ENHANCING THE ENVIRONMENT

20 case studies in LONDON

ENVIRONMENT AGENCY

Foreword

The Environment Agency is committed to improving the environment not only by its own actions but also by working with and influencing others.

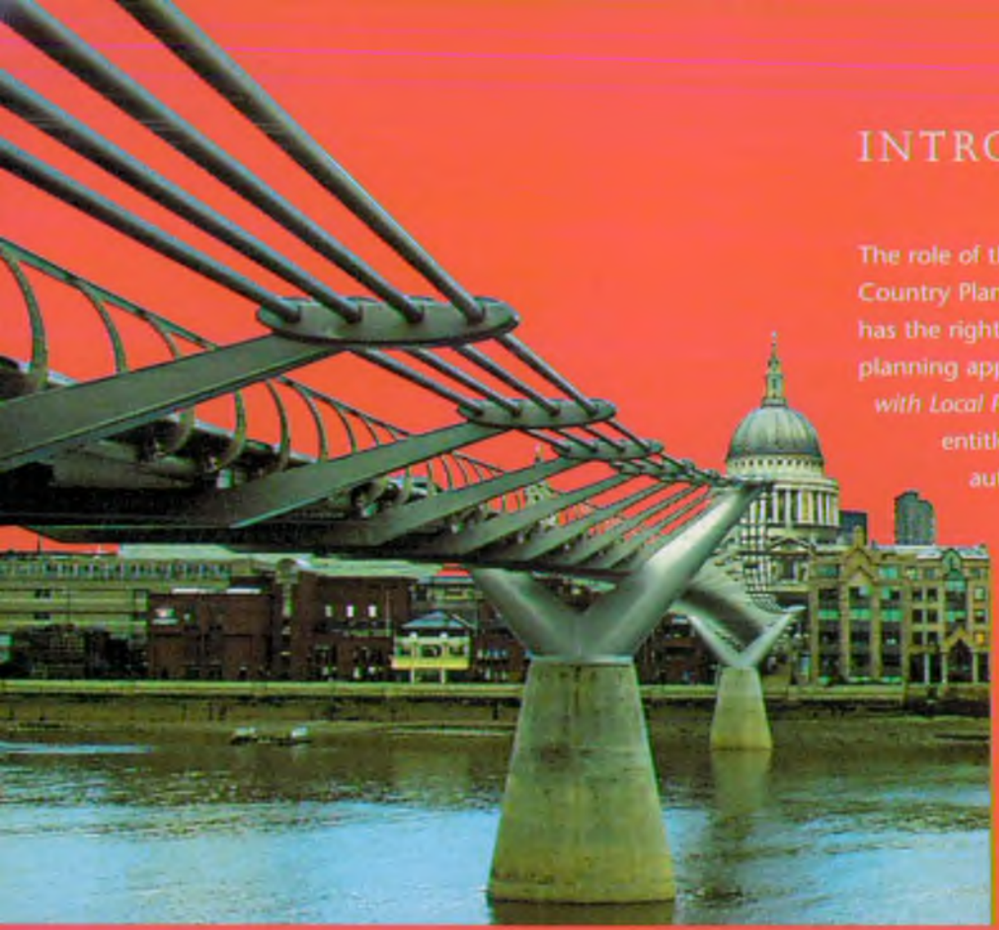
The Town and Country Planning system is a major vehicle for us to achieve these significant environmental enhancements. It gives us the opportunity to work closely with local planning authorities and the development industry, and staff working in our local area offices are dedicated to securing environmental enhancements through the development process. Their efforts add value to development projects in terms of attractiveness and sustainability with associated benefits to surrounding areas.

Often their successes do not receive the full recognition they deserve. I am therefore delighted to present this series of case studies which amply demonstrate their effectiveness. In publishing this document I hope that our partners in this work will be able to recognise the wide scope that exists for building a range of enhancements into the development proposals.

