <tr> <td>Class D</td> <td>Bad Quality</td> <td>0 to 8 points</td> </tr> </table>		Class A	Good Quality	24 to 30 points	Class B	Fair Quality	16 to 23 points	Class C	Poor Quality	9 to 15 points	Class D	Bad Quality	0 to 8 points
Class A	Good Quality	24 to 30 points											
Class B	Fair Quality	16 to 23 points											
Class C	Poor Quality	9 to 15 points											
Class D	Bad Quality	0 to 8 points											

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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Tel: 0121 711 2324
Fax: 0121 711 5824

SOUTH WEST

Manley House
Kestrel Way
Exeter EX2 7LQ
Tel: 01392 444 000
Fax: 01392 444 238

NORTH EAST

Rivers House
21 Park Square South
Leeds LS1 2QG
Tel: 0113 244 0191
Fax: 0113 246 1889

THAMES

Kings Meadow House
Kings Meadow Road
Reading RG1 8DQ
Tel: 0118 953 5000
Fax: 0118 950 0388

NORTH WEST

Richard Fairclough House
Knutsford Road
Warrington WA4 1HG
Tel: 01925 653 999
Fax: 01925 415 961

WELSH

Rivers House/Plas-yr-Afon
St Mellons Business Park
St Mellons
Cardiff CF3 0LT
Tel: 01222 770 088
Fax: 01222 798 555

For general enquiries please call your local Environment Agency office. If you are unsure who to contact, or which is your local office, please call our general enquiry line.

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

ENVIRONMENT AGENCY GENERAL ENQUIRY LINE

0645 333 111

ENVIRONMENT AGENCY EMERGENCY HOTLINE

0800 80 70 60

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ENVIRONMENT AGENCY

Information Services Unit

Please return or renew this item by the due date

Due Date

25 - OCT - 05



**ENVIRONMENT
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