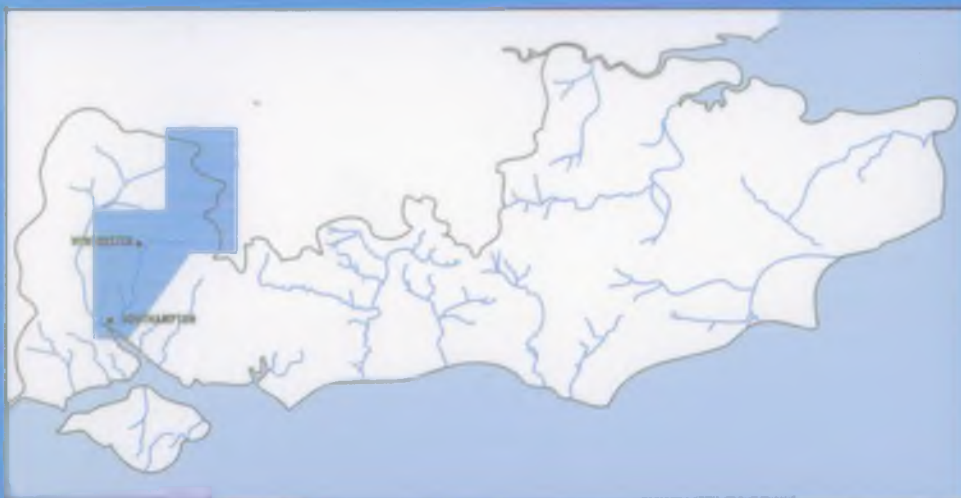


# RIVER ITCHEN CATCHMENT MANAGEMENT PLAN FINAL REPORT



**NRA**

*National Rivers Authority  
Southern Region*

## MISSION STATEMENT

The NRA's mission is :

"We will protect and improve the water environment by the effective management of water resources and by substantial reductions in pollution. We will aim to provide effective defence for people and property against flooding from rivers and the sea. In discharging our duties we will operate openly and balance the interests of all who benefit from and use rivers, groundwaters, estuaries, and coastal waters. We will be businesslike, efficient and caring towards our employees".

### Our Aims are to :

- \* Achieve a continuing overall improvement in the quality of rivers, estuaries and coastal waters, through the control of pollution.
- \* Manage water resources to achieve the right balance between the needs of the environment and those of the abstractors.
- \* Provide effective defence for people and property against flooding from rivers and the sea.
- \* Provide adequate arrangements for flood forecasting and warning.
- \* Maintain, improve and develop fisheries.
- \* Develop the amenity and recreation potential of inland and coastal waters and associated lands.
- \* Conserve and enhance wildlife, landscape and archaeological features associated with inland and coastal waters of England and Wales.
- \* Improve and maintain inland waters and their facilities for use by the public where the NRA is the navigation authority.
- \* Ensure that dischargers pay the costs of the consequences of their discharges, and, as far as possible, to recover the costs of environment improvements from those who benefit.
- \* Improve public understanding of the water environment and the NRA's work.
- \* Improve efficiency in the exercise of the NRA's functions and to provide challenge and opportunity for employees and show concern for their welfare.

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### NRA Copyright waiver

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ENVIRONMENT AGENCY

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Published December 1993

SOUTHERN REGION

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Worthing, West Sussex BN11 1LD

# *River Itchen Catchment Management Plan*

## **RIVER ITCHEN CATCHMENT MANAGEMENT PLAN**

### **FINAL PLAN**

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## *River Itchen Catchment Management Plan*

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## *River Itchen Catchment Management Plan*

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### **INTRODUCTION**

The function of Catchment Management Plans is to promote the overall vision of The National Rivers Authority for the catchment in question. They are central to the development of NRA policy, assigning priorities for its own activities, providing a framework for decisions where the Authority has powers of control and guiding others towards the sustainable use of the resources of the catchment.

This Final Plan represents the second phase of planning for the Itchen Catchment, drawing together information and comment from the earlier consultation stage. Sufficient descriptive text is included to support the Key Issues and Management Proposals, but the reader is referred to the earlier Itchen Catchment Consultation Report for more detailed information.

Recommendations have been framed in the context of a ten year planning horizon but will be reviewed at intervals in the light of changing circumstances.

The NRA is consulted regularly on planning matters falling within its terms of reference, both in the preparation of statutory Plans and in connection with individual applications for planning consent. Recent guidance from the Department of the Environment has strengthened the links between the NRA and the Planning Authorities, but ultimate planning control remains with them.

Catchment Management Plans are complementary to the statutory Plans of Local Authorities; by stating clearly the NRA vision it is hoped they will make a positive input to the formal planning process, which is the responsibility of the District and County Councils.

IT IS IMPORTANT THAT THIS CATCHMENT PLAN IS READ IN THE  
CONTEXT OF COUNTY AND DISTRICT PLANNING POLICIES, ESPECIALLY  
THOSE CONCERNED WITH RECREATION, CONSERVATION, WASTE  
DISPOSAL, MINERAL EXTRACTION AND COUNTRYSIDE MANAGEMENT.



## *River Itchen Catchment Management Plan*

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### **A.1 SUMMARY**

This Management Plan covers the catchment of the River Itchen and its estuary upstream of Dockhead, as shown on the accompanying map. The population of the catchment is approximately 240,000, the main towns being Southampton, Eastleigh and Winchester. Upstream of Eastleigh the catchment is rural with a combination of arable and livestock farming, whilst downstream the area is largely urban and includes heavy industry.

The River Itchen rises on the Upper Chalk of the Hampshire Downs as three spring fed tributaries; the Candover Stream, the River Alre and the Cheriton Stream (or Tichbourne) which join just west of New Alresford. From here the river flows west to Winchester and then southwards, through the outskirts of Eastleigh and Southampton to the tidal limit at Woodmill. Monks Brook, which drains a largely urban catchment, joins the estuary just downstream of the tidal limit. For much of its length the River Itchen is divided between two or more separate channels running parallel to each other, with many structures to regulate flows and levels. This situation arises from past uses of the river to provide water power for milling, to supply water meadows, and from the development of navigation.

Between Winchester and Eastleigh the former Itchen Navigation flows parallel to or coincident with the river. Whilst dating from the reign of Charles II, the navigation fell into disuse many years ago. There is no public right of navigation above the tidal limit.

The character of the River Itchen owes much to its geology: where the Chalk is exposed in the upper catchment most of the rainfall soaks directly into the ground and there are few tributaries; below Eastleigh the river flows over younger sands, silts and clays which are less permeable than the Chalk, allowing the development of surface streams such as the Monks Brook. The Chalk valleys of the Downs were formed in the Ice Age when the ground was frozen, but now that the Chalk is permeable to water many valleys are dry, or support winterbournes.

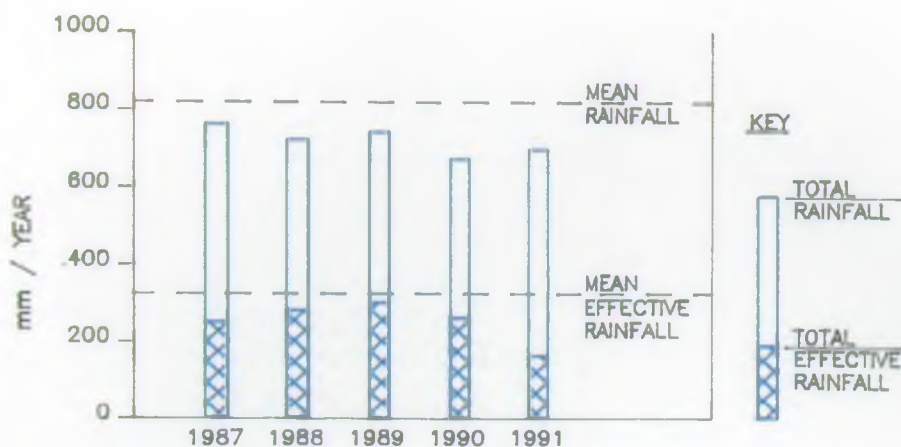
The Chalk provides the river with a stable flow of cool, clear, hard, alkaline spring water, giving an ideal environment for the fisheries which make the Itchen one of the most famous of trout streams. There is a thriving cress industry in the Alresford area, supplied by artesian springs and boreholes. Fish farming is also an important industry with four major farms in the upper catchment.

The Chalk aquifer is exploited for water supply by major abstractions between King's Worthy and Otterbourne. There are also two significant abstractions for public water supply direct from the river at Otterbourne and Gaters Mill.

Flood defence is not an important issue along the main River Itchen, although there were formerly problems on tributaries draining urban areas such as Chandlers Ford and Eastleigh. Low-lying water meadows flood regularly in winter, to the benefit of their wildlife.

When necessary, low river flows are supported by pumping groundwater from the upper catchment (the Candover and Alre Schemes) to maintain water quality in the lower reaches and to ensure that public water supplies can be maintained without damaging environmental interests.

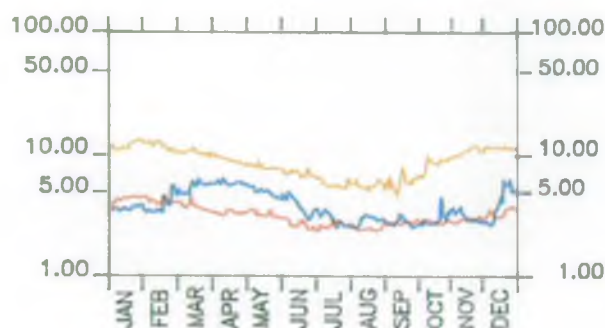




Rainfall Record from Otterbourne Station  
Actual Evaporation Data from MORECS Database

### DAILY FLOW HYDROGRAPH ( $\text{m}^3\text{s}^{-1}$ )

Max. and min. daily mean flows from 1958 to 1990 with an example yearly hydrograph (1990)



HIGHBRIDGE AND ALLBROOK

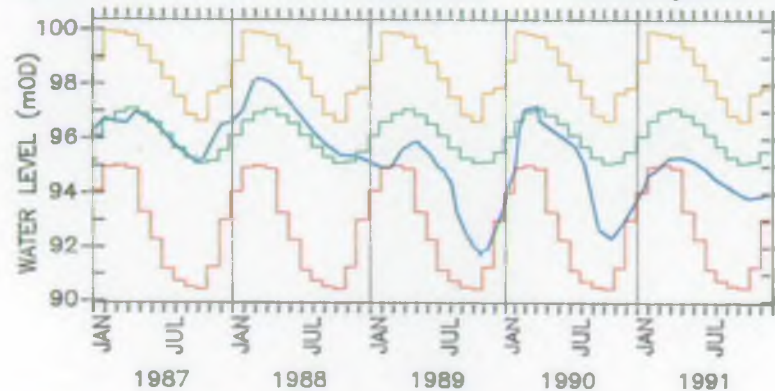
Site name : LOWER WIELD FARM

National grid reference : SU 6380 4049

Aquifer : CHALK AND UPPER GREENSAND

Well number : SU64/28

Measuring level : 158.95



Max, Min and Mean values calculated from years 1958 to 1989

## HYDROMETRIC DATA



### **A.2 HYDROLOGY AND RAINFALL**

The upstream Chalk groundwater catchment is approximately 130km<sup>2</sup> larger than the surface water catchment, extending eastwards beneath the topographic catchment of the River Wey on the far side of the Hampshire Downs ridge. The size of the Chalk groundwater catchment feeding the upper reaches of the Itchen is reflected in high base flows, particularly in the Alre which records a mean flow of 137MI/d at Drove Lane gauging station, just 4.5km below the perennial spring line. Between Alresford and the Easton gauge, a distance of only seven kilometres, the mean flow rises by over 100MI/d.