We cannot achieve the progress towards a better environment for everyone without the full support of our partners. These relationships are vitally important to us and we will work to make effective cooperation a continuing reality in London, particularly with the Greater London Authority, the London Boroughs, Development Agencies and the development industry.

Chris Birks
Regional Director

Contents



INTRODUCTION

The role of the Environment Agency in the Town and Country Planning system is that of a statutory consultee. It has the right to be consulted on a range of categories of planning applications. These are set in the Agency's *Liaison with Local Planning Authorities* manual. The Agency is entitled to comment, but the local planning authorities take the final decision. The Environment Agency takes a proactive approach towards its involvement in the planning system and we see this as an integral part of our work to protect and enhance the environment.

The protection and enhancement of the environment relies on good working relationships between the Environment Agency, local planning authorities and the developers. The Agency is keen to work closely with these partners in promoting its plans and proposals. Cooperation can offer significant benefits to the environment and to the community at large. Developers can likewise benefit from an enhanced environment. For instance they may increase the competitive edge, obtain an enhanced image and increase the demand and perceived value of a site. Such partnerships can therefore be an efficient and effective method for promoting the interest of all parties.

One of the primary pressures on the Agency will continue to be the environmental impact of new development. It is therefore essential for Agency staff to identify throughout the planning process – be it pre-planning or consent enquiries, planning applications, land drainage consent applications or unitary development plans – how the Environment Agency's interests can be protected and furthered through partnerships with external bodies including local authorities, industry and environmental groups. This approach has resulted in the achievement of a wide range of environmental enhancements.

In April 1999 the Agency published its first selection of environmental enhancements within the Thames Region, *Enhancing the Environment – 25 Case Studies from Thames Region*. This document continues the aim of the original publication to raise awareness of environmental opportunities presented through the development process, but focuses on examples specifically within London.

ENVIRONMENTAL ENHANCEMENT PRIORITIES AND OPPORTUNITIES

London's Environmental Issues

The Environment Agency believes that London's environment is one of its major assets. It is an asset that should be promoted in its own right because it has a significant part to play in advancing London's role as a world class city.

We also believe that the state of London's environment should be of interest to everyone who lives in and enjoys our capital. The quality of our surroundings impacts upon our everyday lives, our health and the health of the economy. However, the requirements for economic growth and social inclusion mean there are likely to be conflicting claims on the environment. The Agency is keen to seek optimal solutions in such instances.

Our appraisal of environmental issues across the capital has identified four key themes which are interlinked with each other and with the Greater London Authority's (GLA's) agenda:

- *A Healthy City* – integrating management of the environment into the GLA strategies will contribute to the health and social well being of London's people and visitors.
- *Environmental Awareness and Civic Pride* – promotion of environmental awareness together with a high quality environment in London will cultivate positive urban values and develop civic pride.
- *Urban Density and Environmental Capacities* – the increase in urban densities proposed by urban renaissance may be sustainable if planned and managed through a strategic and integrated approach which is sympathetic to London's environmental capacity.
- *Ecological Networks* – London's waterways and open spaces offer unique opportunities to promote regeneration, enhance the environment and improve the quality of life for Londoners.

Enhancing and sustaining the current value of London's environmental assets is the critical issue found within all of these themes. The case studies demonstrate how the development process can contribute positively to this end.

Environmental Opportunities within London

Many of the major development sites in London are associated with rivers and waterways. Examples include Brentford, Deptford Creek, Stratford-Thameside area, Park Royal Business Park, and a wide range of other Thameside sites. These sites offer tremendous opportunities to enhance London's environment, promote sustainable urban development and achieve a better quality of riverside design. With improvements in water quality encouraging new waterside development, people want to live, work and play near water. Environmental enhancements have a key role to play in regenerating and improving our quality of life.

River corridors offer many opportunities for regeneration. We need to maintain the conservation and amenity value of the rivers while ensuring that development does not bring with it an increased risk of flooding or cause pollution. Good development can contribute to river restoration, improved sustainable drainage options, enhanced landscape, fisheries and biodiversity.

