

Box 4

# local environment agency plan

## DARENT LEAP

### ENVIRONMENTAL OVERVIEW

SEPTEMBER 1999



ENVIRONMENT  
AGENCY

# Darent Area Key Details

## General

Area (km<sup>2</sup>) 400

## Administrative Details

Councils and the % of the Darent Catchment they administer

Kent CC	72
Dartford BC	13
Sevenoaks DC	57
Tonbridge & Malling BC	2
Greater London Area	26
Bexley London Borough	8
Bromley London Borough	16
Greenwich London Borough	2
Surrey CC	1
Tandridge BC	1

## Flood Defence

Length (km):

Coastline including main tidal waters	9.2
Main River including main tidal lengths	78.7
Sea Defences Agency Responsibility	0
Tidal Banks Agency Responsibility	13.1

## Conservation

Sites of Special Scientific Interest	17
Water Dependant SSSIs	7
NNRs	0
Ramsar or SPAs	0

## Fisheries

Length of EC Designated Fisheries (km):

Freshwater	
Cyprinid	51.64
Salmonid	0

## Population

Year	Population
1991	417,000
2001 (Estimate)	422,000

## Water Resources

Rainfall (mm/yr.):

	Actual	Effective
Average	700	278
Drought (1989-1992)	649	242

Number of licensed abstractions

Surface Water	20
Ground Water	62
Impoundments	0

## Water Quality

Chemical GQA as % of lengths in each class for the Darent catchment (1995-97)

Class	%
A	21.5
B	65.8
C	12.7
D	0
E	0

Number of EC Designated

Bathing Waters	0
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## Pollution Prevention and Control

Numbers of sites holding licences

Waste Licences	28
Process Industry Regulations	3
Radioactive Substance Regulation (sites authorised to accumulate and dispose of radioactive waste)	3

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**CONTENTS**

<b>1. INTRODUCTION</b>	<b>1</b>
1.1. PURPOSE AND SCOPE OF THE DARENT ENVIRONMENTAL OVERVIEW	1
1.2. STRUCTURE OF THE ENVIRONMENTAL OVERVIEW	1
<b>2. DARENT AREA ENVIRONMENT</b>	<b>5</b>
2.1. LAND USE AND ENVIRONMENTAL RESOURCES	5
2.1.1. Introduction	5
2.1.2. Location, geology and topography	5
2.1.3. Land use and management	5
2.1.4. Administrative areas and land use planning	10
2.2. ENVIRONMENT RESOURCES	11
2.2.1. Introduction	11
2.2.2. Landscape and cultural heritage	11
2.2.3. Air quality	12
2.2.4. Water resources	14
2.2.5. Water quality	19
2.2.6. Protection against flooding	23
2.2.7. Recreation	27
2.2.8. Waste management	31
2.3. THE STATUS OF KEY BIOLOGICAL POPULATIONS COMMUNITIES AND BIODIVERSITY	36
2.3.1. Introduction	36
2.3.2. Key habitats	36
2.3.3. Key species (at risk)	38
2.3.4. Designated nature conservation areas	41
2.4. COMPLIANCE WITH ENVIRONMENTAL QUALITY STANDARDS, TARGETS AND POLICIES/STRATEGIES	45
2.4.1. Waste management and regulation	45
2.4.2. Flood defence	45
2.4.3. European water quality directives	46
2.4.4. UK water quality objectives and standards	48
2.4.5. Consented discharges to water	48
2.4.6. Fisheries	48
2.5. HEALTH OF THE ENVIRONMENT	49
2.5.1. Introduction	49
2.5.2. Acidification	49
2.5.3. Water	50
2.6. LONG TERM REFERENCE SITES	51
2.6.1. Long term air quality monitoring	51
2.6.2. Sea level rise	51
2.6.3. Harmonised monitoring site	51



2.6.4. Reference groundwater borehole	52
2.6.5. Long term river flows	52
2.7. AESTHETIC QUALITY OF THE ENVIRONMENT	54
2.7.1. Introduction	54
2.7.2. Landscape quality	54
2.7.3. Tranquil areas	54
2.7.4. Aesthetic GQA of rivers	54
<b>3. SUMMARY OF ISSUES TO BE ADDRESSED</b>	<b>56</b>
3.1. INTRODUCTION	56
3.2. SUMMARY OF ISSUES	56
<b>APPENDIX 1: GLOSSARY</b>	<b>58</b>
<b>APPENDIX 2: ABBREVIATIONS</b>	<b>61</b>

### Maps

Map 1: Catchment Overview	3
Map 2: Topography	4
Map 3: Geology	6
Map 4: Administrative Areas	7
Map 5: Strategic Planning and Development	9
Map 6: Water Resource and Supply	16
Map 7: Water Quality	22
Map 8: Flood Defence	26
Map 9: Recreation	30
Map 10: Licensed Sites	33
Map 11: Conservation	37
Map 12: The Size and Loss of Tranquil Areas in the Darent Catchment	55

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Maps have been produced using the best information available at August 1999 and it is recognised that there may be some inaccuracies. More detailed information may be available from the original source.

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**Figures**

Figure 1: River Darent flow accretion profile	18
Figure 2: Sea level change at Sheerness	51
Figure 3: Groundwater levels in the North Downs Chalk Block at Hop Pole Inn near Farningham.	52
Figure 4: Naturalised and actual flow at Hawley	53

**Tables**

Table 1: Landcover in 1990	8
Table 2: Part B Processes	13
Table 3: Water balance summary for Darent and Cray resource area	15
Table 4: Summary of authorised abstractions from Darent/Cray Resource Area	15
Table 5: Chemical quality	20
Table 6: Biological quality	21
Table 7: Activities at licensed waste management sites	32
Table 8: Fisheries locations and fish farms	40
Table 9: Colour coded flood warnings	45
Table 10: Flood risk zones wholly or partially in the Darent LEAP area.	46

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## **1. INTRODUCTION**

### **1.1. PURPOSE AND SCOPE OF THE DARENT ENVIRONMENTAL OVERVIEW**

This Environmental Overview has been prepared to provide supporting information to the Darent Area Local Environment Agency Plan (LEAP) for the next five years. It is a factual description and analysis of the environment in the Darent Catchment and the stresses and strains that are acting upon it. A series of issues has been developed from this review and they have been carried forward into the separate LEAP Consultation Draft. This allows consideration by the Agency, its partners and those individuals and organisations generally interested in the local environment so that the relative importance of local concerns can be identified. After this consultation the LEAP Action Plan is prepared to provide a five year programme for addressing these issues.

The Overview has been prepared in the context of the Agency's overall aim to protect and enhance the whole environment, thus contributing to sustainable development. The term sustainable development is most commonly taken to mean 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'.

A Kent Area LEAP has been issued as an overarching plan to address major environmental issues of strategic importance to the Kent Area as a whole. This document is a catchment based LEAP focussing on more specific issues local to the Darent area.

### **1.2. STRUCTURE OF THE ENVIRONMENTAL OVERVIEW**

The Agency has adopted a framework for determining the state of the environment in the area. This has identified six viewpoints classifying the environment, which are in turn subject to six types of stresses and strains. The six frameworks are:

- Land use and environmental resources;
- Key biological populations, communities and biodiversity;
- Compliance with environmental standards and targets;
- The health of the environment;
- Long term reference sites;
- Aesthetic quality.

The stresses and strains acting on these environmental resources have been classified under the following headings:

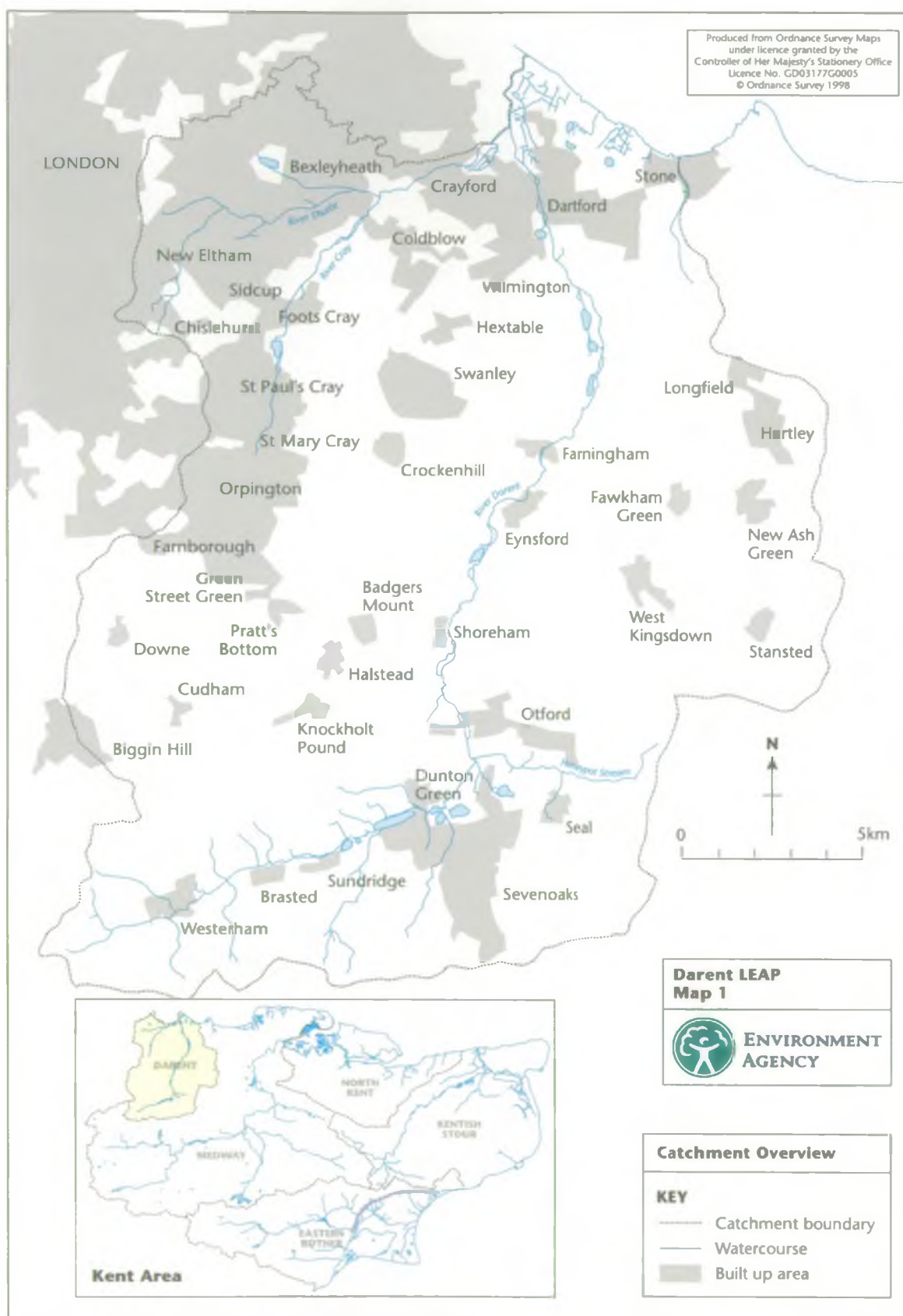
- Natural forces;
- Societal influences;
- Abstractions and removals;
- Uses, releases and discharges;



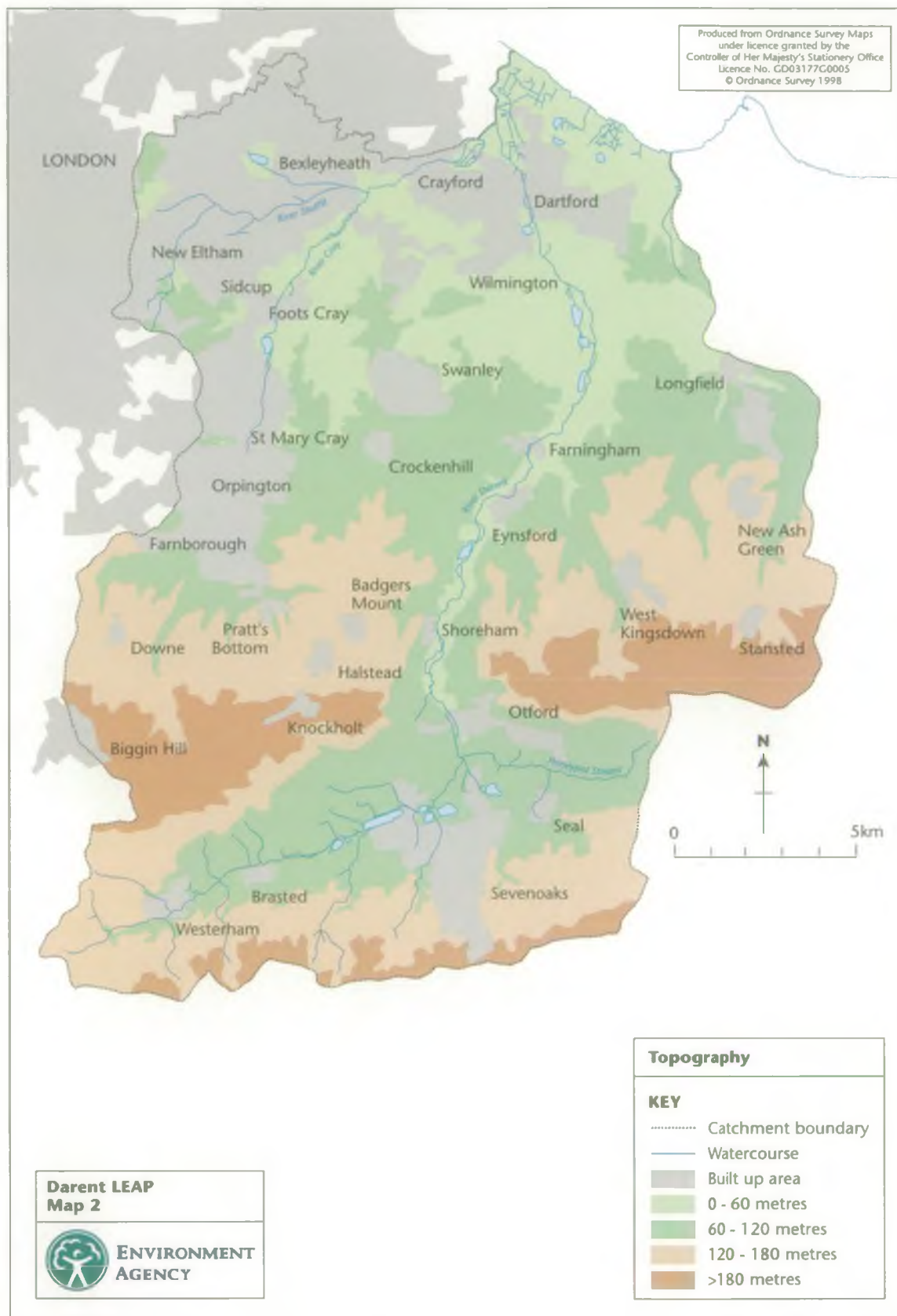
- 
- Waste arisings and disposals;
  - Illegal practices including accidents and non-compliance with regulations.

The issues identified in the Consultation are summarised in Section 3. They have been grouped according to the Agency's environmental concerns presented in its overall strategy document *An Environmental Strategy for the Millennium and Beyond* (1997) as:

- Addressing climate change;
- Improving air quality;
- Managing our water resources;
- Enhancing biodiversity
- Managing our freshwater fisheries;
- Delivering integrated river-basin management;
- Conserving the land;
- Managing waste;
- Regulating major industries.







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## **2. DARENT AREA ENVIRONMENT**

### **2.1. LAND USE AND ENVIRONMENTAL RESOURCES**

#### **2.1.1. Introduction**

The Darent Catchment lies in the north west corner of the Agency's Kent Area covering the area drained by the Rivers Darent, Cray and their tributaries (Map 1). It is the smallest catchment in the Kent Area, with a land area of 400 km<sup>2</sup> but the inclusion of the outer suburbs of south east London and the adjoining area of Kent gives it the highest population density in the Area (approximately 1000/km<sup>2</sup>). The Darent catchment falls mainly within Kent with small parts in Surrey and London.

#### **2.1.2. Location, geology and topography**

The area extends from Eltham in the west to Longfield in the east and from the Thames in the north to Sevenoaks in the south. In the north it includes the Thames Marshes and it extends southwards to include a section of the North Downs and the Vale of Holmesdale. The land rises up the dip slope of the Downs from sea level by the Thames to a maximum height of 251m Above Ordnance Datum (AOD) north of Westerham (Map 2).