The river is gauged at Allbrook, the downstream limit of the Chalk, where the hydrograph shows a very unresponsive catchment with a high baseflow component, typical of a Chalk river. South of the gauge the river flows across variable sand and clay strata which have little influence on the catchment flow characteristics in dry weather.

Average annual rainfall across the catchment is fairly constant, varying from 800mm on the south coast to 1000mm on the northern downland. During the period from November 1988 to January 1992 the Region experienced a drought of greater than 1:50 year severity, rainfall at Otterbourne was some 90% of average but with much of this falling in the summer months the effective rainfall was only 75% of the long term mean. Allbrook river gauging station recorded the lowest flows of its thirty one year record and at Lower Wield Farm the groundwater level remained below the mean for much of the period, recording minimum levels on four separate occasions.

When necessary, river flows are supported by two augmentation schemes on the Alre and Candover tributaries in the upper catchment, which operate by pumping groundwater into the river during extreme low flow periods. The Candover scheme (which operated in 1989 and 1990) is considered to have a significant beneficial effect, maintaining river water quality and protecting the public water supply abstraction at Gaters Mill, and the Alre scheme is due to be fully licensed in 1993.

### **A.3 PUBLIC WATER SUPPLY**

The total mean daily licensed abstraction from the Itchen catchment, from both surface and groundwater sources, is given in Table 1 together with the actual volume abstracted in 1988/9. Under the Water Resources Act 1991 details of individual abstractions are confidential, but all values are included in the total. In 1988/89 the actual abstraction from all sources for public water supply was approximately 65% of the total licensed volume.

**Table 1. Mean Licensed and Actual Abstractions for Public Water Supply**

Resource Area	Volume Licensed (Ml/d)			Volume Abstracted (Ml/d)		
	Surface	GW	Total	Surface	GW	Total
<b>TOTAL CATCHMENT</b>	90.9	139.8	230.7	64.3	85.2	149.5

#### **Surface Water Sources**

There are two major surface water abstractions for public supply from the River Itchen:

**Otterbourne, Southern Water Services.** Licensed for a maximum mean daily abstraction of 45Ml/d. Significantly reduced river flows are known to result from the operation of this abstraction and two associated borehole sources.

**Gaters Mill, Portsmouth Water Co.** Licensed for a maximum mean daily abstraction of 45Ml/d.

Eastleigh sewage treatment works discharges 30Ml/d of effluent upstream of Gaters Mill intake, water which is available for re-use if treated to a suitable standard. River water quality downstream of the outfall is protected by a summer minimum residual flow of 240Ml/d at Allbrook, which was set in part to provide sufficient dilution for this discharge (higher MRF figures are set for autumn and winter). The Minimum Residual Flow at the tidal limit has been set at 86.4 Ml/d to protect estuary water quality and fish migration. However, neither Otterbourne nor the Gaters Mill abstraction is subject to this control as both operate under Licences of Right.

#### **Groundwater Sources**

There are four major licences in the Itchen catchment for groundwater abstraction for public water supply, each controlling a number of supply boreholes. Actual abstraction from groundwater sources in 1989 was approximately 61% of the licensed total.

Lasham pumping station falls within the Thames Region of the NRA, but draws on groundwater which contributes to the resources of the Itchen catchment.

### **A.2 HYDROLOGY AND RAINFALL**

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## *River Itchen Catchment Management Plan*

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#### **Groundwater Sources**

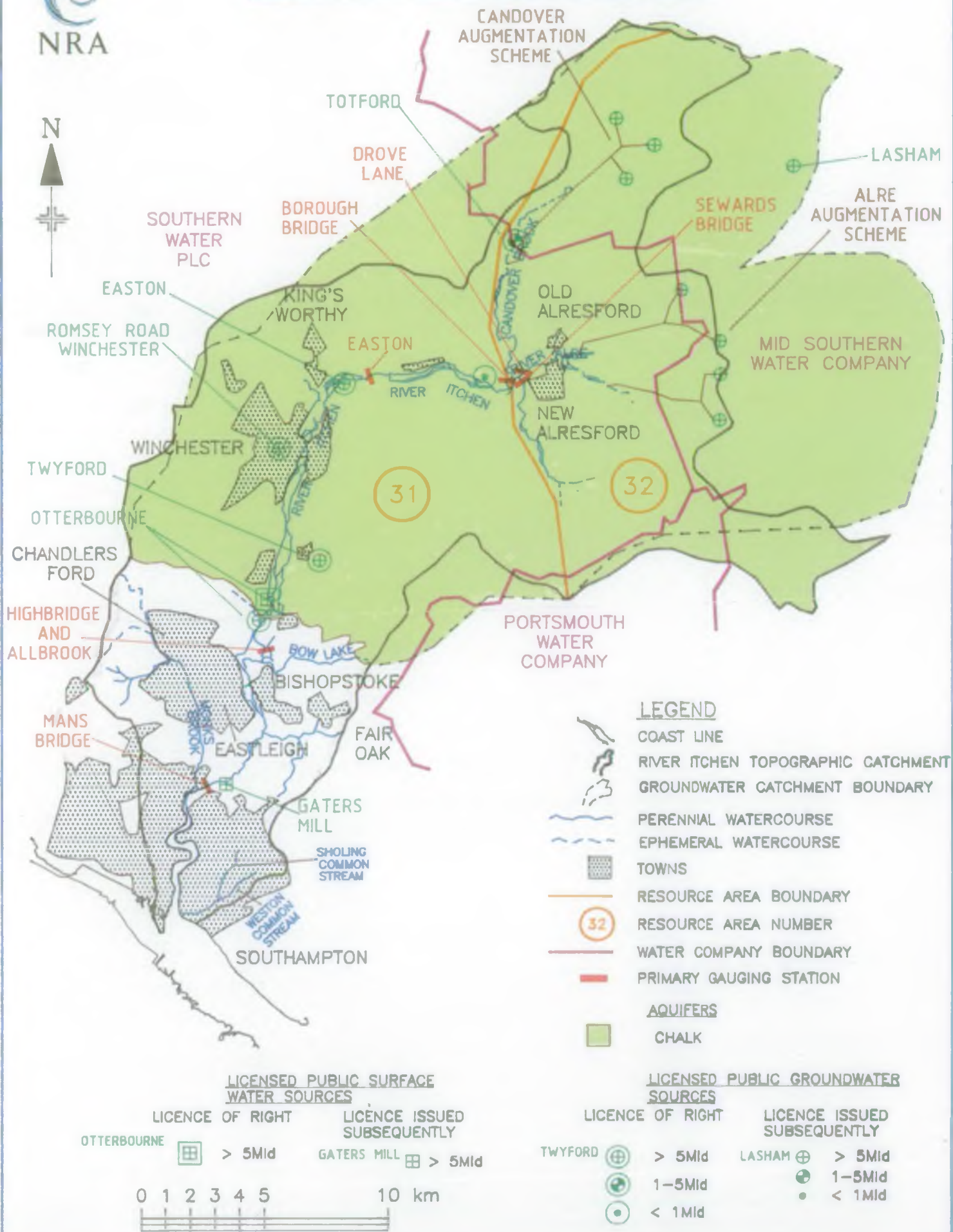
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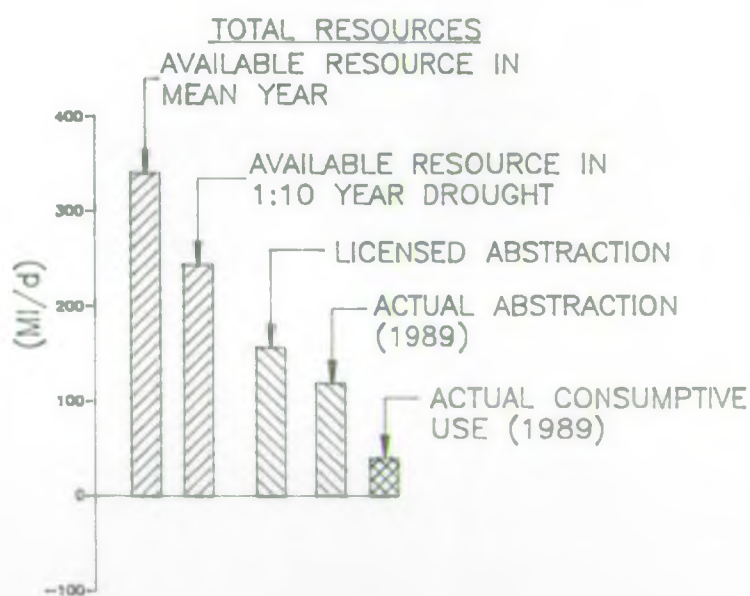
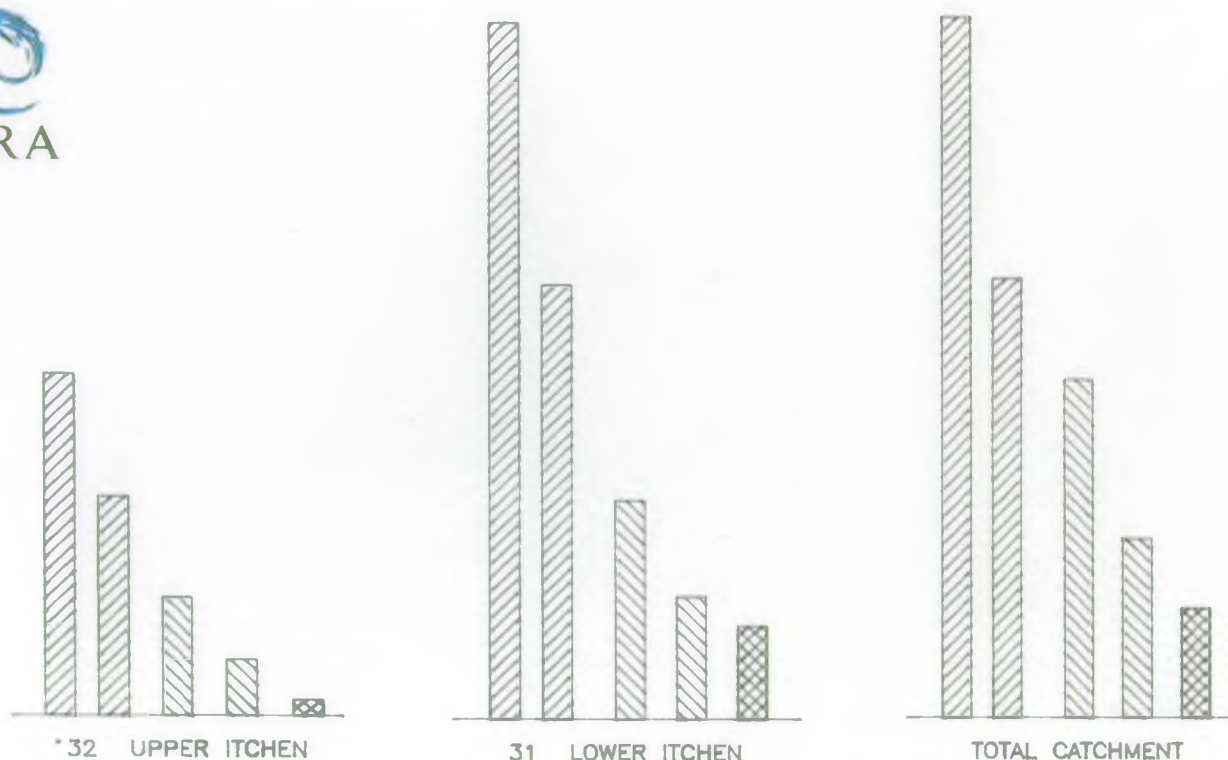
Lasham pumping station falls within the Thames Region of the NRA, but draws on groundwater which contributes to the resources of the Itchen catchment.