TYPES OF ENHANCEMENT

This selection of case studies illustrates the many different types of enhancement that can be realised through the planning system and land drainage consents, as well as those achieved as part of partnership regeneration initiatives. The case studies reflect the main priorities that the Agency is aiming to secure as enhancements within London. Our partners are encouraged to look at these case studies as an illustration of the range of possibilities for environmental enhancements, and to view enhancements as an opportunity to secure higher building standards rather than as a development constraint.

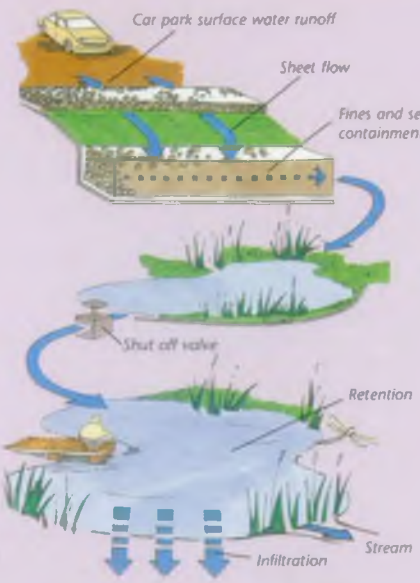
The range of enhancements illustrated by the case studies can be classified into six broad categories. However, it should be emphasised that many of the case studies illustrate more than one type of enhancement.

Sustainable urban drainage

Sustainable urban drainage is an approach to managing surface water runoff which ensures that its absorption into the ground is as close as possible to the point where the rain falls. This approach can create a natural drainage regime which retains nutrients and balances the sites water budget. Schemes should also consider how drainage within the site can affect the drainage within the wider catchment. This approach can reduce the need for expensive and complicated flood defence works and can also benefit water quality. Water conservation measures such as grey water use and provision of water butts are also included within this category of enhancement.

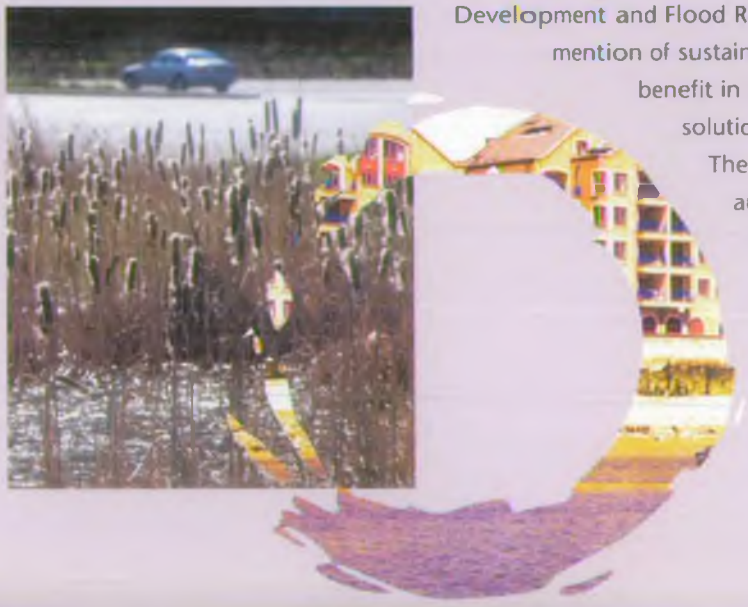
Techniques that may be incorporated into Sustainable Urban Drainage Systems (SUDS), include:

- *Grass Swales* – broad bottom ditches with gently sloping sides and a regularly mown grass surface. These slow and spread water running off adjacent paved areas and roads, giving pollutants the chance to settle and water to infiltrate into the soil;
- *Soakaways* – shallow excavated trenches back filled with stone to create a small underground reservoir. From here water filters into the subsoil to help replenish groundwater;
- *Detention and retention ponds* – areas which collect storm water runoff and hold flood flows for a few hours to let sediment settle out. Outside storm periods detention ponds will be dry, whereas retention ponds will normally contain a significant volume of water; and
- *Porous surfaces* – an alternative to conventional paving. Porous pavements allow water to permeate through, rather than runoff, the paving surface. Rainwater can filter directly into subsoil or can drain into a reservoir of stone backfill before soaking away.