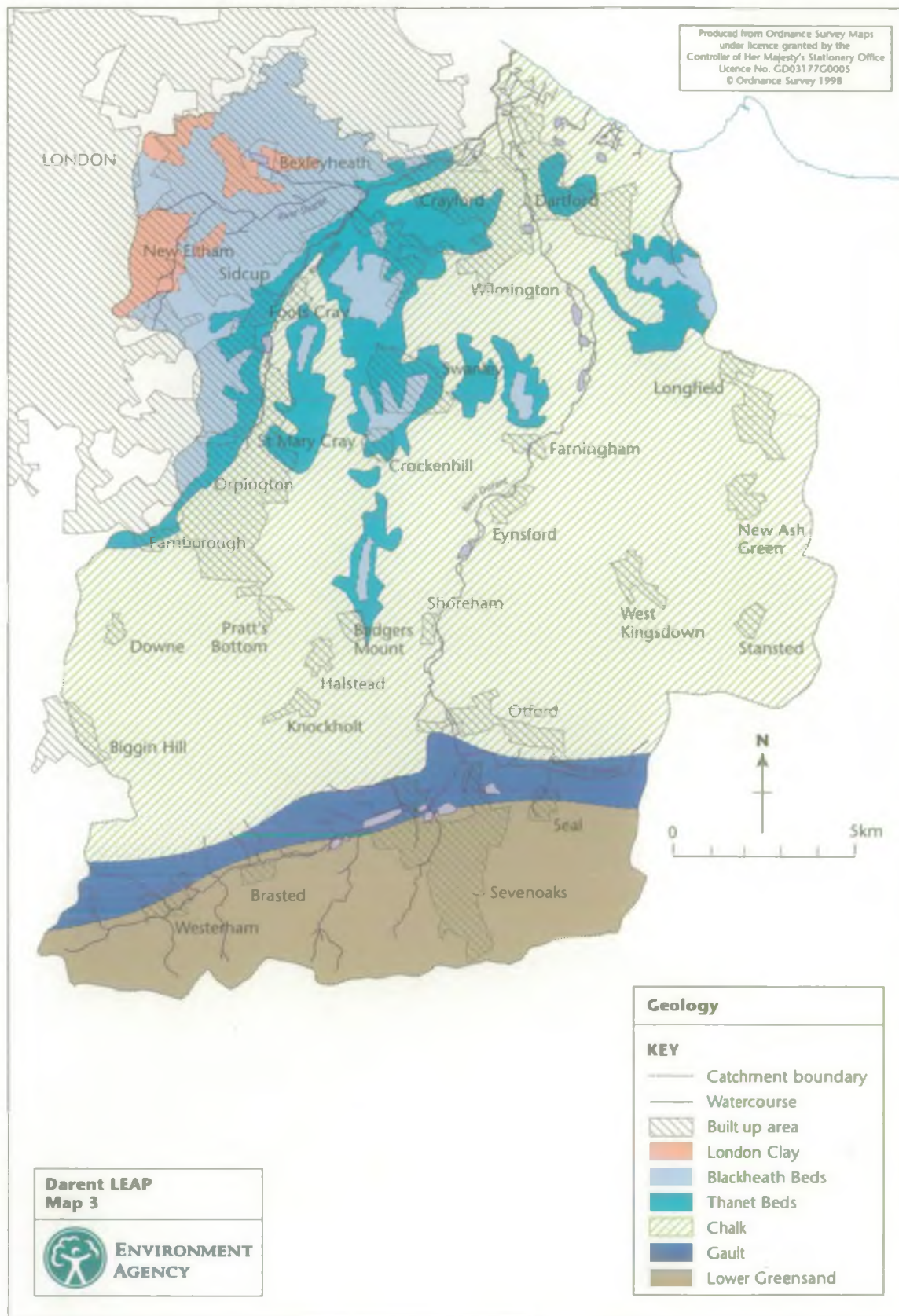
To the south lies the oldest geological formation in the area, the Lower Greensand. Above this lies thin bands of Gault Clay and Upper Greensand. These are overlain by the main bed in the catchment, the thick block of Chalk forming the North Downs. Above this are smaller sections of London Tertiaries, which largely corresponds with the main urban area (Map 3).

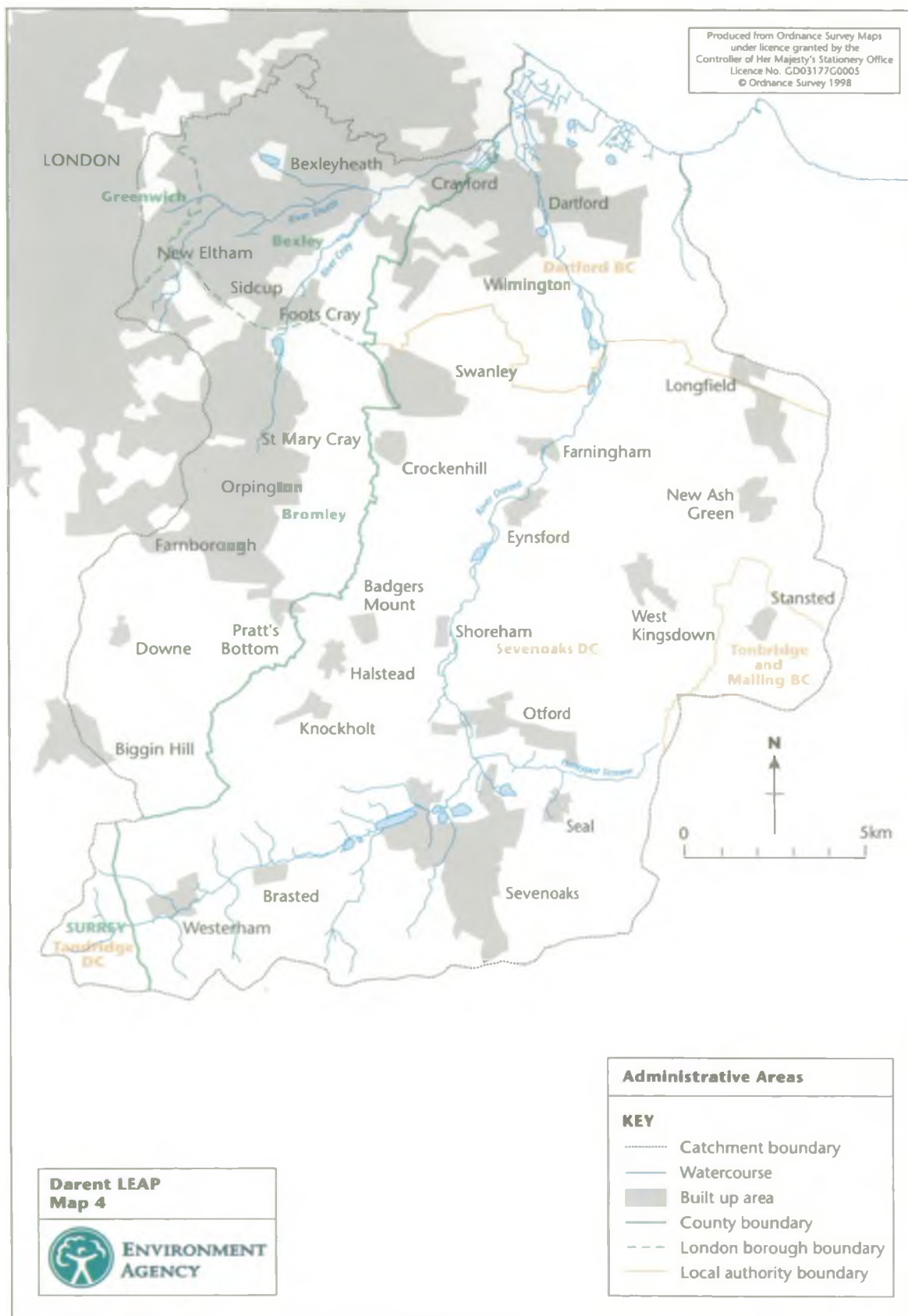
The topography seen today has been shaped by this geology and the rivers that flow through it. The Darent rises to the west of Westerham and flows in an easterly direction to Otford, where it is joined by a major tributary flowing from east to west, the Honeypot Stream, both fed by springs from the Lower Greensand and Chalk. It then turns north, where it has cut a large valley through the North Downs, flowing to its tidal limit at Dartford. It is joined by the River Cray in its tidal length where Dartford Creek crosses the Thames Marshes. The River Cray rises at Orpington and runs in a generally north east direction, mainly on the Chalk through the edge of the urban area. It is joined near Bexley by the River Shuttle, which flows in an easterly direction mainly through the urban area.

#### **2.1.3. Land use and management**

There is a distinct split between the heavily developed urban areas, mainly the suburban edge of the Greater London conurbation in the north and west of the area and the protected rural green belt area to the south and east. In recent years the area's more traditional industries have tended to contract, although Dartford still retains significant manufacturing industry. New commercial









developments have expanded providing new employment opportunities and this trend is set to continue with the Thames Gateway Planning Framework.

A breakdown of the proportions of the different types of landcover is given in Table 1.

Urban development covers approximately 23% of the area. The resident population of the catchment is approximately 417,000 of which over 280,000 are situated within the London Boroughs of Bexley, Bromley and Greenwich.

Outside the urban areas agricultural land for arable and grazing is the predominant use accounting for over half of the LEAP area altogether. However adjacent to the urban areas a significant proportion of the grazing land is used for horses. Woodland, which is almost all deciduous, occupies 11% of the area.

**Table 1: Landcover in 1990**

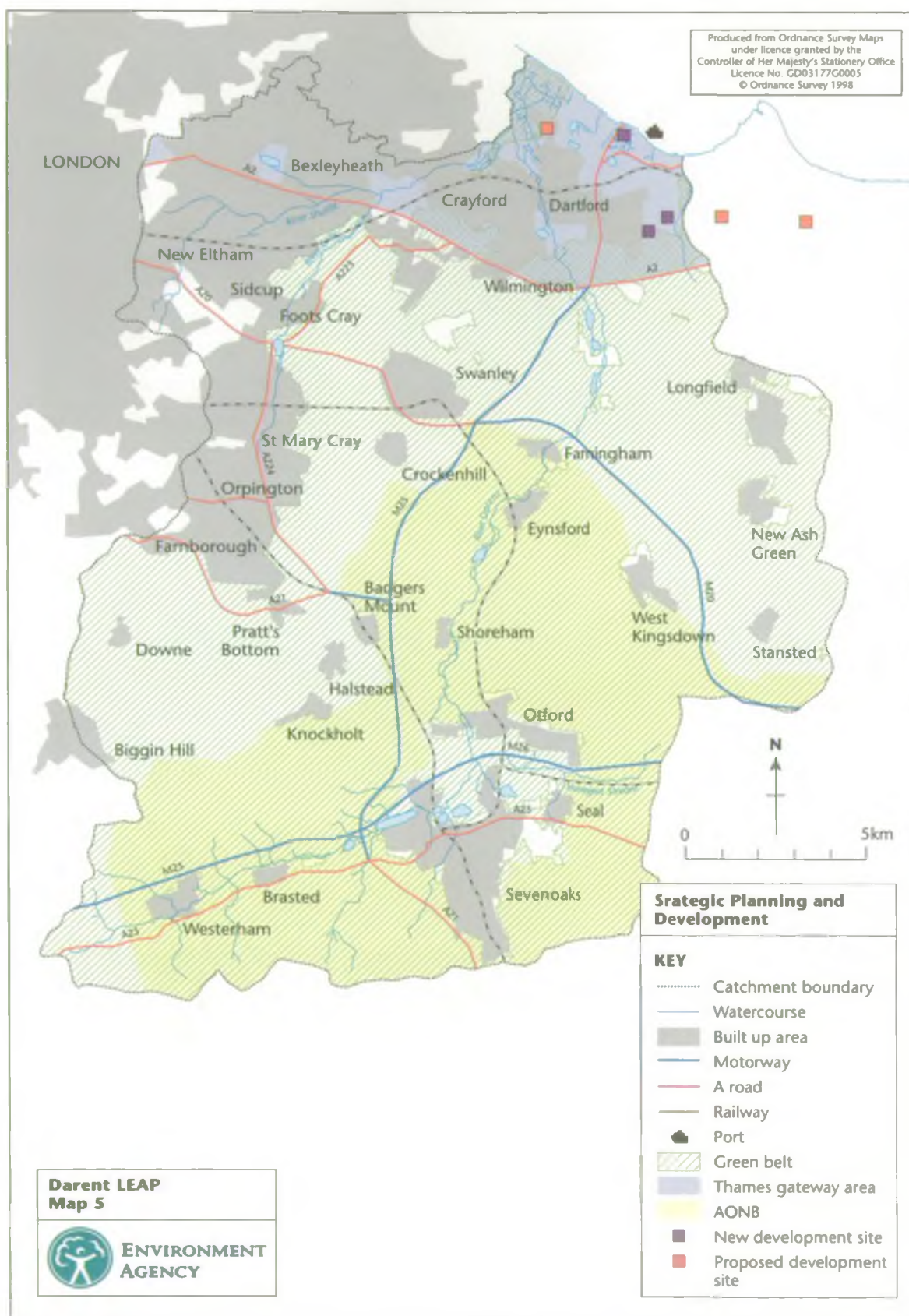
Landcover type	%
Estuary and associated land	0.1
Inland water	0.3
Grass heath	0.7
Mown / Grazed turf	7.8
Meadow / Verge / Semi-natural	28.8
Rough / Marsh grass	1.5
Shrub heath and bracken	0.1
Scrub / Orchard	0.8
Deciduous woodland	10.4
Coniferous woodland	0.6
Tilled land	23.3
Ruderal weed	1.3
Suburban / Rural development	19.9
Continuous urban	3.5
Inland bare ground	0.9
Total	100

*Stresses: Abstractions and removals – minerals*

The Darent catchment has been important historically as a source for a range of minerals, including:

- chalk for the cement industry from large quarries near the Thames;
- chalk for agricultural use from small quarries dotted across the North Downs;
- clay for brick and tile manufacture from the Gault Clay near Sevenoaks;
- flint gravel for aggregate from the Darent Valley south of Dartford.





With the exhaustion of the chalk reserves at Western Quarry and the construction of Bluewater Regional Shopping Centre, remaining mineral extraction sites in the LEAP area are relatively small. Outside the existing sites, there is a general planning policy that proposals for the working of minerals will not normally be permitted on land subject to one or more of a series of constraints, such as where there is nature conservation interest or in areas of outstanding natural beauty (AONB) which cover much of the LEAP area.

#### **2.1.4. Administrative areas and land use planning**

The Darent LEAP area is mainly divided between Kent and some London Boroughs with a very small part in Surrey. The area includes parts of the areas administered by Bexley, Bromley, Greenwich, Dartford, Sevenoaks, Tonbridge and Malling and Tandridge councils (Maps 4 and 5). The development plans covering the area are:

- Kent Structure Plan (1996);
- Surrey Structure Plan (1994);
- Bexley London Borough Unitary Development Plan – Deposit Draft (June 1992);
- Bromley London Borough Unitary Development Plan – Adopted (March 1994);
- Dartford Borough Local Plan – Adopted Plan (April 1995);
- Greenwich Unitary Development Plan – Adopted (November 1994);
- Sevenoaks District Local Plan – Deposit Draft (October 1996);
- Tandridge District Local Plan – Deposit Draft (June 1998);
- Tonbridge and Malling Borough Local Plan – Deposit Draft (September 1996);

#### *Thames Gateway planning framework*

The “Thames Gateway” embodies the vision for the future of the area adjacent to the Thames Estuary previously known as the East Thames Corridor. Within the Darent LEAP catchment this covers the area north of the A2. Its origin, the Thames Gateway initiative, was a collection of substantial and disparate development sites, some seen as difficult to bring into productive use. Thames Gateway aims to change that by setting the framework for a sustained and sustainable programme of economic, social and environmental regeneration. Some of these changes will entail additional residential developments at the fringes of urban areas, although much of it will comprise the re-development of brownfield sites in Bexley and Dartford. It is likely to result in large-scale new housing developments at Greenhithe and further commercial development at Bluewater.

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## **2.2. ENVIRONMENT RESOURCES**

### **2.2.1. Introduction**

This section of the Environmental Overview describes the environmental resources of the Darent LEAP area that fall within the realm of the Environment Agency's interests. Such resources include landscape and cultural heritage associated with the water environment, air quality, and the quantity of water resources available. Nature conservation resources are considered separately in Section 2.3.

Also considered in this section are three additional important concerns of the Environment Agency: the protection of people and property against flooding, the management of waste and recreation.

### **2.2.2. Landscape and cultural heritage**

The Environment Agency is required when formulating or considering any proposal relating to any of its activities other than pollution control to further the conservation and enhancement of natural beauty, geological or physiographical features of special interest.

In addition, all functions are required to take into account any effect that proposals would have on the beauty or amenity of an area and have regard to the desirability of protecting and conserving buildings, sites and objects of archaeological, architectural, engineering or historic interest.

The Agency also has a duty to promote - to such extent as it considers desirable and resources allow - the conservation and enhancement of the natural beauty of inland and coastal waters and land associated with these waters.

By understanding the character of the landscape of the LEAP area, the Agency can evaluate the alterations to the character that will take place from the decisions it has to make.

#### *Current situation in the Darent Area*

The area comprises sections of the following areas defined by the Countryside Commission (now the Countryside Agency) as landscape character area and by English Nature as Natural areas:

- *Greater Thames Estuary* - generally characterised by open spaces dominated by the sky within a flat, low-lying landscape.
- *North Kent Plain* - open, low and gently undulating landscape characterised by high quality fertile loamy soils dominated by agricultural land. With a strong contrast from the built environment particularly around Dartford and the Thames Gateway area there are large pressures from increasing urban sprawl.

- *North Downs* - dramatic and distinctive rolling chalk downland with the dip slope incised by the River Darent towards London. While some valleys of species rich grassland are still retained, the character changes to urban, with the topography masked by the built-up areas.
- *Wealden Greensand* - typically characterised by a scarp/dip-slope topography with wooded commons or charts to the south and a series of spring line settlements below the downs.