# PUBLIC WATER SUPPLY





Resource Area	'Licensed' Abstraction (% of Resource)		Actual Abstraction (1989) (% of Resource)		Actual Consumptive Use (1989) (% of Resource)	
	Mean Year	1:10 Year Drought	Mean Year	1:10 Year Drought	Mean Year	1:10 Year Drought
32 UPPER ITCHEN	35	54	16	25	5	8
31 LOWER ITCHEN	32	51	18	29	14	22
Overall Catchment Balance	48	77	25	41	15	25

## USE OF THE WATER RESOURCE

### **A.4 WATER SUPPLY FOR INDUSTRY AND AGRICULTURE**

The total daily licensed abstraction from surface and groundwater sources in the Itchen catchment is given in Table 2, together with the actual abstraction in a typical year (1988/9). Under the Water Resources Act 1991 details of individual abstractions are confidential, but all values are included in the total.

By far the largest use is for water cress farming with a licensed abstraction of 110 MI/d, over 90% of the total. Cress growing is essentially a non-consumptive use of the resource as the outflow is fed into the adjacent river or stream. However, the groundwater abstractions are large and may locally reduce river flows in the vicinity of cress farms.

There are eight industrial abstractions in the catchment, two of which are greater than 2 MI/d. Three are non-consumptive for gravel washing and cooling purposes.

There are four fish farms in the upper Itchen catchment, the largest producing several hundred tonnes of trout per year. These also require a licence to abstract water from the river.

**Table 2 - Mean Licensed and Actual Abstractions for Industry & Agriculture**

Resource Area	Volume Licensed (MI/d)			Volume Abstracted (MI/d)		
	Surface	GW	Total	Surface	GW	Total
TOTAL CATCHMENT	4.1	121.2	125.3	2.3	52.1	54.4

### **A.5 USE OF THE WATER RESOURCE**

The water resources of the catchment are heavily committed to abstraction, but much of this water is used for cress growing or fish farming and is returned to the river close to the point of abstraction. Licensed consumptive use is 127 MI/d, representing 23% of the resource in an average year (559 MI/d) and 52% of that in a 1 in 10 year drought (244 MI/d). Actual abstraction for all purposes accounts for 29% of the resource in an average year and 66% of that in a 1 in 10 year drought.

It is estimated that by the year 2010 demand on the water resources of the catchment will increase by 20% if current trends are maintained, even if action is taken to reduce per capita consumption. Upstream of Gaters Mill the water resources of the catchment which can be guaranteed in a year of average flow are already fully committed, although there may be some potential for seasonal increases. However, an additional resource of 70 MI/d to 90 MI/d may be available at the tidal limit if river flows can be supported at times of drought.

The Candover and Alre augmentation schemes, owned and operated by the NRA, are an essential component of resource management in the Itchen catchment.

### **A.6 WATER QUALITY**

Whereas continental European practice is to apply uniform emission standards to all effluents, river water quality in the United Kingdom is managed by matching effluent consent conditions to the circumstances of individual discharges. Environmental Quality Objectives (EQOs) are determined for receiving waters and quantified as Environmental Quality Standards (EQSs), allowing permitted pollution loads and consent conditions to be calculated.

EQSs and consent standards for toxic or non-degradable substances are very strict and in practice there is little difference between the two control philosophies, but in the case of degradable wastes the British approach protects the environment whilst allowing rational decisions to be taken about the allocation of investment to treatment plant.

By defining the water quality requirements of different water uses (e.g. agriculture, water supply, angling etc.) it is possible to set use-based EQOs and to classify individual river reaches according to the functions they serve. However, this approach lacks the means for making absolute comparisons of water quality - from year to year or between different water courses. The National Water Council (NWC) classification introduced in 1979 enabled such comparisons to be made, but used only a limited number of Classes defined in terms of Biochemical Oxygen Demand (BOD), Dissolved Oxygen and Ammonia. This system was used in the National River Quality Surveys of 1980 and 1985, and following the 1990 Survey was refined by the introduction of a biological component which corrects distortions by reference to the biology of the rivers concerned.

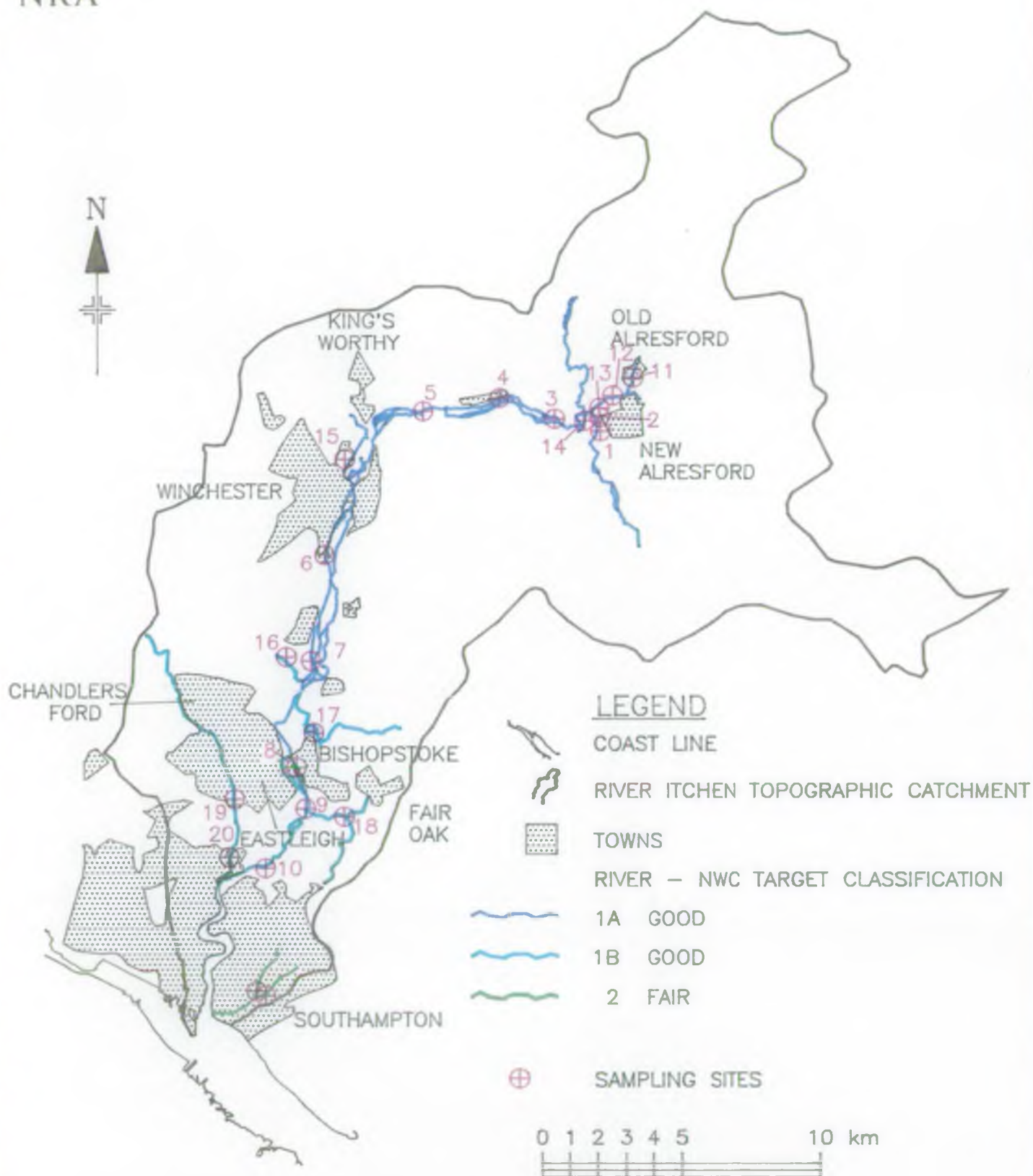
The NRA is developing a more comprehensive use-related classification system of statutory water quality objectives, but the NWC scheme will continue until this is introduced. The new scheme will classify river water quality according to the following criteria:-

- 1) Compliance with the EQSs relating to identified use-related EQOs.
- 2) Compliance with the relevant NRA target class.
- 3) Compliance with relevant EC Directives.

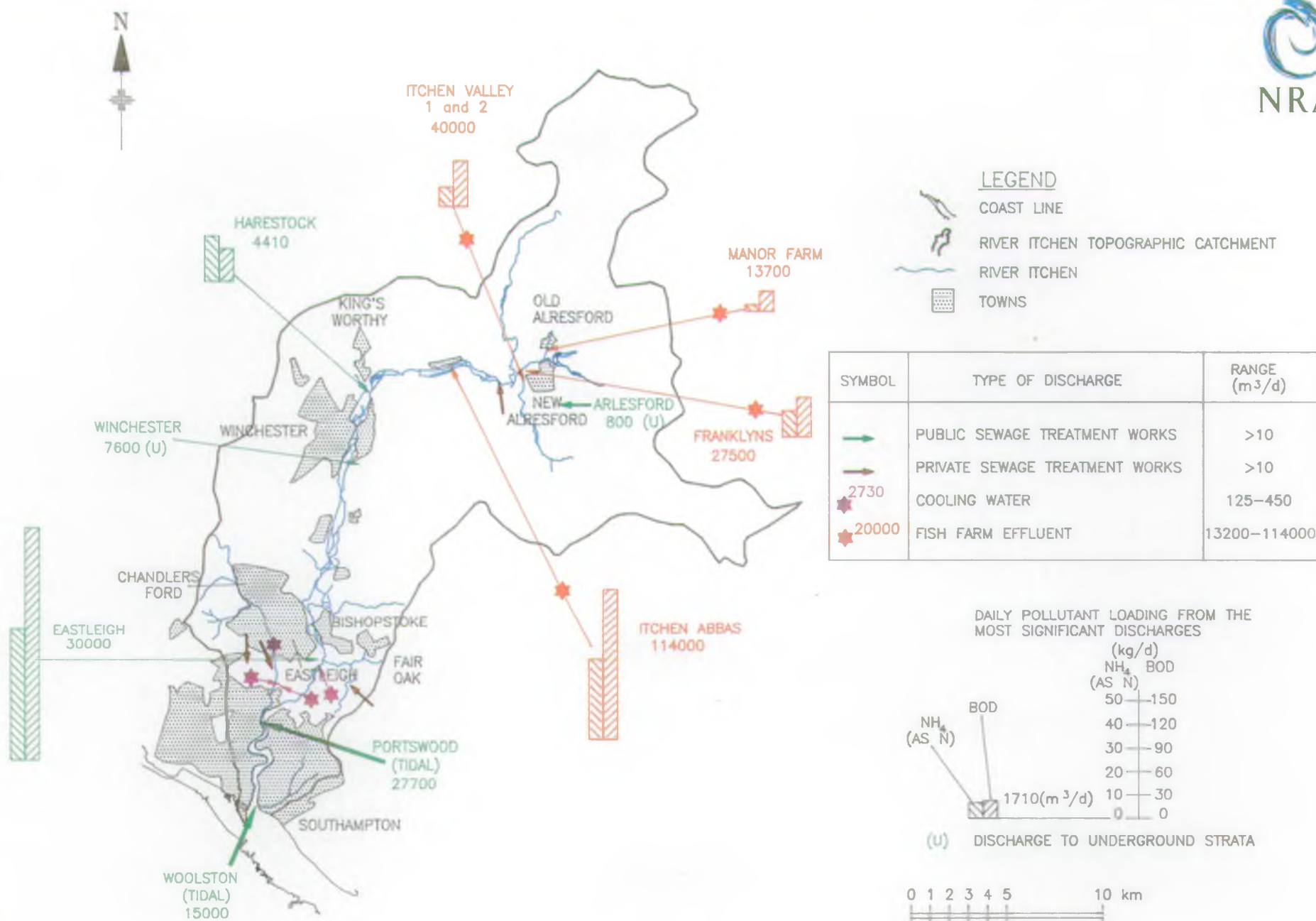
The map shows the existing NWC target designations within the Itchen catchment. Compliance is assessed using the results of a comprehensive sampling programme.