These techniques can also form part of an attractive development landscape, with high biodiversity value. This has the added advantage that on sites where space is restricted the land identified for the landscape scheme required by the planning process may also be used for surface water disposal and flood balancing. Most urban redevelopment sites are suitable for this approach, but site conditions will determine which of the above techniques are appropriate. Within a London context, SUDS can reduce the need for large surface water outfalls into the Thames and minimise the impact upon the foreshore.

The Regional Planning Guidance for the South East (RPG 9) and recent draft Policy Planning Guidance Note on Development and Flood Risk (PPG 25) makes specific mention of sustainable drainage systems and their benefit in delivering 'soft' drainage solutions for development schemes. The PPG also makes it clear that local authorities and developers should work closely with the Agency in developing practical drainage solutions. We also will continue to encourage the inclusion SUDS policies within unitary development plans.



Restoring land

The publication of Lord Rogers' Urban Task Force report, *Towards an Urban Renaissance* (1999), signalled a significant change in the approach to dealing with derelict urban sites. The Government has published an urban white paper which promotes the reuse of previously developed sites and derelict land within urban areas.

The Government is promoting the idea that as part of the sequential test to future housing development, 60 per cent of housing development should be on previously developed land. Some of this land may be contaminated as a result of its previous use. The Government objective for contaminated land is to identify and remove unacceptable risks to human health and the environment. Derelict or previously developed land identified as contaminated will be brought back into beneficial use. The costs of this remediation to the private sector or public purse will be proportionate, manageable and economically sustainable.

A critical issue for the future is the identification of contaminated land sites and their remediation. The Agency will take a lead in controlling the threat of pollution arising from the remediation of such sites under the Contaminated Land (England) Regulations 2000 or their redevelopment under the planning system.

Brownfield sites are often regarded as having little or no ecological value. Such sites, however, can support a range of wildlife including invertebrates, small mammals and

foraging birds. Although the Agency recognises the need to re-use developed land for new developments, this should be balanced with the need to protect and enhance local biodiversity. This can be achieved by incorporating the existing nature conservation interest into new development whilst providing opportunities for wildlife enhancement.

Improving quality of life

Improvements have been seen in the approach to riverside development in recent years. New schemes tend no longer to turn their backs on adjacent rivers, but instead integrate them into their surroundings. The challenge is to create more imaginative riverside open spaces, which sympathetically incorporate the needs of different users into the environment.

The inclusion of access, recreation or education facilities as part of a development fosters a sense of ownership and improves the quality of life for the wider community, not just the occupiers of the new development. New footpaths, interpretative material, signage and education centres, for example, should all be considered, where applicable.

Enhancing the environmental quality associated with a development can have significant social and economic benefits. Attractive and healthy environments also help increase the residual value of sites providing better economic solutions for developers.

Along the River Thames itself, there should be recognition of the Thames Path and establishing links with the surrounding areas of open space. The tidal foreshore provides a unique resource for access and education, and consideration should be given to how this resource can be best incorporated into a site adjacent to the Thames.

River restoration

Traditionally, land drainage and flood management practices involved the straightening of watercourses within concrete channels, culverting and excessive flood protection measures. These have left a legacy of sterile rivers across London. Within the Ravensboune catchment in south London, for example, the Agency's landscape assessment of the catchment *(Environment Agency,1992)* identifies that 37 per cent of rivers are culverted and a further 25 per cent are constrained within vertical walled channels.

This response to river management was created through the demands of progressive urbanisation within London. Invariably river channels were culverted or straightened within concrete channels to cope with increased flows arising from new impermeable areas and to maximise land take. It is interesting to note that in public perception studies undertaken by the Agency, individuals prefer a natural river corridor as part of any development rather than a concrete channel.