#### *Stresses on the landscape*

The stresses on the landscape zones are as follows:

- *Greater Thames Estuary* industrial and urban pressures are the most significant reasons for change on the traditional uses of this land. In the north, the marshes are significantly influenced if not dominated by the development at Littlebrook and Crossways of power stations, port facilities and commercial facilities with associated network of roads, rail links, pylons and lighting.
- *North Kent Plain* - pressures on the wider countryside arising from increasing urban sprawl, especially around the Thames Gateway area.
- *North Down* - urban, industrial and residential development (including chalet and caravan developments that have grown up in a random manner), are stresses on this area.
- *Wealden Greensand* - busy transport routes (particularly the M25 / M26) run through, intruding on this area.

### 2.2.3. Air quality

The Environment Act 1995 (EA95) Part IV places responsibility for local air quality management on the local authorities. They are required to carry out a three stage review and assessment of air quality within their boundaries, taking into account factors from neighbouring areas. An inherent component of this review and assessment is ambient monitoring of airborne pollutants to assist with the identification of locations where exceedances may occur. The review must assess whether it is likely that air quality objectives laid down in the Air Quality Regulations (SI 1997 No 3043) will be complied with by 31 December 2005. If it is likely that one or more of the objectives will be breached, the local authority is required to designate that area where the breach is likely to occur as an Air Quality Management Area. An Action Plan must be prepared which sets out the measures required to achieve the objectives. The Agency is a consultee to the overall process of review and assessment, designation of Air Quality Management Areas and the development of Air Quality Action Plans.

The Agency's role in local air quality management is one of liaison, support, technical consultation and provision of data relating to Part A IPC processes.

The Agency's contribution to the achievement of air quality objectives is limited to its regulation of Part A IPC processes. Part B processes (those with lower potential to pollute) are already regulated by local authorities under the Local Authority Air Pollution Control (LAAPC) provisions of the Environmental Protection Act 1990 (EPA90) Part I.

The Kent Air Quality Partnership is an existing forum which promotes co-operation and co-ordinated action on air quality issues. It is the custodian of an emissions inventory and air quality model which is now being used to facilitate member Local Authorities' Air Quality Review and Assessments. The Agency is a full member of the Partnership and KCC provides secretariat facilities.

The air quality model is also used by KCC to assist with strategic planning decisions by evaluating the impact of proposed developments.

#### *Stresses on air quality*

##### *Industrial activity*

There are a total of 3 Part A processes in the Darent LEAP area associated with papermaking, pharmaceuticals and power generation (Map 10). The Agency is required to review all existing Part A authorisations every four years and assess the potential for impact on sites protected under the Habitats Regulations e.g. Special Protection Areas, (SPAs). This could involve dispersion modelling to estimate the cumulative impacts of the processes.

There are at least 38 Part B processes, regulated by local authorities, within the LEAP area. The most numerous of those that have been identified are vehicle spraying and cement processes (Table 2).

**Table 2: Part B Processes**

Processes	Number of Licensed Processes
Cement process	5
Combustion process	2
Demolition	3
Gas odourisation	2
Metal coating process	2
Mineral drying	1
Printworks	1
Quarry process	2
Vehicle spraying	19
Waste oil burner	1

##### *Traffic emissions*

A significant amount of air pollution is generated from the urban areas and the busy motorways and trunk roads (M20, M25, A2, Dartford Crossing) within the Darent area.



*Emissions from landfill sites*

Landfill gas is a known cause of climate change. This is the product of the decomposition of organic waste within landfill sites. Whilst it contains many trace elements which give it odour, the most significant component of landfill gas is methane. Methane is a flammable asphyxiant and a powerful greenhouse gas. There are closed and current landfill sites in the LEAP area that are producing landfill gas at rates that could either detrimentally affect the locality or contribute to the greenhouse gases in the atmosphere. This issue is addressed in the Kent Area LEAP.

**2.2.4. Water resources**

The Agency has to ensure that water resources are properly managed to provide water for all reasonable needs as well as meeting the Agency's commitment to progressive enhancement of the environment. Water is abstracted from the area's rivers and groundwater for a range of uses including public water supply, agriculture and industry (Map 6).

*Current situation in the Darent Area**Rainfall*

The average annual rainfall across the area is approximately 700mm although during the 1989-92 drought this fell to less than 650mm. The average annual effective rainfall, allowing for losses by evaporation, is estimated at 280mm, falling to around 240mm during the 1989-92 drought.

*Groundwater*

Groundwater constitutes 96% of the abstraction currently authorised for the LEAP area with more than 70% of this being drawn from the Chalk. There are five public water supply companies operating a total of 17 borehole sources and taken together these account for approximately 80% of the total licensed groundwater abstraction.

It was in recognition of the heavy commitment of aquifer resources and their vulnerability under drought conditions that the NRA in 1993 introduced the Kent Area Groundwater Management Policy. This embodied a general presumption against the authorisation of any further increase in groundwater abstraction for consumptive use. Other measures to reduce borehole abstraction and redress the resource imbalance were adopted as components of the low flow alleviation scheme.

*Surface water*

There are no surface water abstractions for public water supply within the Darent LEAP area. There are 2 licences for industrial abstraction and 2 licences for spray irrigation.

*Water resource balance*

Table 3 summarises the results of the water balance estimate carried out for the resource area, which has the same boundaries as the LEAP area. This shows that 93% of the available water resources are committed for licensed abstraction.

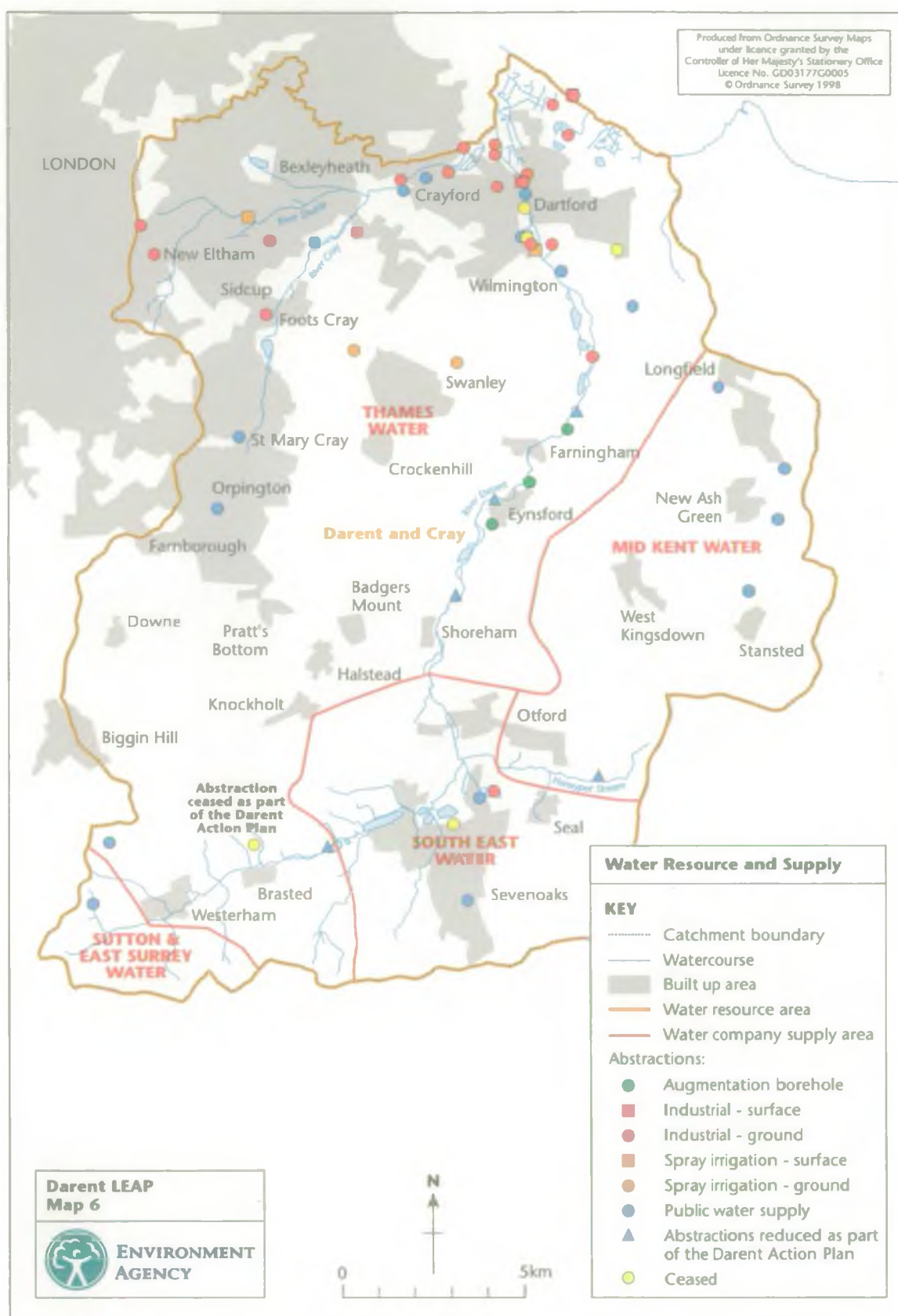
**Table 3: Water balance summary for Darent and Cray resource area**

Conditions	Average	Drought (1989-92)
Catchment area (km <sup>2</sup> )	399	399
Annual rainfall (ave 1961-90) (mm)	700	649
Actual evapotranspiration loss (mm)	422	407
Effective rainfall (mm)	278	242
Annual total available resource (ave) (MI)	110,936	96,761
Authorised abstraction (MI)	103,065	103,065
% commitment	93	107

Table 4 summarises the current commitment in terms of licensed abstractions from surface and groundwater sources. These take into account the recent licence variations under the first phase of the low flow alleviation scheme.

**Table 4: Summary of authorised abstractions from Darent/Cray Resource Area**

Source	Public Water Supply Licences MI/annum	Other Licences MI/annum	Total Licences MI/annum
Groundwater	82,715	16,823	99,538
Surface Water	0	3,527	3,527
<b>Total</b>	82,715	20,350	103,065



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*Stresses on water resources**Public water supply*

Public water supplies in the catchment are currently provided by four companies: Mid Kent Water, Sutton and East Surrey Water, South East Water and Thames Water. The sources of potable water are Lower Greensand, Chalk and River Gravel aquifers. Pressure for public water supply is expected to increase with further development in Dartford and elsewhere in the Thames Gateway area.

*Water supply for industry and agriculture*

Industry and agriculture in the Darent area are supplied from both surface and groundwater sources, with the majority from the latter. Although new developments have increased the demand for water there have been local reductions, particularly in the lower Cray Valley at Crayford and Bexley, where industrial abstractions have declined. This decline may have contributed to localised instances of groundwater flooding reported in recent years.

*Forecast demand growth*

Household growth in most of the Darent area is restricted to windfall sites by green belt or AONB constraints. The main exception is Dartford where the number of households within or immediately adjacent to the catchment is predicted to rise by 4,700 units from 1991 to 2001 with an additional 5,800 units by 2006. This will place greater stress on public water supply.

The Habitats Regulations impose a specific duty on the Agency, as a competent authority, to review the effects of new groundwater licences on designated conservation sites.

*Long term stresses and the Darent Low Flow Alleviation Scheme*

The Chalk and Greensand aquifer of the Darent and Cray catchments have for many years provided sources of high quality water for public supply, industry and agriculture throughout North West Kent and South East London. Until recently the total volume abstracted each year from boreholes in the Darent Valley was only slightly less than the average rate of aquifer replenishment by rainfall and records show, furthermore, that for drier than average years there is a substantial deficit (Table 3). At such times summer flows have been severely depleted and under the more extreme drought conditions such as those experienced during 1989-92 and 1995-97 springs have failed and the lower courses of the river have dried out completely.

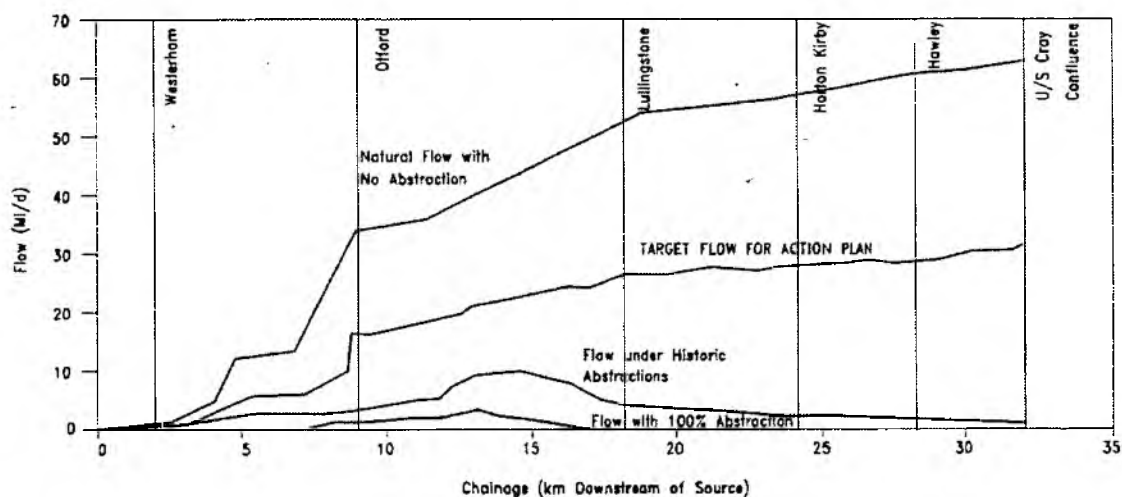
It has been estimated that prior to the implementation of the Darent Low Flow Alleviation Scheme, the average daily flow at Hawley, near Dartford, was only 40% of what would normally be expected of the river at this point in its natural state if no abstractions were taking place anywhere within the catchment (Figure 4).

The impact of flow depletion is evidenced by the loss of biodiversity with the disappearance or at least a substantial reduction of key invertebrates. Recent years have also seen the abandonment of watercress beds and a general increase in the depth and extent of siltation of the river bed gravels which has had its effect in the loss of native brown trout from the middle and lower reaches. Silt deposition has also resulted in the encroachment of reed beds and a consequent reduction in channel capacity.

#### *The Action Plan*

In recognition of the problem, the River Darent was given high priority on a list of 40 over abstracted catchments compiled by the NRA following the 1990 national survey. A subsequent assessment by specialist consultants led to the adoption of a plan for joint action by the NRA and Thames Water Utilities Limited (TWUL) aimed at the restoration of a stable and sustainable chalk stream habitat. This meant that the year-round flows of the river would have to be increased in order to create what is termed an *Environmentally Acceptable Flow Regime* and this has been defined by a sequence of monthly target flows prescribed for key locations along the course of the river.

**Figure 1: River Darent flow accretion profile**



Target Flow Profile

Figure 1 illustrates the principle using a comparison of the conditions likely to obtain during the late summer /early autumn when the river would normally be at or around its lowest flow. It can be seen that the target flows achieved by the Action Plan will approximate to 50% of the flows under natural pre-development conditions. It was understood from the outset that significant improvements in flow could only be achieved by substantially reducing the rate of abstraction from public supply boreholes in the Chalk and Lower Greensand aquifers underlying the catchment and feeding the springs along the course of the river.



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*Outline of Action Plan*

The plan adopted by the Environment Agency, as successor to the NRA, comprises two principle phases summarised as follows:

Phase I (completed mid 1999) having the following components:

- reductions in the authorised and actual quantities of groundwater abstracted by TWUL from boreholes in the Chalk and Lower Greensand;
- river flow augmentation from specially constructed bankside boreholes at Lullingstone, Eynsford and Farningham each capable of discharging between 4 and 5Ml/d;
- construction of low flow weirs designed to increase the depth of flow at important amenity sites (e.g. Eynsford);
- a programme of in-river and bankside works by the Darent Valley Enhancement Programme (DVEP) team (part funded by the Agency) to enhance the conservation value of the scheme.

Phase II (2000 – 2005):

This has been approved by the Department of Environment, Transport and the Regions (DETR) in outline and will comprise further cut-backs in public supply abstraction from boreholes operated by TWUL and South East Water (SEW). It was recognised that the companies would need to make sustained investments in the development of alternative sources of supply to replace the capacity lost in the Darent catchment. With this in mind TWUL are currently investigating the resources of the chalk aquifer of the Swanscombe area, just outside the LEAP boundary, with a view to intercepting a proportion of the groundwater which Blue Circle Industries are currently obliged to pump to waste to protect their quarrying operations.

Progress to date includes:

- abstraction licences reduced to 52Ml/d (66% of original);
- actual winter abstraction reduced to 32Ml/d (41% of original);
- commissioning of three artificial springs delivering up to 15Ml/d;
- achievement of half the target flows in the augmented reaches.

#### **2.2.5. Water quality**

A principal concern of the Agency is to achieve a continuing and overall improvement in the quality of controlled waters through the prevention and control of pollution.

*Current situation in the Darent Area*

The current state of water quality is described below with reference to General Quality Assessment, the River Ecosystem Classification, groundwater protection and consented discharges to water.

*General Quality Assessment (GQA) of surface watercourses*

The Agency routinely obtains chemical and biological data through its monitoring programmes. Periodic assessment is now made by applying the GQA Scheme, which provides a general measure of water quality and allows national comparisons. The assessment is based on water chemistry and the biological diversity of the watercourse. The Chemistry GQA comprises six water quality grades which reflect different levels of pollution (A = very good to F = bad).