A scheme for the introduction of statutory water quality objectives is under consideration by the Department of the Environment, setting enforceable limits for individual river reaches. This will be applied progressively to catchments for which Management Plans have been prepared and will take note of advice received from the NRA.





## NWC TARGET CLASSIFICATION



## EFFLUENT DISPOSAL

## *River Itchen Catchment Management Plan*

### **A.7 EFFLUENT DISPOSAL**

The catchment contains only a few sewage treatment plants, which range in size from 30 MI/day (Eastleigh) to less than 0.01 MI/day at the smaller private installations. A list of the major discharges is given in Table 3 and their relative Biochemical Oxygen Demand (BOD) and Total Ammonia loads are shown on the map. Winchester and Alresford sewage treatment works discharge to soakaways, conserving the water resource and providing a further 'natural' stage of treatment during percolation through the unsaturated Chalk. This has proved to be very effective and no trace of the effluent has been detected in the River Itchen itself.

There are no major discharges of process effluent anywhere in the catchment, although several cooling water discharges are licensed.

Four fish farms discharge to the catchment.

**Table 3. Consented Effluent Discharges**

<b>Discharge</b>	<b>Consented Vol (MI/d)</b>	<b>Average Daily BOD</b>	<b>Load (kg/d) Ammonia</b>	<b>Remarks</b>
<u>Sewage Works</u>				
Eastleigh	30.0	294	57	
Portsmouth	27.7	188	463	To Estuary
Woolston	15.0	207	378	To Estuary
Winchester	7.6	**		To Soakaway
Harestock	4.4	43	18	
Alresford	0.8	**		To Soakaway
<u>Fish Farms</u>				
Itchen Abbas	114.0	194	34	
Itchen Valley	40.0	56	8	
Franklyns	63.7	113	25	
Manor Farm FF	13.7	25	3	
<u>All Others (Total)</u>	20.6	50	N/A	

### **A.8 INTERMITTENT AND DIFFUSE POLLUTION**

Intermittent pollution incidents in the Itchen catchment are predominantly centred around the urban areas of Winchester, Eastleigh and Southampton. The Monks Brook in particular suffers from pollution events with oil spillage being a primary concern.

As most sewerage systems accept both foul sewage and rainfall from paved surfaces stormwater overflows are required to cope with extreme flows. These are consented by the NRA in terms of their polluting load and frequency of operation and the larger treatment works responsible for the greater part (by volume) of these discharges are shown on the map.

There are some 30 known landfill sites within the Itchen catchment, many of which have now been closed. Few problems have been reported, but information is limited and increased monitoring may be required in future.

## **A.9 FLOOD DEFENCE AND LAND DRAINAGE**

Flood defence is not a strategically important issue in the Itchen catchment, although there were formerly problems on tributaries draining urban areas such as Chandlers Ford and Eastleigh. Most of the sluices controlling flows between channels are privately owned, so cooperation between the NRA and riparian owners is essential for effective river management. This is particularly the case at agreed weed-cutting times, when the Authority operates a boom to remove floating cut weed which might otherwise block sluices. Similarly, a cooperative maintenance programme is needed to counter low-flow problems and the saturation of low-lying land caused by leaks through defective sluices or damaged banks on high-level carriers.



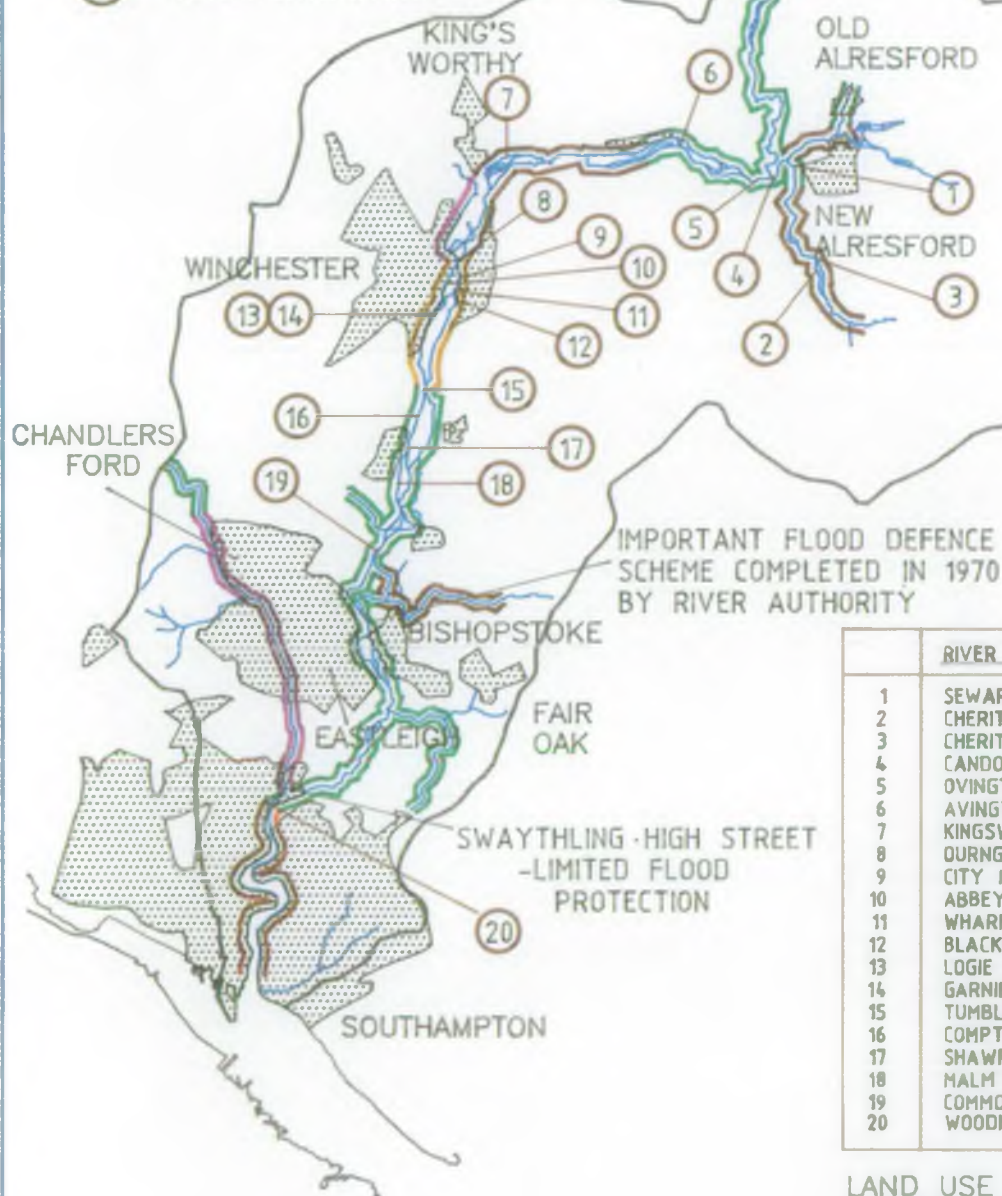


NRA



## LEGEND

- COAST LINE
- RIVER ITCHEN TOPOGRAPHIC CATCHMENT
- RIVER ITCHEN
- TOWNS
- RIVER STRUCTURE



	RIVER STRUCTURE
1	SEWARDS BRIDGE GAUGE
2	CHERITON MILL
3	CHERITON MILL WEIR
4	CANDOVER STREAM SLUICE
5	OVINGTON WEIR
6	AVINGTON SLUICE
7	KINGSWORTHY SLUICES
8	OURNGATE MILL
9	CITY MILL
10	ABBAY MILL
11	WHARF MILL
12	BLACKBRIDGE SLUICE
13	LOGIE SLUICE
14	GARNIER ROAD SLUICE
15	TUMBLING BAY HATCH SLUICE
16	COMPTON LOCK WEIR
17	SHAWFORD SINGLE GATES WEIR
18	MALM LOCKS WEIR
19	COMMON HATCH SLUICE
20	WOODMILL SLUICES

## LAND USE ALONG MAIN RIVER SECTIONS - FLOOD PROTECTION CATEGORY

- A
- B
- C
- D
- E

0 1 2 3 4 5 10 km

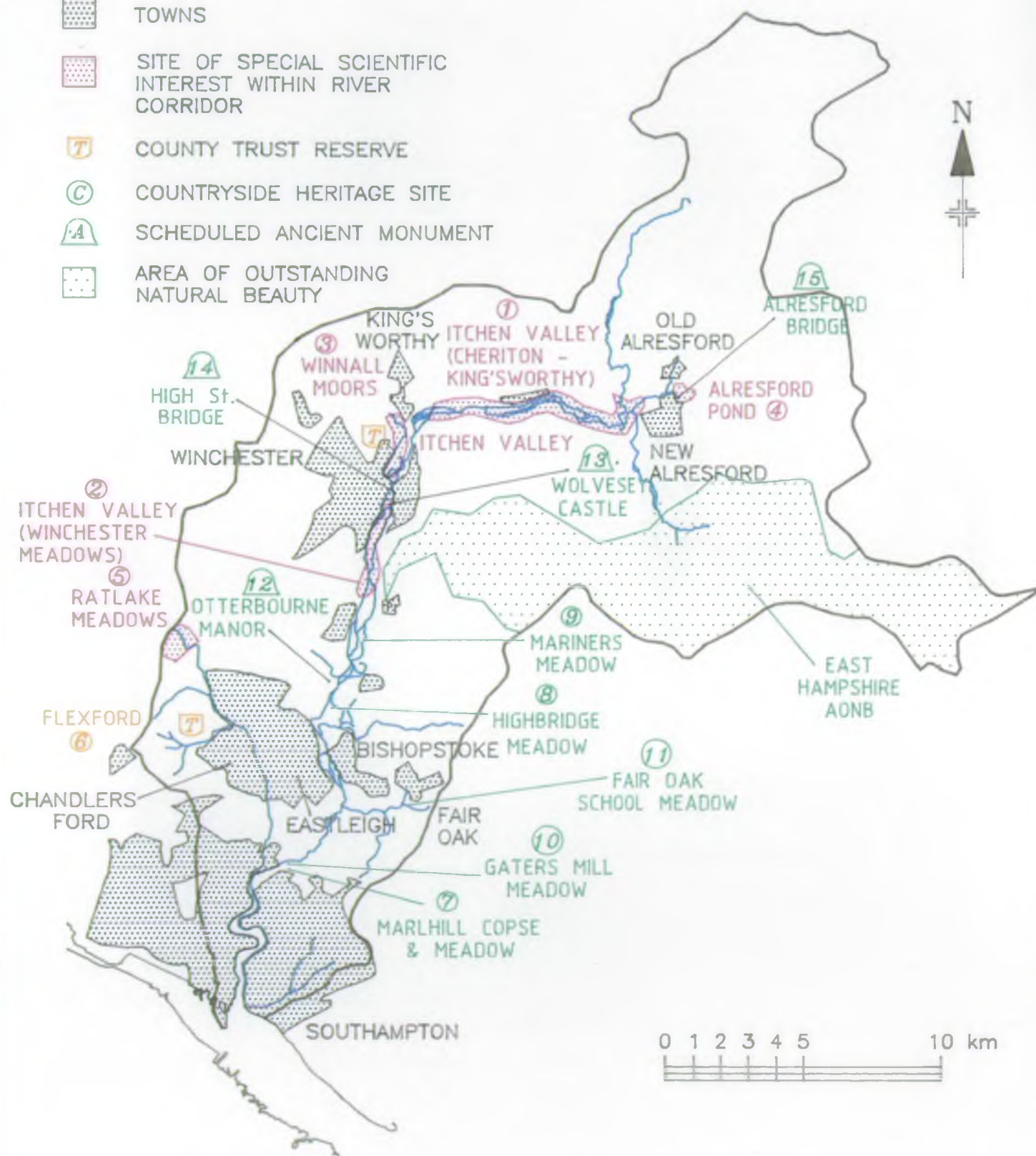
# FLOOD DEFENCE AND LAND DRAINAGE



NRA

## LEGEND

-  COAST LINE
-  RIVER ITCHEN TOPOGRAPHIC CATCHMENT
-  RIVER ITCHEN
-  TOWNS
-  SITE OF SPECIAL SCIENTIFIC INTEREST WITHIN RIVER CORRIDOR
-  COUNTY TRUST RESERVE
-  COUNTRYSIDE HERITAGE SITE
-  SCHEDULED ANCIENT MONUMENT
-  AREA OF OUTSTANDING NATURAL BEAUTY