Mill Lane, Carshalton – before restoration

Mill Lane, Carshalton – after restoration

These practices are no longer acceptable. However, the legacy remains and opportunities to restore rivers to more naturalised forms and create ecological networks are encouraged. In rejuvenating river channels, the aim is to create a more natural form with opportunities for improved habitat, visual amenity and to reconnect rivers with their natural floodplain. Features that can be incorporated to create healthier rivers include:

- *Pool and riffles* – these natural features create oxygenation and habitat for in-channel species;
- *Natural banks* – a variety of alternatives to concrete are now used, for example gabions baskets and willow spilling; and
- *Two stage channels* – rather than creating oversize rivers to accommodate flood flows, rejuvenated watercourses now incorporate a low flow channel and second channel to take the additional flows whilst providing benefits to biodiversity. Wet grassland can also be integrated as part of the design.

The Agency operates a policy against culverting of watercourse in order to protect these natural features from degradation.

Sustainable flood defences and management of flood risk

The threats of climate change and rising sea levels raise particular issues for managing flood risk in London. In meeting these challenges new flood defence solutions will need to minimise the impacts upon both biodiversity and landscape. The current estimate for the value of property protected by tidal flood defences stands at £30 billion. The Thames Barrier is the centre piece of the tidal flood defences, but equally important are the other river walls and structures that combine with the Barrier to form the overall flood protection from the Thames. Recent flooding within London during October and November 2000, also showed the risk that other rivers within London pose. Both the Lee and Roding valleys, for example, experienced extremely high flow levels causing extensive damage.

Against this background, it is important that decisions taken today do not compromise possible future options for the management of flood risk. For example, leaving sufficient space alongside rivers at locations where the expected life of the development is longer than that of the flood defence structures.

Considerable advances have been made in improving the ecological value and visual quality of flood defences. In London this has been realised by the removal of interim flood defences, terracing flood defences and by using timber cladding and other materials sympathetic to habitat creation. Increasing the stability of existing flood defences and reducing the effects of scour are also techniques being tested.

Sustainable flood defence is linked to many of the other categories of enhancement outlined here. In many situations enhancements that improve the quality of life or restore rivers will also result in greater flood protection.

Delivering biodiversity

In planning and designing a development, it is important to consider the ecological context and objectives for the site. This will involve considering what to retain, selecting appropriate species to introduce, and linking to the biodiversity targets for London. Wildlife should not be viewed as a restriction to development, but as providing opportunities that can be utilised in a positive way.

The ecological considerations on the site should be fully considered and collated in the form of an ecological masterplan, detailing surveys undertaken, species and habitats of note, mitigation measures and how it is planned to incorporate nature conservation as part of the redevelopment.

London's river corridors form the backbone of the open space framework across the capital. In improving biodiversity a variety of forms of enhancement can be considered. These include:

- *Buffer zones* – incorporation of green strips alongside watercourses can have a number of beneficial recreation and environmental affects. Within the London context these strips are particularly important in developing a green network across the capital and improving the quality of life;
- *Ecological roof systems* – a relatively new concept that involves planting or creating brownfield habitat of under utilised roof surfaces. In addition to biodiversity, benefits include noise reduction, energy minimisation, sustainable drainage and visual improvements; and
- *Landscaping and habitat creation* – integrating development within the environment can be achieved through appropriate landscaping. Habitat creation is also fundamental and can be tailored to species identified within the site. Many species are urban dwellers by there nature (i.e. Black Redstart) and landscaping and species can be left to colonise naturally.

Sainsbury's, Greenwich – ecological design

THE DEVELOPMENT PROCESS

The illustration outlines the key steps in the development process. This is a very simplified version of the process and each site and proposal is likely to follow its own particular path.

In order to secure environmental enhancements as part of development proposals, the case studies illustrate that it is critical for the Agency to be involved in discussions as early as possible in the planning process. Past experience has shown that the Agency needs to be involved even before a planning application is made otherwise the scope to incorporate enhancements is significantly reduced.