Whereas the Chemistry GQA grades reflect the degree of pollution at the time of sampling, the Biology GQA assesses the health of river stretches through the diversity and abundance of particular species of small organisms (macro-invertebrates) that live on the bed of the river. This provides a longer term picture and the best overall guide to the health of the river ecosystem. Biological grades are assigned to rivers based on values of Ecological Quality Index (EQI). EQI is a ratio, which is calculated by expressing biological quality as a fraction of the predicted biological quality that would be found in a clean river. The Biology GQA applies a water quality grading scheme comprising six grades (a = very good to f = bad).

The stretches sampled in the Darent area, as well as consented discharge points, are shown on Map 7, and the GQA Chemical Grades in 1995 to 1997 are given in Table 5.

**Table 5: Chemical quality**

<b>Water-course</b>	<b>Location and Grid Reference</b>	<b>GQA 1995</b>	<b>GQA 1996</b>	<b>GQA 1997</b>	<b>RE Objective</b>	<b>RE Achieved 1995-97</b>
Darent	Otford Gauging Station (TQ 5249 5839)	B	A	B	2	2
Cray	D/S STC Foots Cray (TQ 4776 7129)	B	B	B	3	2
Shuttle	Black Prince (TQ 4985 7420)	C	C	C	3	3

The GQA Biological Grade from 1990 to 1997 for 3 stretches of watercourses in the Darent Catchment are given in Table 6. These results show that the River Darent is very good, the River Cray has moderate quality reflecting its more urban character and the River Shuttle is poor reflecting urban pollution.

**Table 6: Biological quality**

Water-course	Location and Grid Reference	90	91	92	93	94	95	96	97
Darent	Otford Gauging Station (TQ 5249 5839)	a	a	b	b	b	a	a	a
Cray	D/S STC Foots Cray (TQ 4776 7129)	c	c	c	c	n/a	c	c	c
Shuttle	Black Prince (TQ 4985 7420)	e	d	d	e	d	d	d	d

#### *River Ecosystem Classification*

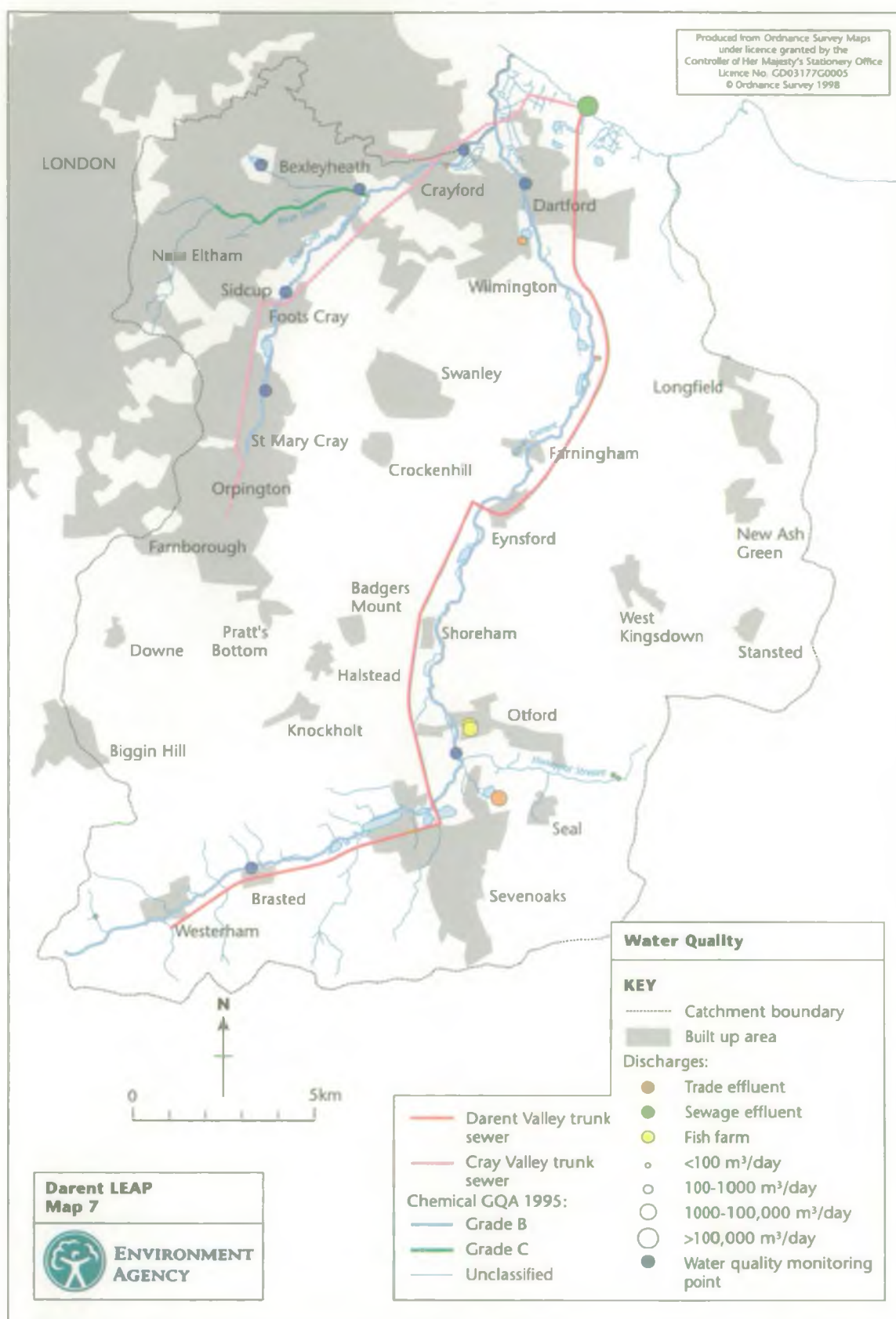
The River Ecosystem Classification is used to establish long term targets for water quality by defining classes containing chemical water quality standards to protect certain water users (RE1 = water of very good quality suitable for all fish species to RE5 = water of poor quality which is likely to limit coarse fish populations).

The target RE classes and achievement for 1995 to 1997 are shown in Table 5. These results show that the Rivers Darent and Shuttle met their targets whilst the River Cray exceeded its target by one class.

#### *Groundwater protection*

The Agency considers the protection of groundwater to be of great importance. Once a groundwater source is contaminated it can take many years before it can be used again. The Agency framework document, *The Policy and Practice for the Protection of Groundwater (1998)*, advises on activities which may affect groundwater quality, including physical disturbance to aquifers, point source and diffuse pollution and contaminated land and identifies constraints. Groundwater Vulnerability Maps that are being produced nationally for England and Wales support these policies. These show the location of aquifers and classify their vulnerability according to the properties of the soil and underlying strata.

The geology of the Dartford area comprises Tertiaries over the Chalk. The Tertiaries are classified as a minor aquifer, and the Chalk is classified as a major aquifer in the terms of policy and practice for the protection of groundwater. The aquifers are heavily used for potable abstraction, and source protection zones (SPZ) I to III exist around each borehole (I being the most vulnerable, III the least). Much of the Darent area lies within these SPZ





areas. The suitability/restrictions on land uses in terms of groundwater protection are authorised in the *Policy and Practice for the Protection of Groundwater*. The industrial history of the river valley has led to contamination of the groundwater. This is dealt with on a site-specific basis depending on the risk to the receiving groundwater. Investigation and clean up proposals need to take into account of the possibility of there being a perched water table in the alluvium and the risk of breaching the two aquifer units and allowing the migration of contamination.

#### *Consented discharges to water*

The total consented volume of effluent that can be discharged within the LEAP area is approximately 6,500m<sup>3</sup> per day (excluding discharges from major industries regulated by the Agency under the IPC regime). The Agency issues consents for discharges from sewage treatment works (STW) and industrial sites to watercourses. It is the responsibility of the water companies to issue consents to industrial organisations that discharge their trade effluent to sewer.

Wastewater generated in the catchment is transferred down large trunk sewers, following the bottom of the Darent and Cray Valleys, to be treated at Long Reach STW and then discharged into the Thames Estuary. As a result only a very small percentage of the water abstracted from the catchment is returned to the rivers.

Long Reach STW is the only public sewage works in the catchment. Regulation of discharges and monitoring of water quality in the Thames Estuary is the responsibility of the Thames Region of the Environment Agency. At present Thames Water are undertaking a capital programme to improve the performance of this works.

#### *Stresses on water quality*

Stresses on water quality are primarily from non-consented discharges and wastes from pollution incidents such as the operation of foul sewer overflows during dry weather conditions, overflow from cesspits, spillage from road accidents and potential contamination from landfill sites and agricultural run-off.

Reported pollution incidents are categorised in terms of their environmental impact from 1 – major to 4 – no impact. During the last 3 years there were 4 Category 1 incidents and 9 Category 2 incidents. The main cause has been untreated sewage entering watercourses including 4 closely related incidents near Sevenoaks during 1996.

### **2.2.6. Protection against flooding**

A key aim of the Agency is to provide appropriate protection for people and property against flooding from rivers and the sea and to provide adequate arrangements for flood forecasting and warning. Details of flood risk areas and flood defence structures are shown in Map 8.

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*Current situation in the Darent Area**Tidal*

After the 1953 event there was a major reconstruction of all sea defences in the Darent LEAP area. These sea defences were further upgraded, including the construction of the Dartford Creek Barrier, in conjunction with the construction of the Thames Barrier. All Thames Tidal Flood defences were built to a 1 in 1000 year standard.

*Fluvial*

After fluvial flooding in 1968, flood alleviation schemes were carried out at Westerham, Chipstead and Dartford. Virtually the whole length of the River Cray was subject to improvement schemes including the reconstruction and automation of Vitbe Mill Sluice, construction of Hall Place flood storage reservoir and flow regulation works at Ruxley Gravel Pits. On the River Shuttle, most of the road bridges were widened and deepened to allow the passage of floodwater and a flood storage reservoir was constructed at Lamorbey Park.

*Flood risk areas*

The worst fluvial flooding in recent history was in September 1968 when both the Rivers Darent and Cray burst their banks inundating large areas of farmland and properties including the town centres of Dartford and Crayford. The risk of flooding is a problem in the Darent LEAP area due to the potential combination of both fluvial and coastal flooding events. In 1953 the worst tidal flooding in recorded history resulted in extensive property damage with high water recorded at 5mAOD in Dartford.

*Maintenance works: tidal*

The tidal defences present are generally in a good state of repair and are maintained primarily by the Environment Agency, through a programme of annual maintenance work. The flood defences protecting marshland and farm land are constructed of earth embankments which are sown with a specialised grass seed mixture, while those defences protecting built up and industrial areas are hard defences; i.e. steel piling and concrete. The Agency is not obliged to maintain tidal defences as public amenities but does require access for maintenance, so there are generally a number of points of access. Parts of the defences are historic public rights of way and as such it is the Agency's responsibility to provide public access to these defences whilst carrying out its defence maintenance programme.

The grass on many of the embankments is flail mown at least twice a year. This is necessary to maintain the structural integrity of the flood defences including in times of over topping. The defences in some locations are botanically interesting, due in part to the mowing regime and the programme is designed to promote this where practical. In view of the length of defence and resources available it is not possible to always undertake the most ideal mowing regime from a conservation viewpoint.

On the hard defences a programme is carried out of monitoring and repairing expansion joints, making minor specialist concrete repairs together with electrical and mechanical maintenance of all moving equipment such as flood doors and sump pumps.

*Maintenance works: fluvial*

Along fluvial lengths of flood defences the Agency ensures that all material that could block sluices is removed. This includes annual clearance of herbaceous growth to prevent it being dislodged at times of high flow and the pollarding of trees during the winter where if there is a danger of them falling in the river. The river is also patrolled during periods of high flow to ensure that blockages at sluices are removed quickly.

A stretch of the River Darent between Horton Kirby and South Darenth is in its fifth year as a demonstration length to determine maintenance techniques that will have minimal impact on sensitive habitats. This work is carried out by Agency Flood Defence and Conservation staff to develop and demonstrate best practice. The aim of this work is to adopt the most successful techniques on additional lengths of the river.

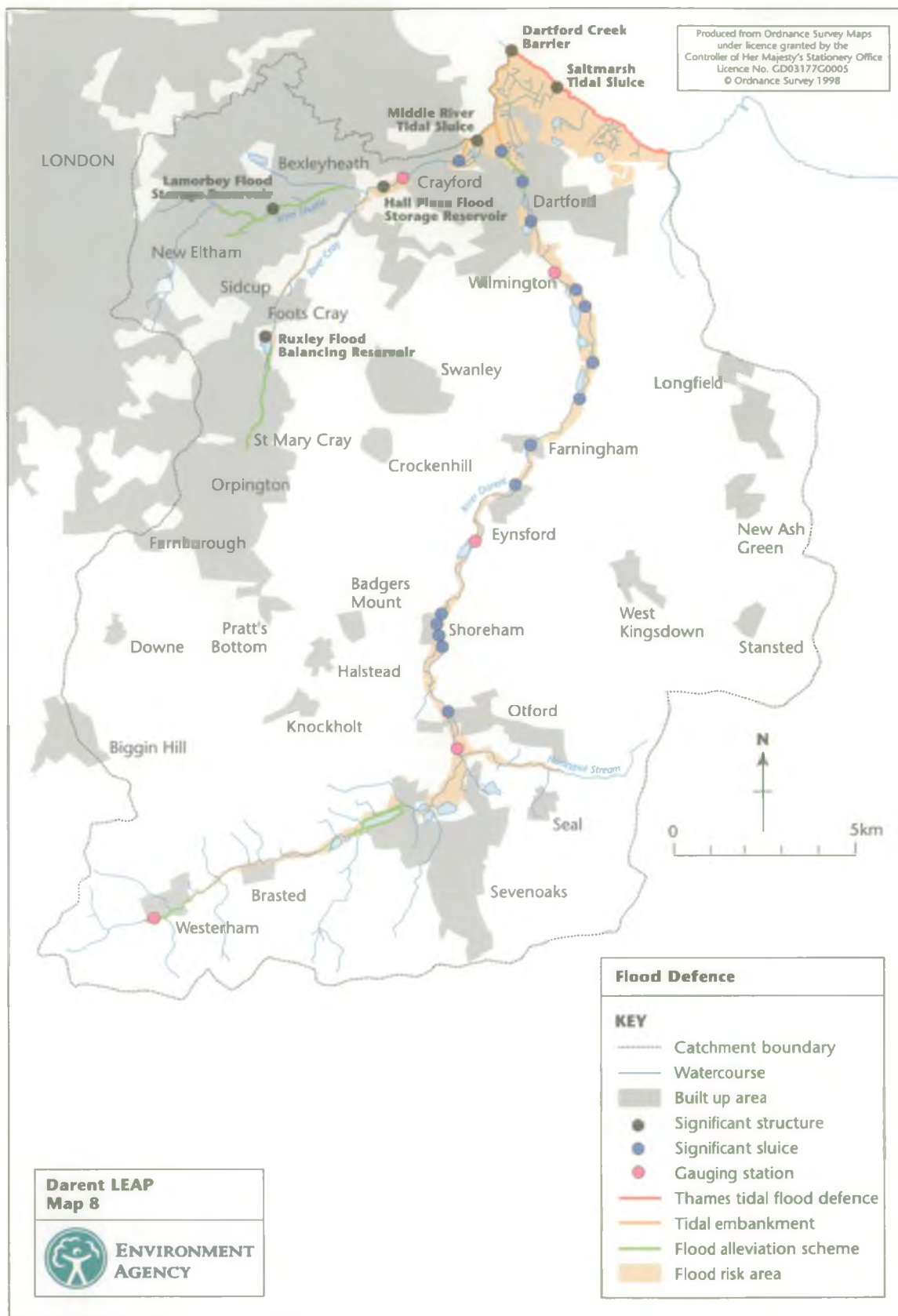
*Dredging*

The Environment Agency occasionally carries out dredging works on main river at the request of the riparian owners, provided there are flood defence, conservation or fisheries benefits. Lengths dredged are invariably mill heads that by their nature entrap unwanted silts.

*Stresses on flood defence*

Four stresses on flood defence have been identified in the Darent LEAP Area:

- pressures for development which have resulted in building in river floodplains and below maximum tide levels in areas protected by sea defences, for example at Crossways at Dartford. There are also associated pressures arising from development not in the floodplain but close to defences;
- blocked combined sewer overflows (CSOs) resulting in backing up of storm waters and flooding;
- recreational use of flood defences which may compromise their effectiveness. The sea defence walls provide useful access routes and many form part of the public rights of way system. There may be opportunities to enhance recreation provision on the sea walls, although there are potential conflicts between different uses on the narrow tops of the walls and with health and safety;
- the natural force of rising sea levels relative to land level, partly due to climate change, which may increase the area of land liable to flood and could have serious long-term consequences for the Darent Area. The UK Climate Change Impacts Review Group (CCIRG) completed a review of the potential effects of climate change in July 1996 for the Department of the Environment (DOE). This document stated that "the balance of evidence suggests that there is a discernible human influence on the global climate". It is predicted that sea level will rise at the rate of about 4mm per year for the UK as a whole and this is likely to be exacerbated in the southern and eastern England by sinking land.