## CONSERVATION

### **A.10      LANDSCAPE AND CONSERVATION**

The high conservation value of the Itchen catchment is demonstrated by the designation of many reaches as Sites of Special Scientific Interest (SSSIs), and the proposal of English Nature to extend this designation to 33 Km of the main river channel. Habitats include old water meadow, unimproved grassland, fen, carr, wet woodland and the river itself. The river's flora and fauna are diverse and otters still occur in parts of the catchment; estuary mud flats provide an important feeding area for sea birds and waders and have been recognised by Southampton City Council for their conservation value.

Land use in the higher reaches of the catchment is mixed, with a tendency to permanent grassland in the valley and arable farming on higher land. Riverside parkland is a feature, and in the urban areas of Southampton, Eastleigh and Winchester a broad corridor of open land has been retained along most of the river's length introducing elements of rural landscape into an urban setting. Watercourses such as the Monks Brook and Weston Common Stream are managed to provide a similar landscape feature within the city.

Three bridges are scheduled as Ancient Monuments; important heritage sites are shown on the map.

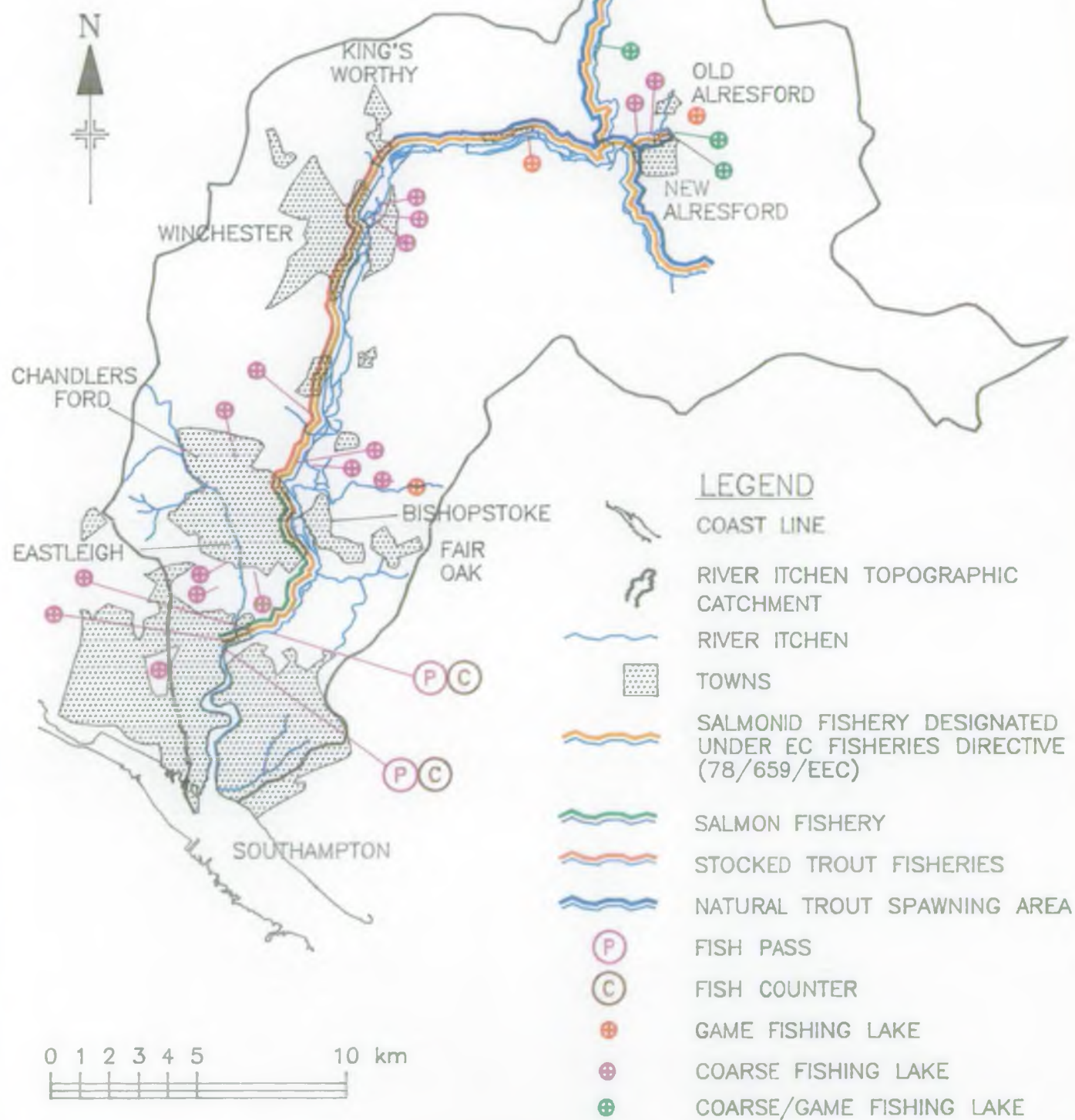
### **A.11 FISHERIES**

The Itchen is renowned for its wild brown trout fisheries in the upper reaches and for the stocked trout fisheries downstream of Kings Worthy. The river below Bishopstoke supports a salmon rod fishery, with ancient netting rights at Woodmill Pool at the tidal limit. The whole of the non-tidal river has been designated as a Salmonid Fishery under the EC Freshwater Fisheries Directive, but despite high water quality the fisheries face a number of problems:-

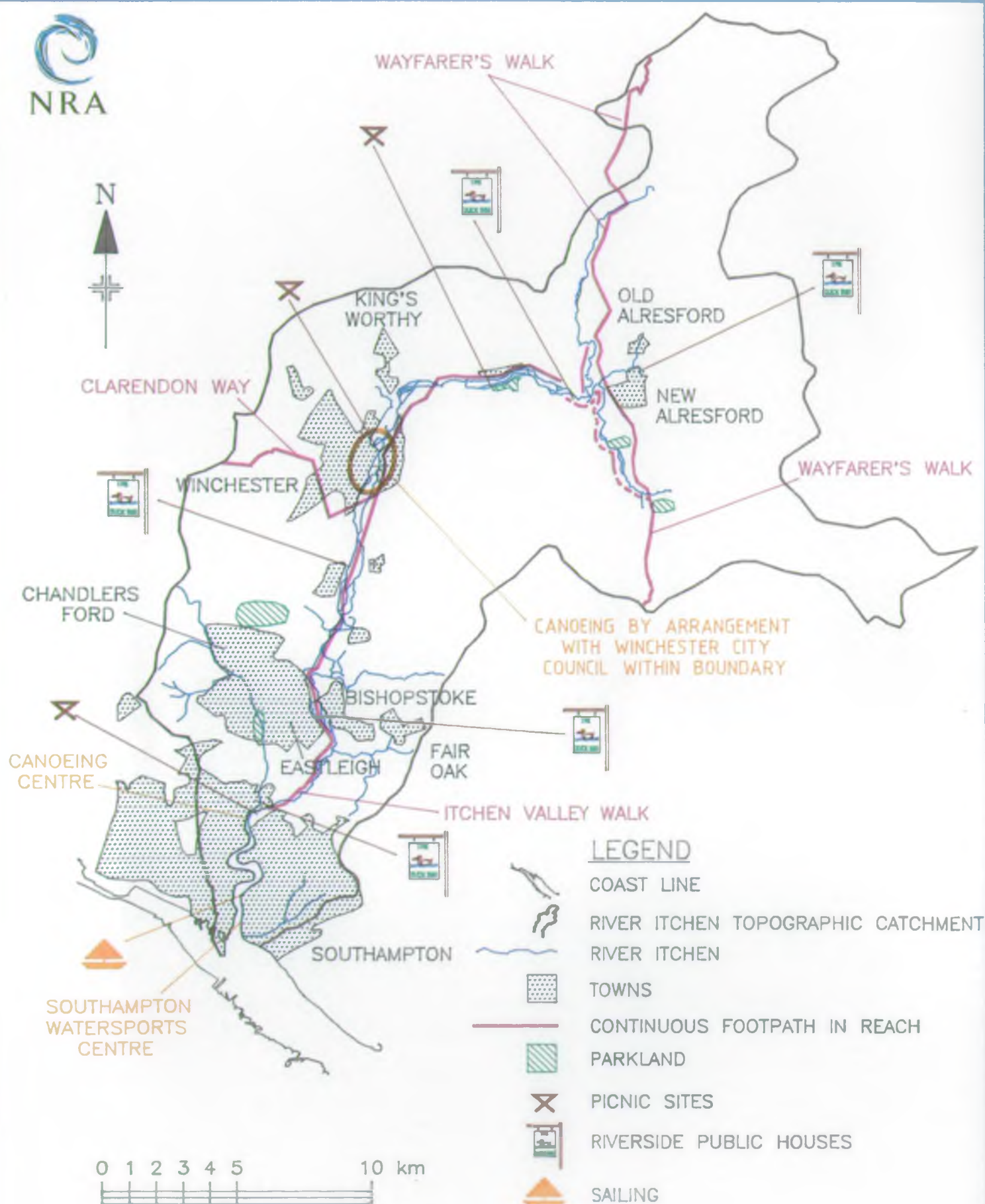
- Low flows and water levels in the extreme drought of 1988-92 impacted heavily on fisheries.
- Escapes of small rainbow trout from fish farms in the upper valley are considered to be a problem, competing with native Brown Trout and sometimes dominating anglers' catches.
- The number of returning adult salmon has declined drastically in recent years and up to 60% of the run is caught in the river.
- Production of salmon smolts (migrating juveniles) is poor, heavy mortality of eggs within the redds (spawning sites) has been recorded and much of the river's spawning gravel is badly silted. In contrast the survival and growth of older fry are good, with stocked fry growing as well as native fish, suggesting that water quality, territory and food supplies are not limiting factors for salmon production.
- Migrating salmon are impeded by obstructions in the lower reaches.
- Reduced emphasis on autumn weed cutting has altered the pattern of sediment movement in the river, contributing to turbidity problems in early summer.
- Changes in river management practices have resulted in some channels growing wider, leading to siltation and sluggish flows.