Planning applications that treat environmental aspects sympathetically with the aim of achieving sustainable development may well have a greater chance of success and a more secure future because:

- sales and marketing opportunities are created and maintained through the promotion and demonstration of good environmental practice and performance;
- the risks to investors and stakeholders associated with environmental liabilities and future legislation are significantly reduced;
- preferential terms for financing are available for environmentally sensitive projects;
- projects that demonstrate consideration of risks to the environment attract lower insurance premiums;
- project lead times can be significantly reduced by identifying and overcoming potential barriers to planning approvals on environmental grounds at an early stage;
- incorporation of best environmental practice and clean technologies will reduce operating costs and secure the long term viability of projects;
- an environmentally conscious project has greater potential for attracting public and private sector funding.

Partnerships

The Agency has established a reputation for working closely with local planning authorities and the development industry to achieve environmental enhancements through the planning system. The Agency have become increasingly involved through both regulatory work and Local Environment Agency Plans (LEAPs) in a variety of partnership initiatives in London. For example, the Thames Estuary Partnership, the Cross River Partnership and London Waterways Partnership. European, central government and Regional funding sources have been targeted across London to improve and sustain the quality of life.

The Agency are now seeking ways of working with potential new partners to demonstrate how an enhanced environment can facilitate economic goals and alleviate social exclusion through the regeneration and renaissance of the run down parts of London. The House of Commons Select Committee in to the Environment Agency recognised that "a damaged environment impairs the quality of life and may threaten long term economic growth". In the future the Agency is looking to work more closely with health and welfare organisations in order to meet these challenges.

Environment Agency Partners

External sources of funding play an important part in urban regeneration and the Agency is anxious to play a full part in contributing to this process. Significant parts of London enjoy Objective 2 status and several areas are the subject of SRB bids. These provide an additional opportunity to secure the high environmental standards which the Agency is anxious to promote.

Many of these partnerships have resulted in significant improvements to the environment. The case studies include a number of examples which illustrate the benefits that such an approach can have on the social, economic and environmental health of an area.

CASE STUDIES

Case study	Development type	Type of enhancement
1 RAF Stanmore, Stanmore	• residential	• river restoration • improving quality of life • sustainable flood defence
2 Brent Cross, Hendon	• retail park	• river restoration • improving quality of life • restoring land • delivering biodiversity
3 Tokyngton Park, Tokyngton	• environmental improvement	• river restoration • delivering biodiversity • improving quality of life
4 Brentford Regeneration, Brentford	• mixed	• sustainable flood defences • delivering biodiversity • improving quality of life
5 Wandsworth Riverside, Wandsworth	• mixed	• sustainable flood defences • delivering biodiversity • improving quality of life • restoring land
6 Wandle Park, Colliers Wood	• environmental improvement	• sustainable urban drainage • river restoration • sustainable flood defences • restoring land • improving quality of life
7 Priory Park, Colliers Wood	• retail park	• sustainable urban drainage • improving quality of life • sustainable flood defence • delivering biodiversity
8 Culvers Avenue, Carshalton	• residential	• sustainable urban drainage • restoring land • improving quality of life • river restoration • sustainable flood defence • delivering biodiversity
9 Tate Modern, Southwark	• art gallery	• improving quality of life • sustainable flood defence
10 Lockes Wharf, Isle of Dogs	• residential	• improving quality of life • sustainable flood defences • delivering biodiversity
11 Deptford Creek Regeneration, Deptford	• mixed	• sustainable urban drainage • improving quality of life • sustainable flood defences • delivering biodiversity