The future planning of flood defences needs to take account of these stresses and in particular for the Thames tidal defences the possible sea level rise due to climate change must be considered. Raising the level of defences above that necessary today can only be justified where evidence of actual sea level rise supports the need. Where reconstruction or improvement of flood defences is carried out, the designed defence level usually takes account of the predicted sea level rise over a 50 year period. Changes to mean sea level are much smaller than the short term changes due to tides, surges and waves. However, only a slight rise in mean sea level will amplify the frequency of extreme water levels caused by storm surges. MAFF allows for an increase of 6mm/year when appraising its coastal defences in the Agency's Southern region, which includes the Darent Area.

### 2.2.7. Recreation

The Environment Agency seeks to protect, improve and promote recreation on or near to water where appropriate or desirable. It is also concerned about the appearance (aesthetic quality) of the water environment.

Recreation covers all aspects of water-related leisure activities ranging from informal types such as walking, picnicking and visiting the waterside to more organised sports such as sailing and fishing. Water forms an important part of the landscape and people enjoy being on or near water appreciating it aesthetically or observing other people or wildlife using it.

The key objectives of the Agency are to:

- increase the quality, quantity and diversity of access;
- improve access to, and facilities available, at Agency sites;
- promote water and associated land for appropriate recreational use;
- increase the number of recreational opportunities through all Agency operations;
- influence environmental improvements, which provide recreational benefits; and resolve any perceived or actual conflicts.

#### *Current situation in the Darent Area*

The close proximity of the Darent and Cray Valleys to suburban South East London ensures that this area is the local playground. Most facilities are used extensively and during summer weekends certain sites become heavily congested with people and traffic. With respect to travel time and cost, the catchment assumes major importance for the vast numbers of local inhabitants (Map 9).

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*Water based recreational activities**Sailing*

Sailing is organised by a sailing club at Chipstead Lake

*Canoeing*

Canoeing takes place at Danson Park Lake

*Bluewater*

A number of water based recreational facilities are being provided at the site of Bluewater Regional Shopping Centre.

*Angling*

There are 13 principal coarse fishing clubs in the area listed below, representing approximately 7,000 anglers. There are also numerous anglers who are not club members.

- Blue Circle Angling Club
- Bromley District Angling Club
- Cray River 84 Angling Club
- Darent Otters
- Dartford and District A.P.S.
- Holmesdale Angling Club
- Kingfishers A.P.S.
- Lamorbey Angling Society.
- Orpington and District Angling Association
- Stone Marsh Angling Club
- Thameside Angling Club
- Wellcome Angling Club
- Wm. Nash Angling Club

Commercial coarse fisheries are operated in the catchment by:

- Darent Leisure
- Pisces Limited
- Leisure Sport

There are also the following trout syndicates fishing on the River Darent:

- Darent Valley Trout Fisheries
- Park Farm Syndicate

*Land based recreational activities*

Public access to the water environment in the LEAP area is generally good. As well as extensive public rights of way near the rivers there are signposted walks following the courses of the main rivers:

- Darent Valley Path- developed, interpreted and promoted by the North West Kent Countryside Project running from Sevenoaks to Dartford.
- Cray Riverway - promoted by Bexley London Borough running from Foots Cray to Erith including public open spaces at Foots Cray Meadows and Hall Place, Bexley.
- Shuttle Riverway - promoted by Bexley London Borough running from Avery Hill to Hall Place.

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Recreational cycling is increasing within the LEAP area, although there are, as yet, few designated cycle routes. The Kent Cycle Route Development Group, comprising local authorities and cycling organisations has proposed a coastal cycling route that follows the Thames Estuary through the catchment.

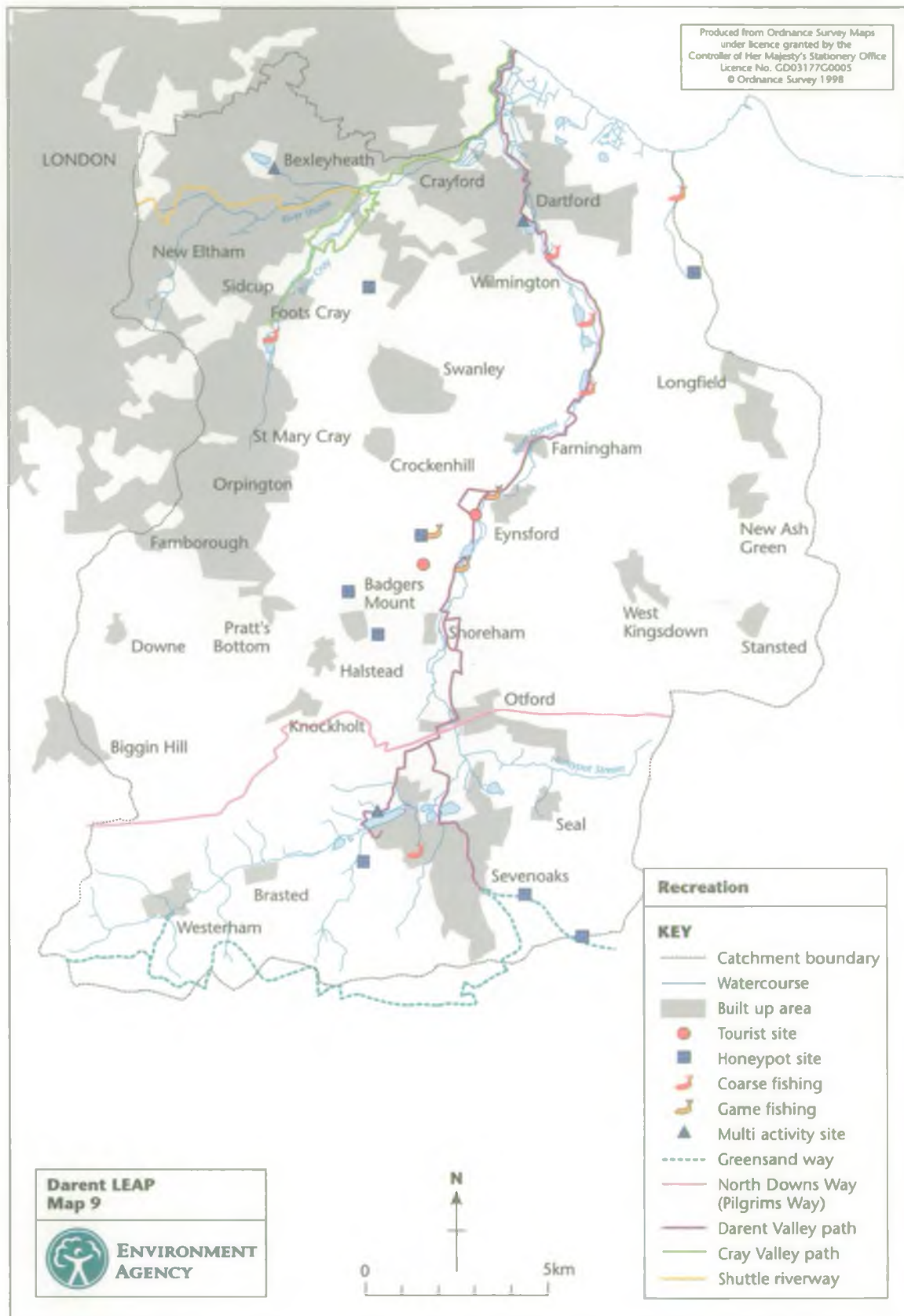
The LEAP area is rich in nature conservation interest and there is some public access available at Sevenoaks Wildlife Reserve, which includes an on-line lake on the River Darent.

*Stresses on recreation*

Due to the close proximity of a large population there is often overcrowding at the popular honeypot sites linked by the Darent Valley Path such as Eynsford or Lullingstone with consequent pressure on the local resources and habitats.

The signposted river paths still have significant lengths away from the banks of the rivers. There is demand for the riverside sections to be increased but this can only be achieved by agreement with landowners. The introduction of greater access to river banks can also give rise to conflict with other uses such as angling or pressure on fragile bankside habitats. A further specific pressure is the increasing use by cyclists of unmade river footpaths.

Although there are extensive locations for fishing in the catchment they only offer limited day permit and "free fishing availability" for the casual angler. Full details can be found in the Agency publication, "Fishing in the South".





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### 2.2.8. Waste management

#### *Current situation*

*The Waste Local Plan (1998)* prepared by Kent County Council indicates a growing shortage of facilities with planning permission to deal with the waste that the community will generate. The Agency, in line with the proximity principle and the principle of regional self-sufficiency, would prefer local facilities to the catchment to be used for waste disposal.

#### *Licensed facilities*

There are 28 sites with licenses for waste disposal activities that are located within the LEAP area. These are identified on Map 10 and their details are summarised in Table 7.

#### *Exempt sites*

Since 1994 the Agency has registered a total of 854 activities in the Kent Area that are exempt from waste management licensing. The main activity covered by these exemptions is packaging waste recovery.

#### *Landfill sites for domestic waste*

There are no landfill sites used for domestic waste within the Darent LEAP area. As a consequence all domestic waste is disposed of outside the catchment.

**Table 7: Activities at licensed waste management sites**

Site Types	No. operational or pre-operational	No. licensed but closed or otherwise non-operational	Total Number
Landfill	7	4	11
Civic amenity sites	5	-	5
Clinical waste incinerators	1	-	1
Composting	1	-	1
Scrap metal	4	-	4
Waste transfer stations	10	-	10
<b>Total</b>	<b>28</b>	<b>4</b>	<b>32</b>

**Note:** These activities take place at the 28 sites shown on map 10 since four sites are "multi activity" as follows:

3 sites are licensed as both Civic Amenity sites and waste transfer stations.

1 site is licensed as both a waste transfer station and for scrap metal.

#### *Void space*

At the end of March 1996, total remaining void space across the whole of Kent was estimated to be 18.4 million m<sup>3</sup>. On the basis of void space requirements, committed disposal capacity, as at 1993, gives a life of almost 14 years for Type A wastes (material for which, in bulk, the environmental impact of decomposition is less than, or comparable with, that of topsoil). Disposal capacity gives a life of just over 5 years for Type B (material which, in bulk, may decompose slowly, but in its deposited form is only slightly soluble in water) and Type C wastes (material which may decompose (rapidly) and may contain soluble matter which could cause pollution if allowed to enter ground or surface water systems).

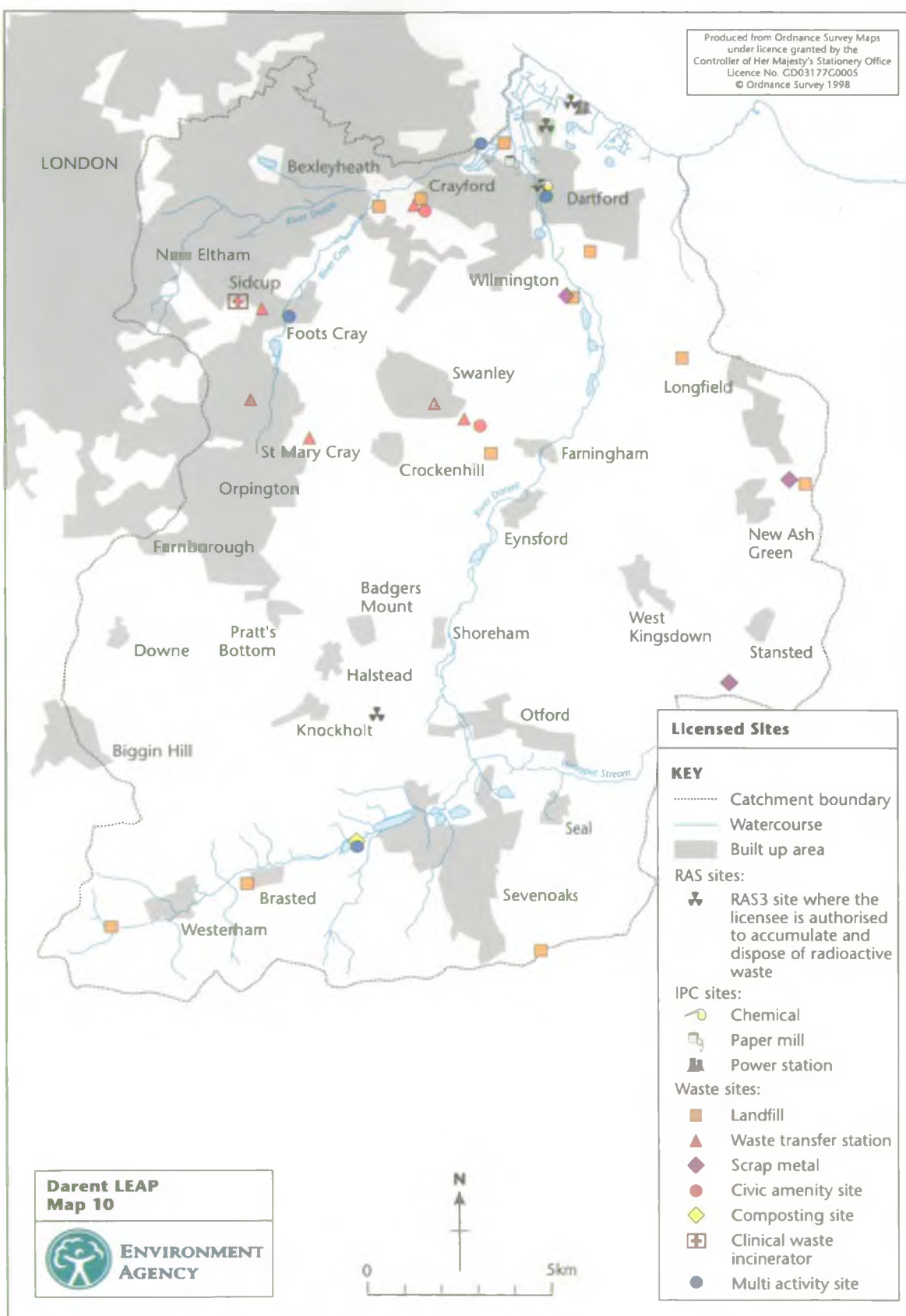
#### *Proposed facilities*

There are no new facilities proposed for domestic waste disposal in the LEAP area.

#### *Stresses on waste management*

##### *Waste arisings*

The Agency has recently commenced work on the National Survey of Waste Arisings. This is based on questionnaires, a telephone survey and some follow-up visits to waste generating activities. The amount of waste arising in the Darent LEAP area will be assessed as part of the National Waste Survey.



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*Storage and spreading of sewage sludge*

The UK agreed under international convention to cease the disposal of untreated sewage sludge at sea by the end of 1998. This necessitates the treatment of sewage sludge at licensed sites and increased spreading on land. The storage and spreading of sewage sludge on agricultural land is regulated by MAFF and regulated by water companies.

Under the Sludge Use in Agriculture Regulations 1989, the sludge producer (generally the water company) is required to keep registers of all spreading sites, waste streams, quantities and the acreage spread. The Environment Agency can inspect these registers at any time and is in the process of doing so under a National Sludge Pilot Survey.

Under the Waste Management Licensing Regulations 1994 (Paragraph 8, Schedule 3), the Sludge Producer is only required to register sites with the Environment Agency where the sewage sludge is to be stockpiled prior to spreading on agricultural land. They also have to register sites with the Agency where they are spreading sludge on non-agricultural land.

In view of the large area falling within source protection zones the spreading of sewage sludge is strictly controlled in the Darent LEAP Area and as a result there are no stockpile sites.

*Transfrontier Shipments of Waste (TFS)*

With a commercial port at Dartford, the area is an important point of entry and exit for numerous shipments under the Transfrontier Shipments of Waste Regulations 1994.

Under the terms of the regulations waste shipments destined for genuine recovery operations are permitted while shipments for disposal are not. Potentially hazardous wastes (Amber and Red Listed wastes) require a prior issued consent before any shipment can take place and prior notification for each shipment of waste once consent has been given. Inspections and spot checks are carried out to ensure that Amber and Red Listed waste shipments are destined for genuine recovery operations and accompanied by the appropriate paperwork.

Green Listed wastes are generally not considered to be hazardous and no prior issued consent is required for these wastes. No pre-shipment checks can therefore be made to ensure that the waste is destined for a genuine recovery operation. Competent Authorities are not provided with pre-notification of individual green listed waste shipments to enable routine inspections to be undertaken at the point of origin, or recovery, or during transit. Where possible, random road checks are carried out at key sites in Kent. These checks ensure that Green Listed wastes are destined for genuine recovery operations, accompanied by the appropriate paperwork and are suitable for inclusion on the Green List (i.e. clean and uncontaminated).



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The tracking and control of Green Listed waste shipment is of concern to the Environment Agency and is an area being considered at an international level. The provision of better information to the Competent Authorities regarding waste sources, routes and destinations would enable more efficient inspection.

*Radioactive Substances Regulation (RSR)*

Under the Radioactive Substances Act 1993, the Environment Agency regulates the storage, use and disposal of radioactive substances and wastes. In the Darent area there are 4 facilities authorised to accumulate and dispose of radioactive waste for hospital, research and industrial use (Map 10).

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## 2.3. THE STATUS OF KEY BIOLOGICAL POPULATIONS COMMUNITIES AND BIODIVERSITY

### 2.3.1. Introduction

Biodiversity encompasses the whole variety of life on earth. This includes all species of plants and animals and their genetic variation, together with the complex ecosystem of which they are part.

A principal concern of the Environment Agency is to help conserve and enhance biodiversity for the benefit of present and future generations.