Whilst coarse fishing on the river is restricted to its lower reaches, many lakes, ponds and disused gravel pits are managed as still-water coarse fisheries. Restocking and fish movements are regulated by the NRA which operates a policy of refusing the introduction of wild fish from outside the catchment.





## FISHERIES



## RECREATION AND AMENITY

## **A.12 RECREATION AND AMENITY**

The Itchen valley is an area of high landscape value, including part of the East Hampshire Area of Outstanding Natural Beauty. Footpaths close to the River Itchen, Candover Stream, Cheriton Stream and River Alre give reasonable access to the river corridor, and the catchment is crossed by long distance footpaths such as the Itchen Valley Walk, Clarendon Way and Wayfarers Walk. The Pilgrims Way begins in Winchester, follows the Itchen and Alre to New Alresford and crosses into the Wey catchment en route to Canterbury.

The Itchen flows through parkland and public gardens in a number of areas including Hinton Ampner, Tichbourne, Avington, Winchester and Swaythling. The river itself is a high quality amenity with clear water and an attractive setting. However, turbid waters and the presence of rafts of cut weed can temporarily reduce this amenity value.

The Itchen estuary below Woodmill is a popular base for sailing in Southampton Water, the Solent and wider afield. There are marinas and boatyards downstream of Northam Bridge, with Ocean Village and Shamrock Quay in the old docks at Southampton. Woodmill, at the head of the tide, has been developed as an educational canoeing centre by Southampton City Council, who also run a water sports training centre at Itchen Bridge. Shipbuilding is an important industry in the lower estuary.

There is no public right of navigation upstream of Woodmill.

## **A.13 INTERACTIONS WITH PLANNING AUTHORITIES**

The NRA is not a Planning Authority, but has powers under the Land Drainage Act 1991 and the Water Resources Act 1991 to prevent flooding and to control development in the flood plains of Main River. In addition to its own byelaw powers the NRA has the right to be consulted by Planning Authorities on development proposals which may affect its interests.

### **Housing and Employment**

The Itchen catchment is situated wholly in the County of Hampshire and predominantly in the Districts of Winchester, Eastleigh and Southampton, with small areas within the Districts of Basingstoke and Deane, East Hampshire and Test Valley. Based on Hampshire County Council forecasts and preliminary figures from the 1991 census, the resident population in the catchment is approximately 240,000. This has increased by about 5% since 1981 and is projected to increase by about 2% over the next ten years. The main towns are Winchester (population of 30,000), Eastleigh (55,000) and Southampton (110,000 in the catchment).

### **Waste Disposal**

In the case of the Itchen catchment the Waste Regulation Authority is Hampshire County Council, whose Waste Management Plan of 1991 expressed concern at the lack of environmentally acceptable landfill sites, and stated the intention to reduce the County's output of waste below the current 3 million tonnes per year. A further area of concern is the need to upgrade or replace ageing household waste incinerators. Other methods of waste disposal such as waste-to-energy plants or rail transfer outside the county are considered suitable alternatives. However, the protection of water resources will remain of paramount importance in deciding applications for waste disposal, and full consultation with the NRA is essential.

### **Minerals**

Sites where minerals can be worked in an environmentally acceptable manner are becoming scarce, but Hampshire County Council maintains its stance that permission for mineral exploration will not be permitted in SSSIs, Nature Reserves, Countryside Heritage Sites or other areas which are of ecological, landscape or historical importance.

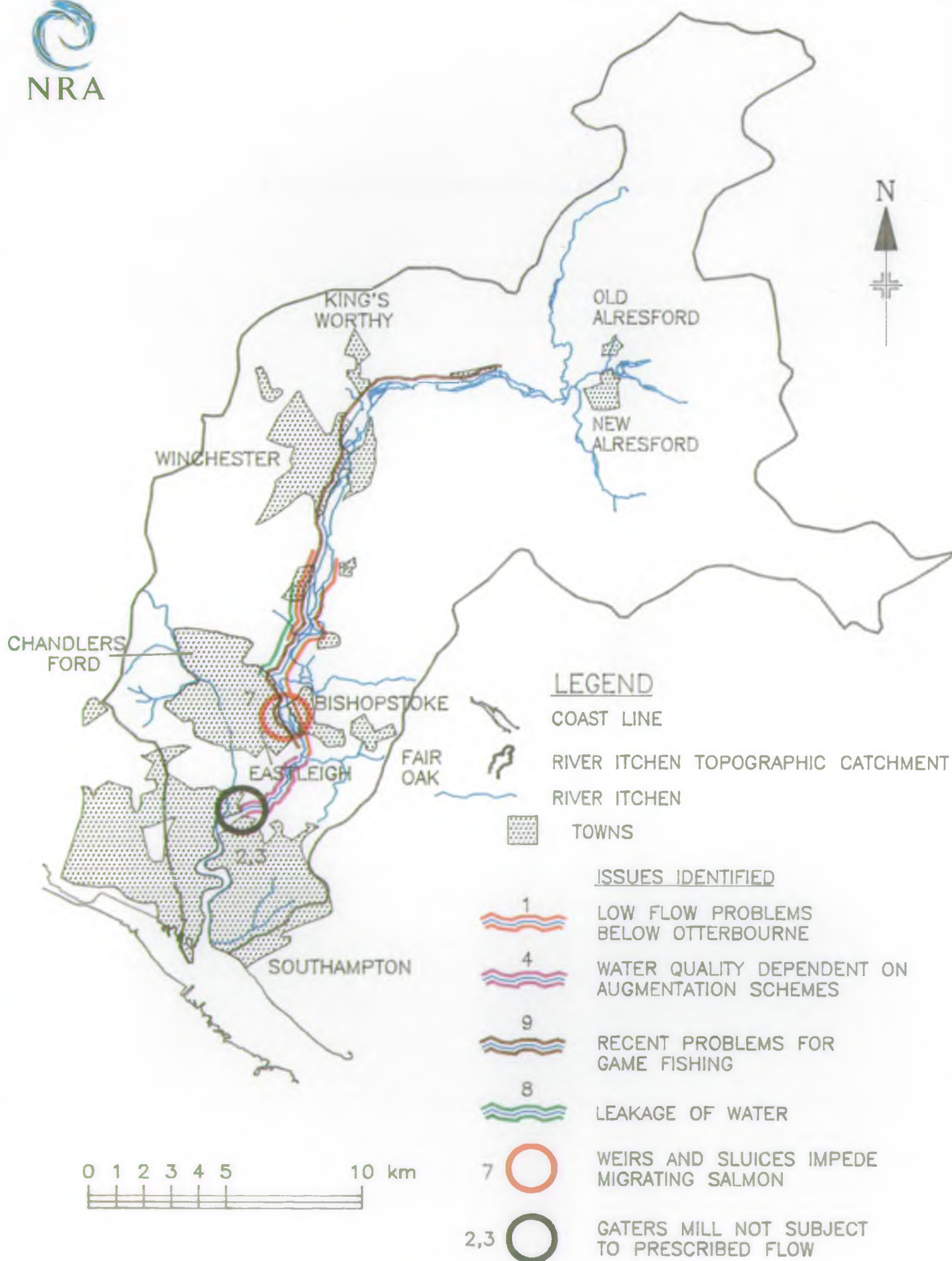
The County Council is preparing a detailed Minerals and Waste Local Plan to cover the period up to 2001.



**SECTION B : KEY ISSUES AND MANAGEMENT PROPOSALS**



NRA



## CATCHMENT ISSUES



## *River Itchen Catchment Management Plan*

### **B. KEY ISSUES AND MANAGEMENT PROPOSALS**

The Consultation Report and public consultation which preceded this Catchment Management Plan identified a number of issues in the Itchen catchment. Many of these are being addressed by the NRA in the normal course of business, although the timing of solutions is dependent on the availability of funds and manpower.

Key issues which apply specifically to the Itchen Catchment are discussed in this Section along with the specific management action which the NRA considers is needed to address them. Most of the Management Proposals lie within the competence of the NRA, but many solutions require collaboration or independent action by others with an interest in the catchment. Some are mutually contradictory (eg. reducing channel capacity to improve low flow velocities; maintaining the flood capacity of the river) and priorities will have to be tailored to local circumstances. An Action Plan with suggested timings is included in Section C.

Issue 1	Major abstractions between Otterbourne and Twyford, which are not subject to prescribed flow restrictions, significantly diminish river flows downstream of Otterbourne in summer months.
Issue 2	A Minimum Residual Flow has been proposed for the outflow of the Itchen to its estuary, but the abstraction at Gaters Mill is not subject to a prescribed flow condition as it operates under a Licence of Right.
Issue 3	An opportunity exists to develop the Itchen resources by an additional abstraction from the tidal limit of 70Ml/d - 90Ml/d, subject to prescribed flow conditions.
Issue 4	There may be insufficient dilution to maintain river water quality downstream of Eastleigh STW at times of low river flow.
Issue 5	The unconfined Chalk aquifer is vulnerable to pollution.
Issue 6	The Itchen salmon population is in decline with poor recruitment although stocked fry grow and survive well. High mortality of eggs appears to be associated with siltation of the spawning gravels.
Issue 7	Migrating adult salmon are impeded by obstructions, particularly in the Bishopstoke area.
Issue 8	Leakage of river water from high-level reaches of the Navigation Carrier reduces flow, encourages siltation and weed growth, and diminishes the amenity value of the watercourse.
Issue 9	Slow water velocity, shallow depth, localised turbidity and lack of the preferred species of weed cause problems to anglers when summer flows are low.
Issue 10	Conservation issues.

**ISSUE 1**

**Major Abstractions between Otterbourne and Twyford, which are not subject to prescribed flow restrictions, significantly diminish river flows downstream of Otterbourne in summer months**

**MANAGEMENT PROPOSALS**

- \* As a long-term objective the NRA seeks relocation of the Otterbourne river abstraction to a point near the tidal limit . In the meantime, every opportunity should be taken to use this water to meet demand in the upper catchment, with effluents discharged locally to conserve the resource and enhance river flows. Abstraction to serve the lower catchment, for export from the catchment and to meet new demand, should be from a point near the tidal limit. **(NRA, SWS, PWC)**
- \* Maintain river flow by operating a presumption against licensing further consumptive abstraction. **(NRA)**
- \* Review Licences of Right, with a view to imposing prescribed flow conditions where necessary. **(NRA)**
- \* Introduce measures to manage demand for water and reduce leakage to agreed target levels, so as to limit the volume abstracted and exported from the catchment. **(SWS, PWC, NRA)**
- \* Ensure that effluents are treated to a high standard and discharged locally, conserving the water resource of the catchment. **(SWS, NRA)**
- \* License the Alre groundwater scheme and operate this and the Candover Scheme to support river flows at critical periods. **(NRA)**

Abbreviations

The following are used in the Management Proposals and refer to those bodies that are relevant to the particular proposals.