Case study	Development type	Type of enhancement
12 Brookmill Park, Lewisham	• light railway system	• improving quality of life • river restoration • sustainable flood defences • delivering biodiversity
13 Worseley Bridge Road, Bromley	• residential	• improving quality of life • river restoration • sustainable flood defences • delivering biodiversity
14 Greenwich Peninsular, Greenwich	• residential, leisure and commercial	• restoring land • improving quality of life • sustainable flood defences • delivering biodiversity
15 Leyton Relief Road, Leyton	• road scheme	• sustainable urban drainage • restoring land • sustainable flood defences • delivering biodiversity
16 Fresh Wharf Estate and Hewett's Quay, Barking	• industrial and retail	• improving quality of life • sustainable flood defences • delivering biodiversity
17 Gallions Reach Urban Village, Thamesmead	• residential	• sustainable urban drainage • restoring land • improving quality of life • river restoration • sustainable flood defences • delivering biodiversity
18 Channel Tunnel Rail Link, Dagenham	• rail scheme	• restoring land • river restoration • sustainable flood defence • delivering biodiversity
19 BICC Cables, Erith	• car park	• sustainable urban drainage • improving quality of life • delivering biodiversity
20 Morrison Pier, Erith	• mixed	• improving quality of life • sustainable flood defence

1. RAF Stanmore

Location
RAF Stanmore, North West London
Rivers / Catchment
Edgware Brook / Brent catchment
London Borough
Barnet
Developer
Laing Homes
Date Started / Completed
Under construction
Types of Enhancement
Improving Quality of Life
River Restoration
Sustainable Flood Defence
Development Type
Residential
Contact details
Customer Services,
Environment Agency,
North East Area,
Apollo Court, 2 Bishops Square,
St Albans Road West,
Hatfield, Herts. AL10 9EX.

Site History

Following the cut backs in the armed forces during the 1990's this site became surplus to military requirements and is now being developed for housing. The RAF site is crossed by the Edgware Brook near to its source within the grounds of Bentley Priory, a designated Site of Special Scientific Interest (SSSI).

Edgware Brook – currently runs in culvert beneath site

Environment Agency Interests

- surface water attenuation
- flood alleviation
- river restoration
- habitat creation

Description of Scheme

The redevelopment of this site has provided the opportunity to de-culvert 70 metres of the Edgware Brook which crosses the south west corner of the site. Extensive consultation has been undertaken with local residents to help shape the final site design and as a result the newly opened watercourse will link to Temple Pond, an existing feature within the site adjacent to the route of the Brook. The newly opened channel will be restored to a more natural state with appropriate planting and re-profiling of the banks.

A buffer zone will surround the de-culverted Brook and in order to provide additional flood storage to benefit the wider Brent catchment, an earth bund and storage pond will be incorporated adjacent to the watercourse.

Prior to the demolition of the site there had been localised flooding resulting from water overflowing from Temple Pond. Residents were concerned, so the RAF undertook to repair the existing weir structure that controls water levels within the pond. This responsibility has now been passed to the developer who has undertaken to repair the control structure within the pond and raise the banks of the pond to increase flood storage levels.

Proposed route of the Edgware Brook

There are flooding problems associated with the upper reaches of the Brent catchment and therefore it has been particularly important to manage surface water flows and runoff as part of this scheme. Increasing the amount of impermeable area within the upper reaches of the catchment could have a dramatic impact on flooding downstream. The Agency is implementing a flood alleviation scheme for this catchment which will utilise areas of open green space, such as parks, to act as flood storage areas.

Temple Pond – overflow weir

2. Brent Cross

Site History

Located at the junction of the A406 and the M1, the Brent Cross centre has been a focus for shopping in the north London area for a number of years. Current constraints upon car parking and the demand for new facilities have meant that the owners of the site are looking to expand their current facilities. This has provided an opportunity to realise a number of environmental enhancements along the River Brent that flows adjacent to the site.

Environment Agency Interests

- river diversion and enhancement
- improved public access
- improve visual amenity of river corridor

Description of Scheme

Originally much of the Brent Cross site was a shallow part of the Brent Reservoir and the River Brent ran further to the south than its present course. In the late 1930's, this part of the reservoir was filled in for the construction of the North Circular Road and the river diverted along its present course. Due to concerns about flooding, the river was straightened within an oversized concrete channel in order that flood flows could be accommodated within the channel.