In order to meet overall objectives for biodiversity, whilst recognising its obligation to consider costs and benefits, the Agency seeks to:

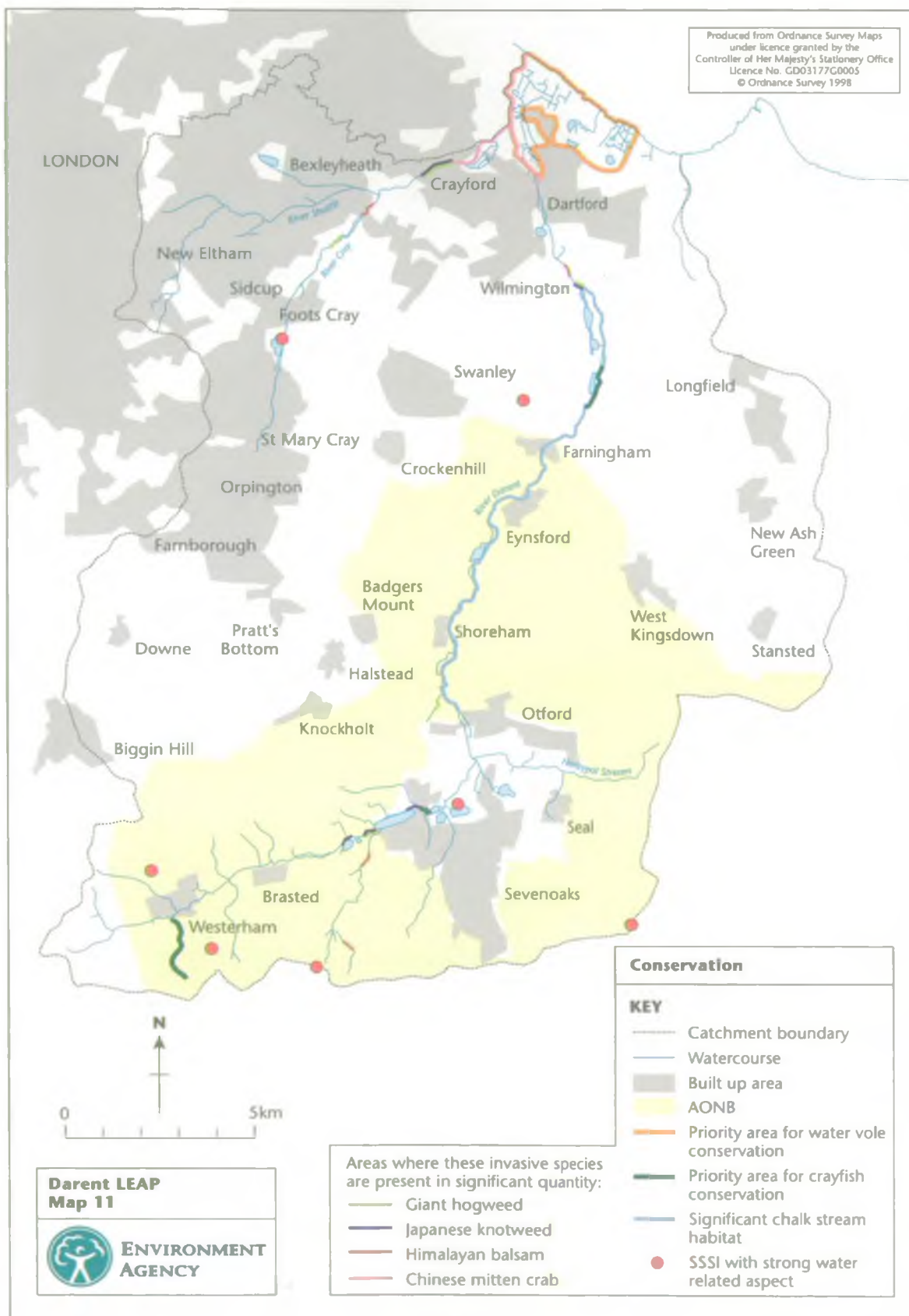
- play a full and active part in delivering the UK's Biodiversity Action Plan;
- play a full part in implementing the EC Habitats Directive;
- implement a series of projects to deliver biodiversity targets at specific sites; in partnership with local conservation groups,
- allocate specific resources to conservation projects aimed at increasing biodiversity;
- improve the management of wetlands for conservation purposes;
- use and promote best environmental practice for the protection and restoration of river habitats;
- implement specific projects to restore habitats in rivers and lakes, increase the area of reed beds and abundance of other water plants, and improve the ecological potential of river banks;
- ensure that there is no deterioration in the quality of the aquatic environment in particular, and deliver significant improvements in river and still water quality by tackling diffuse pollution of them.

### 2.3.2. Key habitats

Due to the predominant chalk geology in the catchment there are only limited wetland habitats of particular relevance to the Environment Agency (Map 11).

#### *Dartford Marshes*

The marshes to the north of Dartford adjoining Dartford Creek and the Thames form one of the largest remaining areas of grazing marsh along the Thames Estuary. There is a gradation of wetland habitats from intertidal mud in the estuary, through saltmarsh where Dartford Creek meets the Thames, to freshwater marsh and wet grassland further south with drainage ditches crossing the area. This area is an important habitat for a number of species including the water vole.



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*Freshwater lakes*

There are a large number of on and off line expired gravel pits associated with the Rivers Cray and Darent. These are used for recreation, fishing, sailing, bird watching, and nature conservation.

*Areas of land owned by the Environment Agency*

The Environment Agency has a responsibility for managing its land to sustain, enhance or create conservation interest where opportunity arises. In the Darent catchment the Agency owns Ruxley Gravel Pit SSSI which is leased to London Wildlife Trust and Orpington and District Angling Association who undertake its management.

**2.3.3. Key species (at risk)***Biodiversity Action Plan (BAP) species*

BAPs are being produced corresponding with the boundaries of various authorities. In the Darent LEAP area BAPs have been produced for Kent and Bromley and are in preparation for Bexley and the whole of London. Under the UK BAP the Environment Agency is the lead agency for a number of species. Of these the water vole, the white clawed crayfish and recently, the otter, have been recorded in the Darent area.

*Water vole (Arvicola terrestris)*: The water vole was formerly widespread but now appears to be restricted to a few locations along the rivers in the catchment and on Dartford Marshes. The target for water vole in the Kent BAP is to arrest the decline in the population in Kent by 2000.

*White-clawed crayfish (Austropotamobius pallipes)*: The native white-clawed crayfish was common more than thirty years ago but the population collapsed due to the fungal *crayfish plague* which was introduced into Britain with the American signal crayfish and Turkish swamp crayfish by commercial crayfish farmers. The white clawed crayfish is now subject to EC Directive protection and the only residual stock of the species in the catchment is to be found at Dunton Green, Sevenoaks. Consideration should be given to the needs of white-clawed crayfish when constructing in-stream habitats for fisheries improvement and any other changes that may affect the river habitat.

*Otter (Lutra lutra)*: The otter is a very shy animal infrequently observed within the catchment. Most sightings are believed to be of otters travelling through the area. Two mortalities in the vicinity of railway lines at Gravesend and Sevenoaks are believed to have been such animals. However, the recent discovery of otter spraints or droppings near Shoreham on the River Darent suggest that another animal may have moved in, perhaps encouraged by the development of bankside buffer strips in the valley.



*Chalk rivers:* In addition to these species the Agency is the lead partner for chalk river habitats. Whilst Greensand is the underlying stratum in the headwaters of the Darent catchment, much of the water emanates from aquifers arising from a chalk base.

#### *Fisheries*

Within the Darent LEAP Area the Agency's fisheries relate to trout, freshwater fish and eels.

*Salmon and sea trout (migratory salmonid fish):* The catchment is not known for stocks of migratory fish. The Thames River Authority prior to 1989 attempted to install a salmon run by stocking juvenile fish in the River Darent. There were no reports of a run materialising following their efforts. A large salmonid type fish was reported to be in the pool below the weir at Glaxo Wellcome in Dartford in the early 1990s but the species was not validated. It is likely, because of the size and the flow characteristics of the River Darent, that any run of migratory fish would consist of sea trout and not salmon.

*Non migratory trout (brown trout):* The Darent was renowned for its stocks of wild native brown trout in the 19th Century. The fishery declined with declining water quality in the early part of the 20th Century but improved in the 1940s & 50s when the middle reaches of the river were well stocked with fish. Reductions in summer river flow associated with increasing abstraction and periodic drought (1976, 1990-92, 1996) caused most of these fisheries to be abandoned.

Most stocking with trout today is with the non-native rainbow trout although token stockings with takeable sized brown trout continue. The NRA implemented a two year stocking programme with 2,000 x 3"-5" brown trout after the 1990-92 drought which, together with habitat improvements, resulted in an increased frequency of occurrence and capture of the species in the catchment. However, the location of juvenile, naturally replicated brown trout in the River Darent remains a rare phenomenon and its status is only likely to improve with increases in river base flow and improvements in the quality of spawning gravels.

Drought and silt deposition has resulted in a shallow uniformity in many streams with subsequent loss of cover for fish, increased predation and displacement. The reinstatement of the *pool riffle* structure has been achieved as part of the Darent Valley Enhancement Project by the construction of small fisheries weirs and deflectors by staff from the Agency and the North West Kent Countryside Project.

**Table 8: Fisheries locations and fish farms**

Type	Name of Water	Owner/club
Coarse Fisheries	Bluewater	Bluewater
	Brooklands	Dartford Borough Council / Dartford and District APS
	Broomwood	Wm. Nash Angling Club
	Chipstead	Marley / Holmesdale Angling Society
	Clubbs Pit	Darent Otters
	Coombe Bank	Coombe Bank School
	Crossways	Blue Circle Angling Club
	Crossways	Stone Marsh Angling Club
	Darent Complex (5 lakes)	Darent Leisure
	Danson Park	Bexley Borough Council
	Glaxo Wellcome, Dartford	Wellcome Angling Club
	Greatness	
	Horton Kirby (4 lakes)	Dartford and District APS
	Lamorbey Park	Bexley Borough Council / Lamorbey Angling Club
	Montreal Park Lake	Holmesdale Angling Society
	Police Pit	Cray River 84 Angling Club
	River Cray, Crayford	Thameside Angling Club
	River Darent, Lullingstone	Kingfishers APS
	Roman Villa	Darent Leisure
	Ruxley (4 lakes)	Environment Agency / Orpington and District Angling Association
	Sevenoaks wildlife nature reserve (4 lakes)	Bromley and District AC
	Stone Castle	Blue Circle Angling Club
	Sundridge	Pisces Ltd
Trout Fishery	Sutton at Hone (2 lakes)	Dartford and District APS
	Sutton at Hone (3 lakes)	Leisure Sport
Trout Farms	Valence School	Valence School
	Lullingstone	Kingfisher Angling Club
	River Darent, Lullingstone – Otford	2 trout syndicates
	Otford	Becketts Well

*Coarse (freshwater) fish and eels:* 19 species of coarse fish have been found in the rivers and tributaries within the Darent Catchment. The most important species in these rivers are chub, roach, eels, pike, perch, gudgeon and dace. Common and mirror carp, bream, tench and rudd are also present with other coarse fish (perch, roach etc) in the on-line and adjacent freshwater lakes.

The principal coarse fishing areas are contained within the on-line and off-line lakes and gravel pits in the Darent & Cray Valleys (See Table 7 in the River Darent & Cray Fisheries Strategy). However, important coarse fished river sections on the Darent are at Dunton Green, Sevenoaks, Otford to Shoreham, Horton Kirby and Dartford, and on the Cray at Five Arches near Foots Cray, Hall Place near Bexley and Vitbe Mill near Crayford (Table 8). The entire lengths of the River Darent & River Cray are designated as Cyprinid fisheries under the EC Freshwater Fisheries Directive (78/649/EEC). (See also 2.2.7 for recreational aspects of fishing).

#### *Fish farm*

There is one fish farm in the catchment at Beckett's Well near Otford on a minor tributary of the River Darent. This farm rears mostly rainbow trout and some brown trout.

### **2.3.4. Designated nature conservation areas**

English Nature is responsible for proposing sites for designation under international or national legislation such as the EU Habitats Directive or the Wildlife and Countryside Act. At a local level Sites of Nature Conservation Interest (SNCIs) are designated by Kent Wildlife Trust and Local Nature Reserves are identified by local authorities. Both are recognised and protected in local authority plans.

In the Darent LEAP area there are no international or European sites (Ramsar, Special Protection Areas, Special Area for Conservation) nor any National Nature Reserves (NNR) and Environmentally Sensitive Areas.

#### *Sites of Special Scientific Interest (SSSI)*

There are 17 SSSIs in the LEAP area, of which 7 have strong water related aspects. These are listed below and shown on Map 11.

- Farningham Wood
- One Tree Hill and Birchett Common
- Ruxley Gravel Pits
- Scords Wood and Brockhoul Mount
- Sevenoaks Gravel Pit
- Westerham Mines
- Westerham Woods

#### *Sites of Nature Conservation Interest*

There are 65 SNCIs in the Darent area.

#### *Stresses on the biodiversity of the Darent Area*

As indicated above, many factors influence the abundance and diversity of flora and fauna in the Darent Area. These include:

---

*Natural stresses – sea level rise*

With rising sea level intertidal mudflats and saltmarsh would naturally migrate inland. Along the Thames Estuary the “hard” sea defence walls are preventing this process reducing the area of the mudflats.

*Natural stresses - cormorants*

Natural stresses on the fisheries of the area include the perceived impact of cormorant activity on fish populations in inland still waters and dykes. The cormorant population (*Phalacrocorax carbo*) has been dynamically expanding nationally at an annual rate of 7% during recent years. Their habit has changed from principally sea feeding to feeding in inshore lakes and estuaries particularly during the winter. Cormorants are predators of fish particularly in the 100g to 700g weight range and will take trout, coarse fish and eels. Heavily stocked recreational fisheries and fish farms are especially targeted by the birds, which may fish in pairs or groups.

The birds are protected by the Wildlife & Countryside Act 1981. Problems with over wintering residents have been noted at Ruxley Lakes, Danson Park Lake & Horton Kirby Lakes. Orpington and District Angling Association at Ruxley Lakes has a MAFF licence to shoot a limited number of cormorants each year. Five Agency / MAFF / DETR Research & Development projects on cormorant spread, biology etc. come to fruition in the near future. Further controlling legislation is only likely to be instituted if economic damage can be shown to fisheries.

*Natural stresses - climate stresses*

Reduced rainfall in the area has resulted in lowered water levels and in some instances the total drying out of river stretches resulting in the need for fish rescues. In some cases extensive fish mortalities have resulted.

*Natural stresses - long term effects*

Fisheries are surveyed on a better than 5 year rolling programme but there is concern that there is insufficient baseline information on fisheries against which stresses on the fish population can be assessed. This will improve when a national classification scheme is introduced to give better objectivity.

*Societal stresses – abstractions*

Heavy abstraction in the past has resulted in dropping groundwater levels and, in places, the rivers drying up in places putting stress on the aquatic environment. The Darent Action Plan has addressed these problems and its implementation has helped alleviate these stresses.

The water vole, a legally protected and BAP target species, is present in the LEAP area. The main threats to the water vole population come from low water levels in the ditches, habitat degradation and predation by mink and dogs.



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*Societal stresses - discharges*

There are no major water discharges in the Darent catchment to cause pressure on the habitats.

*Societal stresses – agriculture*

Drainage ditches constitute an important environment for fauna and flora. In the Darent Valley ditches contain reeds, emergent and bankside wild flowers, watercress, submerged water weeds and the related vibrant fauna including dragonflies and damselflies. Not only do the ditches contain resident plants and animals but they act as havens for fish during flood events in the main river, as spawning areas for many species of adult fish and rearing areas for fish fry, amphibia and molluscs.

The ditches are very sensitive to management for drainage purposes and to reductions in flows from spring feeds. It is important that routine maintenance work undertaken by the Environment Agency and landowners is carried out sensitively. The Agency produces an annual maintenance programme and consults widely before starting any works.

Consideration is being given to return some drained areas to formerly maintained water meadow status, which will encourage the returning wild cress beds and enhance the prospects for aquatic life.

*Societal stresses – recreation*

Extensive use of recreational facilities within the catchment causes congestion during peak periods.

Fishing activities undertaken in the LEAP area, such as the introduction of hatchery reared trout, have the potential to impact on key fish species. For example, the viability of wild brown trout populations in the Darent may be adversely affected by inbreeding with hatchery reared brown trout which are less fit to live in the wild. Rainbow trout also compete with and predate upon wild brown trout stocks.

*Societal stresses - development*

Development of artificial sea defences has the potential to result in alteration of the natural coastal processes and reduced deposition of material on saltmarshes, thus contributing to the loss of saltmarsh habitat.

Pressure for development in the LEAP area poses a threat to the natural habitats of the catchment.

*Societal stresses – illegal practises*

Theft of specimen fish especially carp from still water and their unregulated transfer can cause overstocking and disease problems.

---

During the past ten years, there has been a dramatic increase in the number of commercially operated fisheries. Always looking to attract more anglers, some exotic species of fish have been imported from abroad, which invariably grow to super-specimen size and appeal to trophy hunters. Naturally, such fisheries charge a premium to fish for these species.