ADAS	Agricultural Development Advisory Service
BR	British Rail
CC	Countryside Commission
DoE	Department of the Environment
EN	English Nature
IDB	Internal Drainage Board
LA	Local Authority
NRA	National Rivers Authority
MAFF	Ministry of Agriculture, Fisheries and Food
SWS	Southern Water Services
T&I	Test and Itchen Fishing Association
PWC	Portsmouth Water Company

**ISSUE 2**

**A Minimum Residual Flow has been proposed for the outflow of the Itchen to its estuary, but the abstraction at Gaters Mill is not subject to a prescribed flow condition as it operates under a Licence of Right.**

**MANAGEMENT PROPOSALS**

- \* Review Licences of Right, with a view to imposing prescribed flow conditions where necessary. (NRA)
- \* Introduce measures to manage demand for water and reduce leakage to agreed target levels, so as to limit the volume abstracted from the catchment. (PWC, NRA)

**ISSUE 3**

**An opportunity exists to develop the Itchen resource by an additional abstraction from the tidal limit of 70 Ml/d - 90 Ml/d, subject to prescribed flow conditions.**

**MANAGEMENT PROPOSALS**

- \* Investigate the options in detail. (NRA, SWS, PWC)

**ISSUE 4**

**There may be insufficient dilution to maintain river water quality downstream of Eastleigh STW at times of low river flow.**

**MANAGEMENT PROPOSALS**

- \* Ensure that Eastleigh STW effluent is treated to a high standard (subject to benefit/cost considerations) to minimise its impact on the river, recognising the need to retain the effluent in the river as part of the freshwater resource. (SWS, NRA)
- \* Investigate tertiary treatment and flow-balancing to improve effluent quality and even-out the load on the river. (SWS, NRA)
- \* Operate the Candover and Alre groundwater augmentation schemes to maintain effluent dilution at times of low river flow. (NRA)

**ISSUE 5**

**The unconfined Chalk aquifer is vulnerable to pollution.**

**MANAGEMENT PROPOSALS**

- \* Enforce the NRA Groundwater Protection Policy. (NRA, Planners)
- \* Raise public awareness of the risks posed by pollution and groundwater contamination. (NRA)

**ISSUE 6**

**The Itchen salmon population is in decline with poor recruitment, although stocked fry grow and survive well. High mortality of eggs appears to be associated with siltation of the spawning gravels.**

**MANAGEMENT PROPOSALS**

- \* Manage gravel beds to improve spawning success. (NRA, Owners)
- \* Support the natural population by stocking with suitable juvenile salmon (subject to demonstration of the effectiveness of this action). (NRA, Owners)
- \* Continue to investigate the dynamics of the salmon population. (NRA)

**ISSUE 7**

**Migrating adult salmon are impeded by obstructions, particularly in the Bishopstoke area.**

**MANAGEMENT PROPOSALS**

- \* Modify obstructions or provide fish passes where necessary. (NRA, Owners)

**ISSUE 8**

**Leakage of river water from high-level reaches of the Navigation Carrier reduces flow, encourages siltation and weed growth, and diminishes the amenity value of the watercourse.**

**MANAGEMENT PROPOSALS**

- \* Improve maintenance of river banks and control structures. (NRA, Owners)

**ISSUE 9**

**Slow water velocity, shallow depth, localised turbidity and lack of the preferred species of weed cause problems to anglers when summer flows are low.**

**MANAGEMENT PROPOSALS**

- \* Maintain river flow by operating a presumption against licensing consumptive abstraction. **(NRA)**
- \* Ensure that future demand for water is supplied from the bottom of the catchment. **(NRA, SWS, PWC)**
- \* Ensure that effluents are treated locally and returned to the catchment near the point of use. **(NRA)**
- \* Operate Candover and Alre augmentation schemes to support low river flows. **(NRA)**
- \* Agree a formula for the division of flow between carriers at times of drought, and consider closing some carriers when river flows are critically low. **(Owners)**
- \* Seek to ameliorate the localised adverse effects on river flow and ecology resulting from significant agricultural abstractions and discharges. **(NRA, Abstractors)**
- \* Restore over-widened or over-deepened channels to their preferred dimensions, having regard to the requirements of flood defence, land drainage and nature conservation. **(Owners)**
- \* Produce guidelines for the management of Chalk streams. **(NRA)**



**ISSUE 10**  
**Conservation Issues**

**MANAGEMENT PROPOSALS**

- \* Conserve the river as a green corridor through the landscape, to provide a visual feature, a valuable habitat and a migration route for wildlife. **(Owners, LAs)**
- \* Maintain an uncultivated buffer zone between the river and surrounding land to reduce bank erosion, siltation and inputs of nutrients and agricultural chemicals. Agricultural and environmental grant schemes should be structured to encourage this objective. **(Owners, MAFF, EN, CC, LAs, NRA)**
- \* Maintain the high water quality of the river and estuary. **(NRA)**
- \* Conserve and enhance wildlife refuges in addition to designated sites, such as urban streams, wetlands, bankside vegetation and estuarine mudflats. **(Owners, LAs, NRA)**
- \* Conduct river management operations such as flood defence works, weed cutting, fisheries management and the manipulation of fish stocks in a way which enhances landscape and wildlife conservation, and protects monuments and historic sites. **(Owners, NRA, Fisheries Interests)**
- \* Control the access of livestock to the river bank to prevent excessive trampling and erosion. **(Owners, NRA)**
- \* Ensure that fish farms prevent mass escapes of fish, which can disrupt the river ecology. **(Owners)**
- \* Cut weeds according to an agreed timetable, which should include an autumn cut when conditions permit. **(Owners, NRA)**
- \* Restore worked-out mineral and waste disposal sites to an acceptable environmental standard. **(Owners, LAs)**
- \* Take account in long-term planning of the possible effects of climate change. **(All)**

# **RIVER ITCHEN CATCHMENT PLAN. ACTION PROGRAMME**

Management Task	93 94 95 96 97 Future	Action by	Estimated Cost £'000
<u>Issue 1. Reduced low flows downstream of Otterbourne</u>  Reassign Otterbourne/Twyford Resource. Operate presumption against issuing licences for new consumptive abstractions. Review licences of right, introduce controls where needed. Introduce demand management for water supply. Reduce water distribution leakage to target levels. Treat effluents to high standard and discharge locally. License Alre augmentation scheme.	<div>Continuing activity</div> <div>Continuing activity</div> <div>Continuing activity</div>	SWS, NRA NRA  NRA, SWS, PWC SWS, PWC SWS, PWC SWS, Dischargers NRA	High Cost
<u>Issue 2. Abstractions not subject to Prescribed Flow</u>  Review abstraction licences.	<div></div>	NRA	
<u>Issue 3. Develop new water resource at tidal limit</u>  Investigate the options in detail.	<div></div>	NRA, SWS, PWC	
<u>Issue 4. Potential lack to dilution for Eastleigh STW effluent</u>  Continue to treat effluent to a very high standard. Investigate use of tertiary treatment and flow balancing (eg lagoons, reedbeds). Operate river augmentation schemes to support low flows.	<div>Continuing activity</div> <div>Continuing activity</div>	SWS SWS, NRA  NRA	

# **RIVER ITCHEN CATCHMENT PLAN. ACTION PROGRAMME**

Management Task	93 94 95 96 97 Future	Action by	Estimated Cost £'000
<u>Issue 5. Chalk aquifer prone to pollution</u>  Enforce NRA groundwater protection policy. Educate public about pollution risks.	Continuing activity Continuing activity	NRA, Planning auths NRA	
<u>Issue 6. Itchen salmon population in decline</u>  Improve spawning beds in river channels. Restock with genetically suitable juvenile fish. Continue investigation of population dynamics.	Continuing activity Subject to cost/benefit ■■■■■	NRA, Owners Owners, NRA NRA	
<u>Issue 7. Salmon migration impeded by obstructions</u>  Modify obstructions where possible. Build fish passes where needed.	Continuing activity ■■■■■	Owners NRA	
<u>Issue 8. Leakage of water from Navigation Carrier</u>  Improve maintenance of banks and control structures	Continuing activity	NRA, Owners	
<u>Issue 9. Seasonal flow, turbidity, siltation problems etc</u>  Agree formula for division of flow between carriers at times of stress. Introduce measures specified for Issues 1 and 3. Restore over-large channels to their preferred dimensions. Publish guidelines for chalk stream management.	Continuing activity See Issues 1 & 3 Continuing activity ■■■■■	Owners See Issues 1&3 Owners, NRA NRA	

**RIVER ITCHEN CATCHMENT PLAN.  
ACTION PROGRAMME**

Management Task	93 94 95 96 97 Future	Action by	Estimated Cost £'000
<u>Issue 10. Conservation Issues</u>			
Maintain the river and tributaries as a green corridor through the urban landscape.	Continuing activity	NRA, Owners, EN, MAFF, CC, LAs	
Encourage use of grant schemes to promote buffer zones.	Continuing activity	MAFF, EN, CC, Owners	
Maintain high water quality in the river and estuary.	Continuing activity	NRA, SWS	
Protect designated sites and other areas important for wildlife (eg estuary mudflats, urban streams).	Continuing activity	NRA, Owners, LAs	
Conduct river management operations in a way which protects landscape, wildlife, conservation and heritage.	Continuing activity	NRA, Owners, LAs	
Control livestock to prevent excessive bank erosion.	Continuing activity	Owners	
Prevent fish farm escapes.	Continuing activity	Fish Farms	
Agree weed cutting timetable, include autumn cut.	Continuing activity	NRA, Owners, T&I	
Restore mineral and waste-disposal sites.	Continuing activity	Owners, LAs	
Take account of climate change.	Continuing activity	All	





## *River Itchen Catchment Management Plan*

### **APPENDIX 1 : STATISTICS FOR THE ITCHEN CATCHMENT**

#### **1. GENERAL INFORMATION**

Surface catchment area      47,300 Ha (473.00 km<sup>2</sup>)

Groundwater catchment area   60,000 Ha (600.00 km<sup>2</sup>)

#### **Topography**

Maximum Level    234 mAOD

Minimum Level    0 mAOD

#### **Geology**

Tertiaries      South of area

Chalk           North of area

#### **Estimated Catchment Population**

Year	Population	Change per decade
1991	240,000	
2001	242,000	+8.3 %

#### **Districts and Estimated Population (1991)**

District per Ha	Persons catchment	Ha in catchment	% area in catchment	Population
Basingstoke	2.3	4,100	8.7%	9,400
E Hampshire	2.0	5,300	11.1%	10,600
Eastleigh	13.3	4,600	9.7%	61,200
Southampton	39.5	2,800	6.0%	110,600
Test Valley	1.6	1,500	3.1%	2,400
Winchester	1.5	29,000	61.3%	43,500

Note: The population figures are approximate and portray overall trends rather than precise values.

## *River Itchen Catchment Management Plan*

### **2. WATER RESOURCES**

#### **Resource Areas**

	Number	Ha in catchment	% area of catchment
River Meon (part)	29	2,420	5.1%
Lower Itchen (part)	31	28,830	61.0%
Upper Itchen (part)	32	15,890	33.6%
Upper Test (part)	34	160	0.3%

#### **Rainfall (mm)**

1:10 yr  
Mean Year Drought

Mean Annual Total	870	678
Effective Rainfall	340	148

#### **Abstraction**

Licensed Abstraction	690 Ml/d
Actual Abstraction (1989)	160 Ml/d
Actual as % of Licensed	23%
Licensed abstraction from groundwater	301 Ml/d
Percentage from groundwater	44%
Percentage in High/Med Loss category	35%

#### **River Flow (cumecs):**

Mean Flow	(Q50)	4.81
95 percentile Flow	(Q95)	2.94

#### **Water Supply Companies serving the catchment**

	Area (Ha)	% Catchment
SEW (Mid Southern)	36,400	77%
SWS (Hampshire)	9,000	19%
Portsmouth	19,000	4%

## *River Itchen Catchment Management Plan*

### **3. WATER QUALITY**

Length of River in each NWC Quality Class (Km)

Class	Description	Target	Achieved 1990
1A	Good	60.6	79.4
1B	Good	30.8	16.2
2	Fair	6.3	2.1
3	Poor	0.0	0.0
4	Bad	0.0	0.0
TOTAL		97.7	97.7

Length Designated under the EC Freshwater Fisheries Directive (Km)

	Freshwater	Tidal
Cyprinid Designation	0.0	0.0
Salmonid Designation	51.1	0.0

Sewage Discharges

	Number	Volume (Ml/d)
To rivers & underground	8	44,969
To estuary	2	42,700

### **4. FLOOD DEFENCE**

Length of Main River (Km) 105.7 (includes tidal lengths)

Length of Coastline (Km)

Schedule 4	0
Main Tidal Waters	7.3
Sea Defences (NRA)	0
Sea Defences (LA)	0
Tidal Banks (NRA)	13.2

**5. CONSERVATION**

Number of Designated Sites in the Catchment

Type	Total	Water Dependent
Ramsar Sites	1	1 (designated and proposed)
NNRs	0	0
SSSIs	10	10

**6. NAVIGATION**

Length of towpath (km) 15

## *River Itchen Catchment Management Plan*

### **APPENDIX 2 : THE NWC RIVER QUALITY CLASSIFICATION SYSTEM**

#### Class 1A    Water of high quality and high amenity value

- i     Dissolved Oxygen saturation greater than 80%
- ii    BOD not greater than 3.0mg/l
- iii   Total ammonia content not greater than 0.4mg/l
- iv    Where abstracted for drinking water, complies with EC Category A2
- v     Non toxic to fish (as defined by EIFAC)

Average BOD probably no greater than 1.5mg/l  
No visible evidence of pollution

#### Class 1B    Good quality water suitable for the same uses as Class 1A

- i     Dissolved Oxygen saturation greater than 60%
- ii    BOD not greater than 5.0mg/l
- iii   Total ammonia content not greater than 0.9mg/l
- iv    Where abstracted for drinking water, complies with EC Category A2
- v     Non toxic to fish (as defined by EIFAC)

Average BOD probably no greater than 2.0mg/l  
Average ammonia probably no greater than 0.5mg/l  
No visible evidence of pollution

Waters which are excluded from Class 1A because of physical characters or the presence of a high proportion of high quality effluent

#### Class 2        Water of fair quality, treatable for public supply, supporting coarse fisheries and of moderate amenity value

- i     Dissolved Oxygen saturation greater than 40%
- ii    BOD not greater than 9.0mg/l
- iii   Where abstracted for drinking water, complies with EC Category A3
- iv    Non toxic to fish (as defined by EIFAC)

Average BOD probably no greater than 5.0mg/l

#### Class 3        Waters of poor quality, fish absent for much of the time

- i     Dissolved Oxygen saturation greater than 10%
- ii    Not likely to be anaerobic
- iii   BOD not greater than 17.0mg/l

#### Class 4        Grossly polluted

Similar to Class 3 but likely to be anaerobic at times



## *River Itchen Catchment Management Plan*

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Class X    Insignificant watercourses which are not classified

Dissolved Oxygen saturation greater than 10%

NB            Compliance with relevant EC Directives is a condition of classification under the NWC scheme

### **APPENDIX 3: GLOSSARY OF TERMS AND UNITS**

#### **1:10 YEAR DROUGHT/FLOOD**

A drought/flood event with a statistical probability of occurring once in a ten year period (other periods may be specified in a similar way).

#### **ABSTRACTION LICENCE**

Licence to abstract water from a surface or underground source. The maximum annual, daily and hourly abstraction rates are set by the licence.

#### **ABSTRACTION - ACTUAL**

Individual abstraction records are reported to the NRA each year but under the Water Resources Act 1991 these data are confidential. Actual abstraction figures reported in the Plan are area annual totals expressed in Ml/d.

#### **AONB**

Area of Outstanding Natural Beauty, notified by the Countryside Commission.

#### **BOD**

Biochemical Oxygen Demand. A measure of the polluting potential.

#### **COARSE FISH**

See FRESHWATER FISH, CYPRINIDS, SALMONIDS

#### **CONSUMPTIVE USE**

Water which is abstracted but not returned to the catchment, either because it evaporates (as in spray irrigation) or is exported for use in another catchment.

#### **COUNTY STRUCTURE PLANS**

Statutory documents produced by County Councils outlining their strategy for development over a 10-15 year timescale.

#### **CYPRINIDS**

Fish of the carp family. (See also COARSE FISH, FRESHWATER FISH, SALMONIDS)

## *River Itchen Catchment Management Plan*

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### **DISTRICT LOCAL PLANS**

Statutory documents produced by District or Borough Councils to implement the development strategy set out in County Structure Plans. Specific land use allocations are identified.

### **DROUGHT ORDER**

Order issued by the Secretary of State for the Environment allowing the terms of abstraction licences to be varied and/or the levels of service to water company customers to be reduced at times when the resource is under stress.

### **EFFECTIVE RAINFALL**

Total rainfall minus direct evaporation and the water used by plants for transpiration. This is equivalent to the total resource of a catchment.

### **EIFAC**

The European Inland Fisheries Advisory Commission. An agency of the United Nations Food & Agriculture Organisation (FAO).

### **EMERGENT VEGETATION**

Plants with roots in the river bed but which emerge from the water. Examples include reeds, iris and bullrush.

### **EPHEMERAL FLOW**

River flow which dries at some times of the year (eg winterbournes).

### **FLOW MEASUREMENT UNITS**

m <sup>3</sup> /s	Cubic metres per second
l/s	Litres per second
Ml/d	Megalitres per day. A megalitre is equivalent to a ten metre cube (approximates to a 4-bedroom detached house).
mgd	Millions of gallons per day

## *River Itchen Catchment Management Plan*

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### FLOW CONVERSION TABLE

<u>m<sup>3</sup>/s</u>	<u>Ml/d</u>	<u>mgd</u>
0.012	1	0.224
0.06	5	1.12
0.12	10	2.24
0.24	20	4.48
0.6	50	11.2
1.2	100	22.4

### FRESHWATER FISH

For the purposes of the Salmon and Freshwater Fisheries Act 1975, fish other than Salmon, Brown Trout, Sea-Trout, Rainbow Trout and Char (see also COARSE FISH, FRESHWATER FISH, SALMONIDS).

### HECTARE

Unit of area 100m x 100m, equal to 2.471 acres.

### HIGH SEAS RIGHTS

Common law rights of navigation and fisheries on tidal waters where no specific authority exists.

### IDB

Internal Drainage Board. A local land drainage authority with powers to raise finance and do works.

### IMPOUNDMENT RESERVOIR

Surface water storage area formed by construction of a dam and supplied only by natural inflow from the upstream catchment.

### ISOHYETALS

Contours of equal mean annual rainfall.

### LOCAL NATURE RESERVE

A nature reserve designated by a Local Authority, frequently owned or managed by a voluntary conservation organisation.

### mAOD

A measure of altitude. Metres above ordnance datum.

### **MARSH FEEDING**

Supply of water from the river to marsh areas during the summer for wet fencing and abstraction (usually for spray irrigation).

### **MEAN LICENSED ABSTRACTION**

In this Plan the mean licensed abstraction is the total annual abstraction permitted within the terms of a licence, expressed as an average daily volume in terms of megalitres per day (Ml/d).

### **MHWS**

Mean High Water Spring Tides. A datum level used in mapping.

### **MINIMUM RESIDUAL FLOW (MRF)**

The flow set at a river gauging station to protect downstream uses and below which controlled abstractions are required to cease. (see also PRESCRIBED FLOW)

### **NATIONAL NATURE RESERVE**

A nature reserve of national importance, designated and managed by English Nature.

### **NATURAL FLOW REGIME**

The river flow pattern experienced prior to the influence of man, with no abstraction from or discharges to the catchment.

### **PERENNIAL FLOW**

River flow present through the entire year. (See also EPHEMERAL FLOW)

### **POTABLE WATER SUPPLY**

Water supplied for domestic use, including human consumption.

### **PRESCRIBED FLOW (PF)**

A river flow incorporated as a condition in an abstraction licence, such that abstraction must cease once the flow falls below this value. Prescribed flows are set at or above the MRF (qv) which applies to the river where the abstraction takes place.

In many instances the PF applying to new licences is increased incrementally in step with the total licensed abstraction to protect the interest of existing abstractors: ie. newer abstractions have to cease at higher river flows. (see also MINIMUM RESIDUAL FLOW)

### **PRIMARY GAUGING STATION**

A permanent river flow gauging installation included in the National Surface Water Archive.



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### **PUMPED STORAGE RESERVOIR**

Surface water storage area where the natural inflow is supplemented by water pumped from a separate source, typically a nearby river.

### **POOL:RIFFLE**

A stretch of river with alternate sections of shallow fast-flowing water and deeper slow-moving pools.

### **Q95**

River flow that is exceeded for 95 percent of the flow record (a low flow, the Q5 flow would be a high flow).

### **RAMSAR SITE**

A wetland site of international significance for conservation, notified under international treaty.

### **SALMONIDS**

Fish classified by the Salmon and Freshwater Fisheries Act 1975 as belonging to the salmon family - Salmon, Brown Trout, Sea-Trout, Rainbow Trout and Char. (Summer-spawning salmonid species such as Grayling are classified by the Act as Freshwater Fish) (see also COARSE FISH, FRESHWATER FISH, CYPRINIDS).

### **SPATE FLOWS**

Episodic fresh water flood flows.

### **SSSI**

Site of Special Scientific Interest. A site designated by English Nature as being in need of protection to conserve its outstanding ecological or geological features. Land use and management operations within SSSIs are subject to control.

### **SNCI**

Site of Nature Conservation Interest. A site of local importance for wildlife or geology, identified by the County Wildlife Trust or the County Council.

### **STW**

Sewage Treatment Works.

### **TOTAL RAINFALL**

Rainfall as measured by a rain gauge.

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### TOTAL RESOURCE

See EFFECTIVE RAINFALL

### WET FENCING

Water-filled ditches used as field boundaries or to control the movement of livestock.

## **APPENDIX 4 : FURTHER READING**

### **EC Directives**

Quality of Surface Water for Abstraction as Drinking Water:	(75/440/EEC)
Pollution Caused by the Discharge of Dangerous Substances:	(76/464/EEC)
Quality of Fresh Waters for the Support of Fish Life:	(78/659/EEC)
Protection of Groundwater Against Pollution:	(80/68/EEC)
Urban Waste Water Treatment:	(91/271/EEC)
Protection Against Pollution by Nitrates from Agriculture:	(91/676/EEC)

### **Acts of Parliament**

Salmon and Freshwater Fisheries Act 1975  
Wildlife and Countryside Act 1981  
Water Act 1989  
Environment Protection Act 1990  
Land Drainage Act 1991  
Water Resources Act 1991

### **NRA Publications**

NRA Corporate Plan (Annually)  
Water Resources Development Strategy: A Discussion Document. 1992  
Sustaining our Resources. Southern Region Water Resources Development  
Strategy: NRA Southern Region 1992  
River Itchen Catchment Management Plan, Phase I: NRA Southern Region 1992

### **Other Publications**

Conservation and Land Drainage Guidelines: Water Space Amenity Commission 1980  
Nature Conservation and River Engineering: Nature Conservancy Council 1983  
Rivers and Wildlife Handbook: RSPB 1984  
Changing River Landscapes: Countryside Commission CCP238 1987  
Code of Practice on Conservation, Access and Recreation: MAFF, DoE & Welsh Office. HMSO 1989  
Nature Conservation and the Management of Drainage Channels: Nature Conservancy Council & Association  
of Drainage Authorities 1989  
Conservation Guidelines for Drainage Authorities: MAFF, DoE & Welsh Office. 1991  
Solving the Nitrate Problem: MAFF 1993