The potential exists for the escape or further illegal transfer of unsuitable species appearing and interfering in riverine habitats or carrying infective agents to those waters. The catfish (*Silurus glanis*) now appears in some of the lakes having been illegally imported from Europe.

The Environment Agency is implementing an Order made under the Introduction of Live Fish Act 1980, which will require all persons keeping exotic fish to be licensed. The provisions include the dealer trade and commercial fisheries described above. Applicants had until May 1999 to apply for the necessary licence after which time unlicensed keeping has become an offence.

## **2.4. COMPLIANCE WITH ENVIRONMENTAL QUALITY STANDARDS, TARGETS AND POLICIES/STRATEGIES**

### **2.4.1. Waste management and regulation**

The draft waste strategy for England and Wales *A way with waste* (DETR June 1999) identifies specific goals for waste management:

- to reduce industrial and commercial waste sent to landfill to 85% of 1998 levels by the year 2005;
- 45% of municipal waste recovered (recycling, composting, or energy recovery) by 2010;
- 30 % of household waste recycled or composted by 2010;
- reduce household waste arisings possibly to a target weight (still to be determined) per household per year.

No accurate data are available about compliance with these targets in the Darent area. However, in January 1993 recycling centres were in operation at 22 sites across Kent as a whole, of which 17 were purpose built householders' waste sites. Most are small-scale operations, sorting and bulking up inert waste. In 1992-93 8.3% of domestic waste in Kent (53,600 tonnes) were recycled through local authority facilities.

### **2.4.2. Flood defence**

#### *Flood warning responsibilities*

Colour coded warnings are given when water levels are likely to exceed existing flood defences and when combinations of climatic conditions are exceptionally adverse. Colour coded warnings are given according to the amount of flooding likely, as shown in Table 9.

**Table 9: Colour coded flood warnings**

Yellow Warning	A warning of flooding to some low lying farmland and roads near rivers or the sea
Amber Warning	A warning of flooding to isolated properties, roads and large areas of farmland near rivers or the sea
Red Warning	A warning of serious flooding affecting many properties, roads and large areas of farmland

Flood warnings can be issued to households at risk by the use of the Automatic Voice Message (AVM) system over the telephone. Warnings are also distributed via the media such as AA Roadwatch, local radio and teletext. In a flood event more information can be found on Floodcall (0645 881188).

The areas where flood warnings can be issued in the Darent LEAP area are shown in Table 10.

**Table 10: Flood risk zones wholly or partially in the Darent LEAP area.**

Type	Zone	Area
Coastal	1	Dartford to Higham Marshes
Fluvial	7A1	River Cray
Fluvial	7A3	River Darent – Westerham to Chipstead (A21)
Fluvial	7A4	River Darent – Chipstead (A21) to Dartford (A225)
Fluvial	7A5	River Darent – Dartford

*Flood defence standards of service (SOS)*

Specific reaches of sea defences along tidally influenced watercourses, are classified as providing “below”, “above” or “acceptable” standards of service. Other reaches of sea defence are classified according to their condition i.e. good, fair or poor.

The provision and maintenance of defences, to improve the standards of services, requires a large amount of capital expenditure. The survey which provides the basis for the current SOS figures for the Darent area tidal defences was conducted in November 1992, and since then work has been undertaken to improve the defences. However, there remains a need to constantly review these standards, such as for the effects of climate change, through a continuous programme of defence maintenance and improvement (see 2.2.6.).

### **2.4.3. European water quality directives**

The following EC Directives contain standards that are relevant to water quality in the area:

- Dangerous Substances Directive
- Freshwater Fisheries Directive
- Groundwater Directive

The Agency is required to ensure compliance with certain elements of the Directives cited above.

*Dangerous Substances Directive*

The Dangerous Substances Directive (EC Directive 76/464/EC) covers the control of substances based on their toxicity, persistence, and potential to accumulate in biological organisms. They include specific organic compounds such as pesticides and solvents, and specific metals that are discharged to the aquatic environment through some form of effluent treatment.



This Directive describes two lists of compounds. List I contains substances regarded as particularly dangerous because they are toxic, they persist in the environment and they bioaccumulate. Discharges containing List I substances must be controlled by Environmental Quality Standards (EQSs) issued through Daughter Directives. List II contains substances that are considered to be less dangerous but which still can have a harmful effect on the water environment

There were no List I or II failures in the Darent Area in 1997 or 1998.

#### *Freshwater Fisheries Directive*

This Directive on the quality of fresh waters needing protection or improvement in order to support fish life (78/659/EEC) lists appropriate water quality standards for salmonid and cyprinid freshwater fish communities.

There were no failures in the Darent Catchment in 1997.

#### *Groundwater Directive*

The Groundwater Directive seeks to prevent pollution of groundwater from certain dangerous substances. The substances are split into two lists. List I contains the most dangerous substances and these must be prevented from entering groundwater. List II substances are less dangerous but their entry into groundwater must be limited such that it does not cause pollution of the groundwater.

The Government has developed the Groundwater Regulations, which transpose the Directive into British law. This was enacted on the 1 April 1999 and requires the Agency to authorise any disposal of materials containing List I or II substances that could impact or reach groundwater. People wishing to carry out an activity which includes the discharge of List I or II substances to the ground or groundwater after 1 April must apply for an Authorisation prior to undertaking the activity. Failure to do so is a criminal offence.

The Agency can also serve notices on individuals or companies that use or store List I or II substances where it believes that due to a lack of proper facilities or procedures there could be an accidental release of such substances to groundwater. The notice would detail works required by the person or company to prevent such a release and a date by which the work must be done.

The Agency expects to authorise a number of previously exempt activities especially in the farming industry such as the disposal of used sheep dip. A number of properties and industries within the area have oil storage tanks. The Agency will seek to identify those that are below standard and serve notices to prevent pollution occurring.

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#### **2.4.4. UK water quality objectives and standards**

##### *River Quality Objectives*

Details of recent results for river quality objectives are given in section 2.2.5.

#### **2.4.5. Consented discharges to water**

The consented discharges to water are reviewed in section 2.2.5. These include consents that the Agency issues for sewage treatment works and industrial sites. Improvements in effluent quality from sewage treatment works are frequently needed to meet river quality objectives through Asset Management Plans (AMPs).

#### **2.4.6. Fisheries**

Although the Agency has a statutory duty to maintain, improve and develop fisheries, there are few targets or criteria against which fishery performance is assessed. At present there are no targets for the assessment of stocks of freshwater fisheries, eels, smelt and trout. With regard to cyprinids, a National Monitoring Review is underway and it is probable that targets will be a recommendation. Salmon targets have been set in Salmon Action Plans for the most important rivers in England and Wales but the Darent is not in that category.

In addition, the level of current information on fish stocks is insufficient to provide an adequate baseline for assessment.

---

## **2.5. HEALTH OF THE ENVIRONMENT**

### **2.5.1. Introduction**

Traditional methods of assessing environmental quality have relied heavily on the taking of measurements with respect to established physico-chemical standards and criteria. As a consequence, sets of data have accumulated over the years on the levels of certain substances in the environment. Assessments of the state of the environment have frequently been made on the basis of whether the levels of substances are considered to be acceptable or not, rather than by direct measurement of the state of the environment itself. There are good reasons why this has been so. Methods for sampling and analysis for many substances are well developed and convenient, quantitative standards exist, and there is a direct link to the control of emissions to the environment.

Developments in the science of ecotoxicology are opening new avenues for more direct assessment of environmental health. New ecotoxicological techniques show considerable potential not only in providing direct measures of ecological condition but also in making the important link between the observed effects and their causes. Ecotoxicological databases are continually expanding, covering an increasing number of different species and different chemicals, providing a valuable source of interpretative information. A challenge for the future is the development of techniques that allow direct measurement of ecological health "symptoms" that are sufficiently robust and reliable for incorporation into national monitoring programmes. There is still much to be done however to improve overall understanding of the health of the environment and how it is changing in response to the pressures placed upon it.

### **2.5.2. Acidification**

Acidification of the land and surface water is caused by acid deposition - the wet and dry deposition of acidic substances from the air that can affect areas hundreds of miles away from their original sources. Acid deposition consists largely of sulphur dioxide ( $\text{SO}_2$ ) and oxides of nitrogen ( $\text{NO}_x$ ) from the burning of fossil fuels in power stations, other industrial processes, and in road transport, with ammonia emissions from agriculture accounting for a lesser proportion through oxidation to  $\text{NO}_x$ . Emissions of  $\text{SO}_2$  are thought to be responsible for nearly two-thirds of all deposition, with about a third coming from  $\text{NO}_x$ . Natural sources of acidity, including organic decay and lightning, account for only 5% of acid deposition in the UK.

The major sources of emissions of  $\text{SO}_2$  and  $\text{NO}_x$  in the Darent Area are power stations, other industry and road transport. Owing to the nature of the geology in the area there are no specific stresses arising from these emissions in the Darent catchment.

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### 2.5.3. Water

The health of the water environment can be described by parameters other than standard chemical determinands such as Biochemical Oxygen Demand (BOD) (see section 2.4.3 of Kent Area Environmental Overview, p. 98). A further indicator is invertebrate diversity, which is reflected, in the Biological GQA (see section 2.2.5.).



## 2.6. LONG TERM REFERENCE SITES

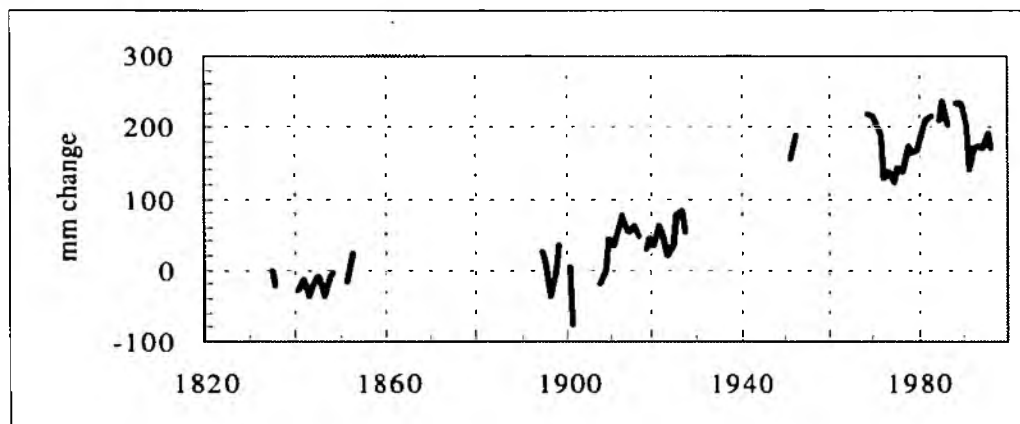
### 2.6.1. Long term air quality monitoring

Local ambient air quality monitoring in the Darent catchment is conducted by the Local Authorities, supported by the Kent Air Quality Monitoring Network operated by the South East Institute of Public Health on behalf of the Kent Air Quality Partnership. In addition, monitoring data from adjacent areas, for example, those covered by the London Cluster Groups of Local Authorities, is acquired and incorporated into ambient air quality assessments to take account of the impact of neighbouring areas. The Agency's remit on air quality issues does not extend to ambient air quality monitoring.

### 2.6.2. Sea level rise

Average sea level relative to land is measured at fixed monitoring points around the coast. The nearest site to the Darent LEAP area where long term readings have been taken is at Sheerness which gives a good representation for the Thames Estuary as a whole (Figure 2).

**Figure 2: Sea level change at Sheerness**



Source: Proudman Oceanographic Laboratory

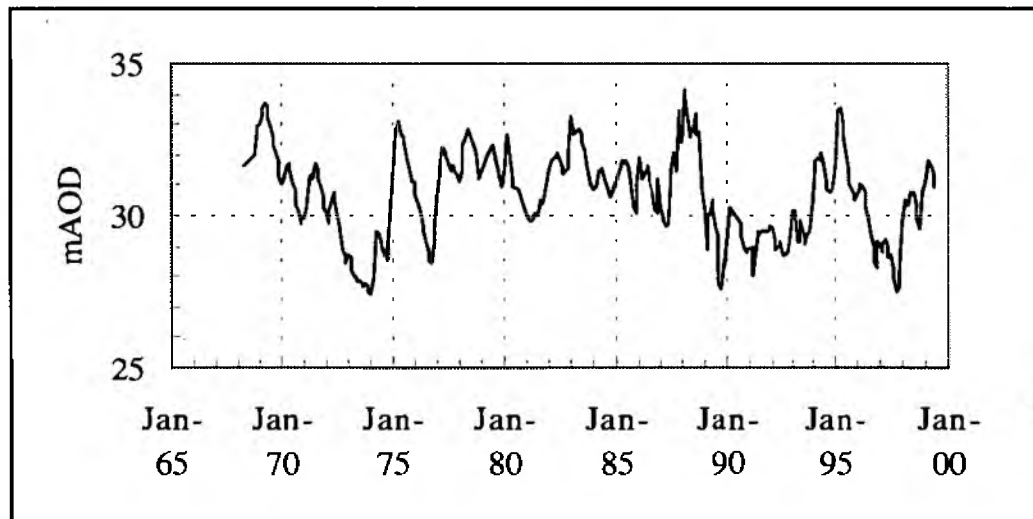
### 2.6.3. Harmonised monitoring site

River quality is monitored in a consistent manner at a series of sites, which are mainly just above the tidal limit or confluence of major tributaries of rivers, under the Harmonised Monitoring Scheme. In the Darent catchment the River Cray above its tidal limit at Vitbe Mill is the only point sampled under this scheme. At present insufficient data is available to accurately determine long term quality trends at this point.

#### 2.6.4. Reference groundwater borehole

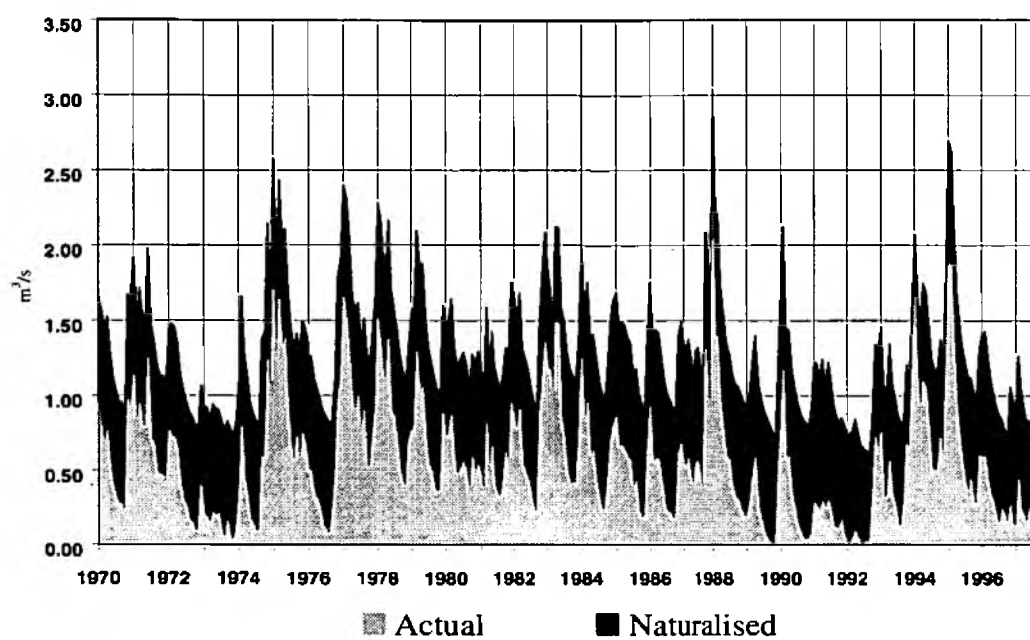
Figure 3 below shows groundwater height, taken from the Hop Pole Inn Borehole, in metres above ordnance datum from 1970. The general trend is of a peak in groundwater height during the winter months, however, an overall reduction can be seen since 1990.

**Figure 3: Groundwater levels in the North Downs Chalk Block at Hop Pole Inn near Farningham.**



#### 2.6.5. Long term river flows

There are a number of gauging stations on the Darent where long term flow data is collected. The site at Hawley, shown in figure 4, is close to the lengths of river that have been most affected by low flows in recent years.

**Figure 4: Naturalised and actual flow at Hawley**

Note: Actual flow is the quantity physically measured  
Naturalised flow is an estimate of the expected flow uninfluenced by abstractions or discharges.

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## **2.7. AESTHETIC QUALITY OF THE ENVIRONMENT**

### **2.7.1. Introduction**

The preceding sections of this Environmental Overview have assessed the state of the environment of Darent from the perspective of series of 'technical' viewpoints. The same viewpoints are used nationally by the Agency to ensure consistency between Regions and Areas. They also help to identify issues for the Agency to address through the LEAP. Qualitative or aesthetic aspects of the environment are also important, however, and it is in these terms that most people view the environment – what it looks like, how it feels.

The links between the Agency's responsibilities and the aesthetic quality of the environment are often indirect, however, an understanding of people's perceptions of an area is an important aspect of the LEAP process. The following paragraphs consider two aspects: landscape quality and tranquillity.

### **2.7.2. Landscape quality**

Landscape assessment is principally a tool for identifying the character of the landscape rather than assessing landscape quality. Section 2.2.2 describes the landscape character of the LEAP area and refers to the Countryside Commission's Character Areas.

### **2.7.3. Tranquil areas**

The Countryside Agency and Council for the Preservation of Rural England (CPRE) have prepared maps showing the influence from visual or noise intrusion of development and traffic. Areas that are far enough away from these sources determined by a number of criteria are deemed to be tranquil areas.

Due to its close proximity to London already by the 1960s only a small proportion of the catchment was classed as tranquil areas and these had virtually all been lost by the 1990s (Map 12).

### **2.7.4. Aesthetic GQA of rivers**

Trials were carried out in 1995 in some areas of the Agency to assess the aesthetic river quality based on the quantities and types of litter, oil, sewage-derived litter and other debris present. No formal assessment has yet been undertaken in this catchment.

**Darent LEAP  
Map 12**



**ENVIRONMENT  
AGENCY**

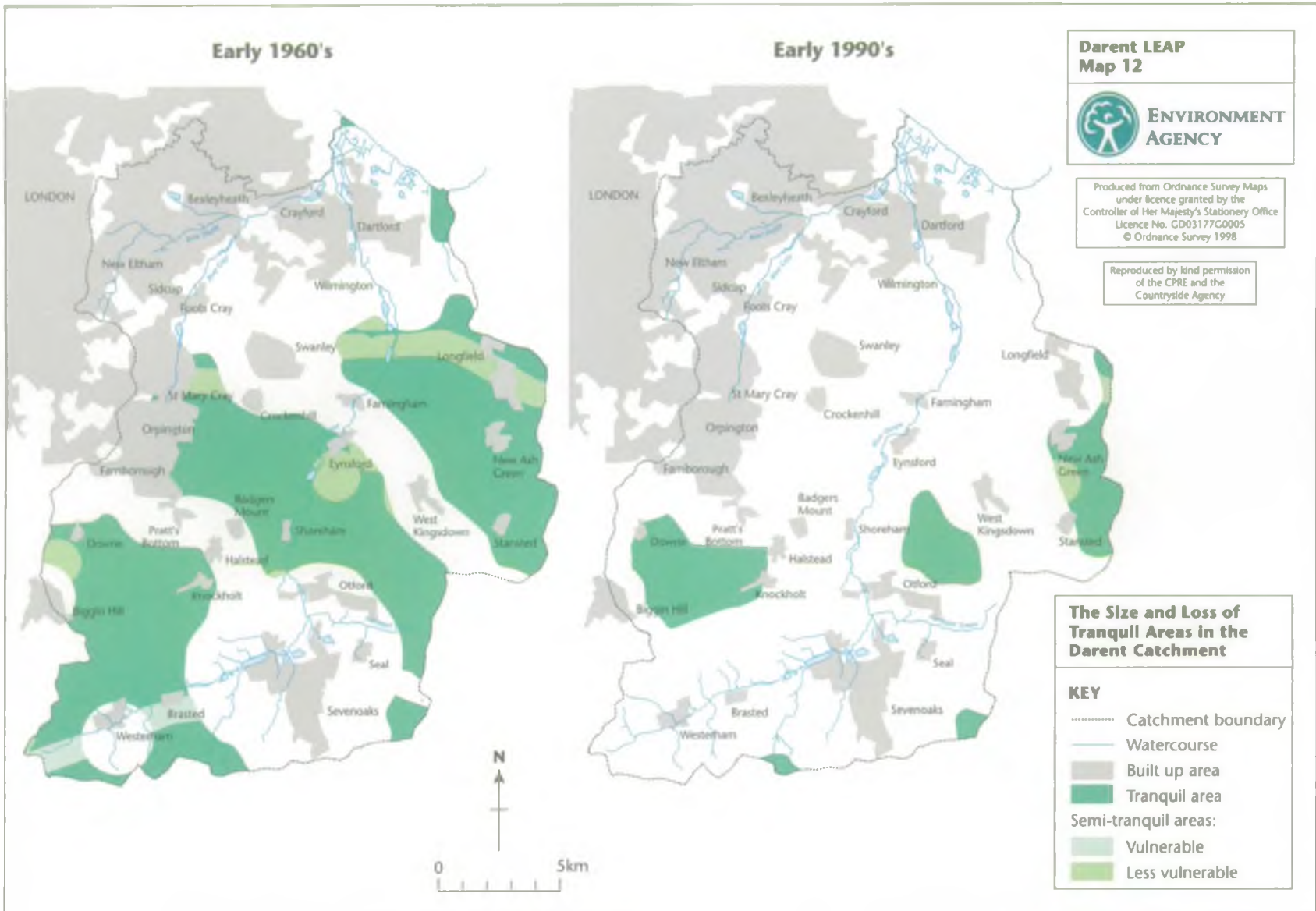
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**The Size and Loss of  
Tranquil Areas in the  
Darent Catchment**

**KEY**

- ..... Catchment boundary
- Watercourse
- Built up area
- Tranquil area
- Semi-tranquil areas:
- Vulnerable
- Less vulnerable





### 3. SUMMARY OF ISSUES TO BE ADDRESSED

#### 3.1. INTRODUCTION

This section provides a summary of the issues emerging from the Environmental Overview of the Darent LEAP area. The issues are grouped around the nine Principal Concerns of the Environment Agency.

#### 3.2. SUMMARY OF ISSUES

Environment Agency Concern*	Issue
Addressing Climate Change	1. Increased summer peak water demand arising from more extreme seasonal climate variation
	2. Impact of sea level rise on the effectiveness of flood defences
Improving Air Quality	Relevant issues already Identified in the KentArea LEAP
Managing Water Resources	3. Deterioration in the balance of water resources as a result of historic development of groundwater for public supply
	4. New economic developments are increasing the pressure on water resources in the Darent Catchment
Enhancing Biodiversity	5. The spread of invasive species through the Catchment
Managing Freshwater Fisheries	6. Excessive unlicensed fishing due to proximity to major urban areas
Delivering Integrated River-Basin Management	7. Loss of water from the catchment
	8. Impact of changing patterns of water abstraction
	9. Accessibility to water based recreation in the Darent Catchment for all people
	10. Management of Dartford Marshes
	11. Operation of weirs and sluices on the Darent
	12. Impact of creosote pollution and siltation at Broomwood Lake
	13. The need for wider adoption of best practice river management
Conserving the land	14. Potential land contamination problems

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Environment Agency Concern*	Issue
Managing Waste	15. Scrapyards and water quality
	16. Trans-frontier Shipments of Waste (TFS) at Thames Europort
	17. Flytipping
Regulating Major Industries	No issues identified beyond normal statutory duties.

\* From: An Environmental Strategy for the Millennium and Beyond (Environment Agency 1997)

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**APPENDIX 1: GLOSSARY**

Abstraction	Removal of water from surface water or groundwater, usually by pumping.
Abstraction Licence	Licence issued by the Environment Agency under Section 38 of the Water Resources Act 1991 to permit water to be abstracted.
Asset Management Plan	Asset Management Plans are the means by which the water undertakers plan the work required and the capital expenditure necessary, for improvements and maintenance of the water supply, sewage treatment works and sewerage systems. These are drawn up through consultations with the Agency and other bodies to cover a five-year period. The Department of the Environment Transport and Regions, and OFWAT must agree Asset Management Plans.
Aquifer	A layer of underground porous rock which contains water and allows water to flow through it.
Biochemical Oxygen Demand	A measure of the amount of oxygen in water during the breakdown of organic matter.
Catchment	The total area of land which contributes surface water to a specified watercourse or water body.
Combined Sewer Overflow	An overflow structure that allows discharge from the sewerage system to a watercourse during wet weather conditions.
Controlled Water	Defined by the Water Resources Act 1991 Section 104. They included groundwaters, inland waters and estuaries.
Cyprinid	Coarse fish of the carp family ie roach, dace, bream etc.
Effective rainfall	The rain remaining as runoff after all losses by evaporation, interception and infiltration have been allowed for.
Environmentally Sensitive Area	An area defined by MAFF for which grant aid is available for appropriate agricultural and water/land management.

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Exempt sites	Waste management related sites and operations that have registered exemptions from waste management licensing. These include a number of small recycling operations.
Floodplain	This includes all land adjacent to a watercourse over which water flows or would flow, but for flood defences, in times of flood.
Greenhouse gas	Natural and man-made gases which influence the greenhouse effect, including carbon dioxide, methane, ozone and chlorofluorocarbons.
Groundwater	Water that is contained in underground rocks (aquifers).
Main River	All watercourses are designated as either 'Main River' (defined in maps held by the Environment Agency and MAFF) or 'ordinary watercourses' ('non-Main River'). Main Rivers include all watercourses that contribute significantly to a catchment's drainage, although ordinary watercourses may be significant locally. The Agency has powers to carry out works to protect land and property from flooding by improving drainage of Main Rivers only, under the Water Resources Act 1991. Local authorities (and in some areas Internal Drainage Boards) have powers for flood defences on ordinary watercourses, and the Agency has a supervisory role.
National Nature Reserve	An area of land designated by English Nature under Section 35 of the Wildlife and Countryside Act 1981. They are managed by, or on behalf of, English Nature specifically for nature conservation purposes.
Perched Water Table	A water table supported by a low permeability layer above the main water table.
Potable Water	Water of suitable quality for drinking.
Ramsar Sites	Internationally important wetland sites adopted from the Ramsar Convention on Wetlands of International Importance especially as waterfowl habitats (1971) and ratified by the UK government in 1976.

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River Quality Objective	The level of water quality that a river should achieve in order to be suitable for its agreed uses.
Salmonid	Game fish of the salmon family, e.g. Salmon, trout and sea trout.
Sea defences	Natural or man-made features that protect land and property from flooding by the sea.
Sites of Special Scientific Interest	An SSSI is an area of land notified under the Wildlife and Countryside Act 1981 as being of special nature conservation interest. SACs, SPAs and Ramsar sites are also classified as SSSI.
Special Protection Areas	Internationally important nature conservation sites designated under the EEC Wild Birds Directive. All SPAs are also SSSIs.
Strata	Layers of rock, including unconsolidated materials such as sands and gravel.
Sustainable development	'Development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs' (definition from World Commission on Environment and Development, 1987. Our Common Future - The Brundtland Report).
Tertiary	A geological era lasting from approximately 65 to 2 million years ago.

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**APPENDIX 2 : ABBREVIATIONS**

AMP	Asset Management Plan
AOD	Above Ordnance Datum
BAP	Biodiversity Action Plan
BOD	Biochemical oxygen demand
DETR	Department of the Environment, Transport and Regions
DVEP	Darent Valley Enhancement Programme
EQI	Ecological Quality Index
EQS	Environmental Quality Standard
GQA	General Quality Assessment
IPC	Integrated Pollution Control
LEAP	Local Environment Agency Plan
MAFF	Ministry of Agriculture, Fisheries and Food
NO <sub>x</sub>	Oxides of nitrogen
NNR	National Nature Reserve
NRA	National Rivers Authority - a predecessor body to the Environment Agency
OFWAT	Office of Water Services
PAH	Polyaromatic hydrocarbons
RE	River ecosystem
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SEW	South East Water
SNCI	Site of Nature Conservation Interest
SO <sub>2</sub>	Sulphur Dioxide
SOS	Standard of Service
SPA	Special Protection Area
SP2	Source Protection Zone
SSSI	Site of Special Scientific Interest
STW	Sewage treatment works
TFS	Transfrontier shipment
TWUL	Thames Water Utilities Limited

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## APPENDIX 2: CONSULTATIONS

The following organisations were consulted during the preparation of this Consultation Draft:

CBI  
CPRE Kent\*  
Country Landowners Association  
Countryside Commission  
Darent River Preservation Society  
English Heritage\*  
English Sports Council (SE Region)  
Farming and Rural Conservation Agency\*  
Kent County Council  
Kent Fisheries Consultative Association\*  
Kent Wildlife Trust\*  
London Borough of Greenwich\*  
MAFF\*  
Managing the Marshes  
Mid Kent Water  
National Farmers Union (SE Region)  
NW Kent Countryside Project  
Port of London Authority\*  
RSPB  
Salmon & Trout Association  
South East Water\*  
Southern Water\*  
Sutton & East Surrey Water plc\*  
Tandridge District Council  
Thames Water plc  
Tonbridge & Malling Borough Council\*

\* = Response received

Meetings were held with the following organisations:

Dartford Borough Council  
English Nature  
London Borough of Bexley  
London Borough of Bromley  
Sevenoaks District Council

Supported by data and information supplied by Area and Regional staff and the National Centre for Environmental Data and surveillance.

## INDEX

### A

Abstraction.....	14, 15, 17, 42
Acidification .....	49
Aesthetic .....	27, 54
Agriculture.....	2, 8, 14-17, 34, 43, 47, 49
Air quality.....	11-14, 51
Angling clubs.....	See Fishing clubs

### B

Biochemical Oxygen Demand (BOD) .....	50
Biodiversity.....	1, 36, 41
Biodiversity Action Plan (BAP) .....	38, 42
Biological quality.....	20, 21

### C

Character Areas.....	54
Climate change .....	14, 27, 42
Contaminated land .....	21
Cormorants .....	42
Council for the Protection for Rural England (CPRE).....	54, 62
Countryside Commission .....	11, 54, 62
Crayfish	
Plague.....	38
Signal crayfish.....	38
Turkish swamp crayfish.....	38
White clawed crayfish .....	38
Cultural Heritage.....	11

### D

Dangerous Substances Directive.....	46
Discharges.....	1, 19, 23, 43, 47, 48
Dredging .....	25

### E

East Thames Corridor .....	See Thames Gateway Planning Framework
Ecological quality index.....	20
Ecotoxicology .....	49
English Nature (EN) .....	11, 41, 59, 62
Environmentally Sensitive Areas (ESA).....	41, 58

### F

Fish	
Coarse fishing.....	28, 41
Cyprinid.....	41, 47
Fish farm.....	41
Fisheries.....	39, 40, 48
Fishing.....	43
Fishing clubs.....	28
Freshwater Fisheries Directive .....	47
Live Fish Act .....	44
Salmon.....	39, 48, 60
Salmonid .....	39, 47
Trout .....	39, 48
Flood defence.....	25, 45, 46
Flooding.....	11, 17, 23, 24, 25, 45

Footpaths	
Cray Riverway.....	28
Darent Valley Path.....	28
Shuttle Riverway .....	28
Forecast demand growth .....	17
Freshwater lakes.....	38

## G

General Quality Assessment (GQA) .....	19, 20, 21
Geology.....	5, 21
Groundwater .....	14–17, 19, 21, 58, 59
Directive .....	47
Protection.....	21

## H

Habitats .....	13, 17, 36, 43, 59
Harmonised Monitoring.....	52

## I

Illegal practises .....	43
Industry.....	5, 13, 14, 17, 49
Industrial discharges .....	23, 47
Integrated pollution control (IPC).....	23
Part A processes.....	13

## L

Land use.....	5
Landscape .....	11, 12, 27, 54
Character Areas .....	11
Leakage.....	23

## M

Macro-invertebrates .....	20
Maintenance Works .....	24, 25
<i>Managed retreat</i> .....	25
Marshes.....	5, 62
Minerals .....	2, 8
Ministry of Agriculture, Fisheries and Food (MAFF).....	27, 34, 58, 59

## N

National Nature Reserves (NNR).....	41
North Downs.....	5, 8, 12

## O

Otter .....	38
-------------	----

## P

Pollution.....	11–14, 19, 20, 21, 23, 32, 36, 47
----------------	-----------------------------------

## R

Radiation Doses to Public.....	48
Radioactive Substances Regulation (RSR) .....	35
Rail.....	12
Rainfall .....	14, 15, 42, 58

Ramsar sites .....	41, 60
Recreation .....	11, 27–30, 43
Reed beds .....	36
River ecosystem classification .....	21
River Quality Objectives (RQOs) .....	48
Rivers .....	19, 21, 48, 59, 60
<i>Chalk rivers</i> .....	39
Cray .....	5, 24
Darent .....	5, 12
Honeypot Stream .....	5
Main river .....	59
Shuttle .....	5, 21, 24
Thames .....	5, 10, 36
Thames Estuary .....	10–12, 23, 29

## S

Saltmarsh .....	42, 43
Sea defences .....	23–27, 42, 43, 46
Sea level rise .....	25, 27, 51
Sewage Sludge .....	34
Sewage treatment works .....	23, 46, 48, 58
Sites of Nature Conservation Interest (SNCI) .....	41
Sites of Special Scientific Interest (SSSI) .....	41, 60
Source protection zone .....	21
Special Areas of Conservation (SAC) .....	41, 60
Special Protection Areas (SPA) .....	13, 41, 60
Storage and spreading of sewage sludge .....	34
Surface water .....	14, 17, 32, 49, 58
Sustainable development .....	1

## T

Thames Gateway Planning Framework .....	8, 10
Topography .....	5, 8
Traffic emissions .....	13
Tranquil areas .....	54

## U

Urban development .....	8
-------------------------	---

## W

Waste .....	31–33
Exempt sites .....	31
Green Listed waste .....	35
Household waste .....	45
Landfill .....	14, 23, 31, 45
Management and regulation .....	45
Methane .....	14
Radioactive waste .....	35
Transfrontier Shipments of Waste (TFS) .....	34
Void space .....	32
Waste management .....	31, 32
Water quality .....	19, 23, 46
Water resources .....	14, 15
Water vole .....	38, 42
Wetlands .....	36
Wildlife & Countryside Act .....	42



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