The proposed diversion of the river presents a number of challenges, including flood management, the possible threat of contamination, and the opportunity of an improved river corridor. The river diversion has been planned as a 'two stage' channel, to allow for times of both low an high flow, and to provide a number of improvements to the river corridor. The increased sinuosity of the new channel, made possible by its diversion to the south, will naturalise the new river corridor. A new weir will help to retain a greater depth of water and the riffles will assist in the oxygenation of the water. This will improve conditions for all forms of aquatic life, especially for fish. The provision of the riffle and weir will also allow fish migration up stream of this point.

On the northern side, the bank will be shallow and a new footpath will be set back from the river. This will enable the creation of a green corridor adjacent to the river and allow passage of wildlife along the river edges. The banks on the northern side will grade up from the footpath and are designed to form the adjacent flood channel at times of high flows in the river. On both sides of the river, a continuous strip will be provided along the footpath, to allow the migration of animals along the dry margins of the river corridor. Wherever possible, softer forms of bank protection will be used, such as timber edging. At several locations, reed beds are to be incorporated which will soften the edges of the bank, and also provide marginal vegetation for additional habitats. A café is planned incorporating a wide terrace down to the river. Disabled access will be provided along the footpath with several ramps at strategic points being integrated within the channel diversion.

River Brent – existing channel

The whole area has been identified within Brent Unitary Development Plan as an area for future development and is linked closely to the redevelopment of the Cricklewood lands, an area that adjoins the North Circular to its southern side.

River Brent – proposed channel realignment

3. Tokyngton Park

Location: Tokyngton Park, Tokyngton, North West London
Rivers / Catchment: River Brent / Brent catchment
London Borough: Brent
Developer: London Borough of Brent
Date Started / Completed: Pre construction – in design
Types of Enhancement: Improving Quality of Life
River Restoration: Delivery Biodiversity
Development Type: Environmental Improvement
Contact details: Customer Services, Environment Agency, North East Area, Apollo Court, 2 Bishops Square, St Albans Road West, Hatfield, Herts. AL10 9EX.
Wembley Project: London Borough of Brent, 3rd floor Brent House, 349 High Road, Wembley, HA9 6BZ.

New footpath and cycleway

Site History

The London Borough of Brent is developing this scheme as one of a group of regeneration initiatives in the Wembley area, with assistance from a number of partners. Notably, these include London's Waterway Partnership (LWP), London Development Agency (LDA), the Environment Agency and UK River Restoration Centre (RRC). LWP is funded by a number of partners whose aim is to secure environmental and social improvements for river corridors across London. As well as improving the immediate environment, this scheme has so far provided the opportunity for the local communities to influence through consultation and 'Planning for Real™', a major environmental project in their area. A package of regeneration funding is being assembled with partners across London that will enable the scheme to progress to implementation during the next two years.

Environment Agency Interests

- maintain the integrity of the flood storage area and river flood defences
- improve local environmental awareness
- restore the natural river channel
- improve public access to the river corridor

Description of Scheme

The scheme centres on the restoration of the River Brent within a heavily urbanised catchment and park setting. Currently, the site offers limited benefits in terms of local amenity, a route to employment, natural habitats and ecology. Funding has enabled the local community to become involved in the rejuvenation of their immediate environment, which will involve a remodelled river corridor. The intention is to enhance the river corridor, through partial realignment and bank reprofiling, making use of innovative but established techniques alongside traditional engineering methods to provide a stable, pleasant and safe local riverside that meets a variety of needs.

Where the River Brent emerges from its culvert at the north end of the site, new access will be provided to link the industrial estate with the enhanced riverside. This will create a linear through route for pedestrians and cyclists to public transport systems and areas of employment and retail, with the integration of appropriate lighting to create a safer environment.

An improved landscape and access regime will better integrate recreational opportunities in the park with the river as a key landscape feature, and with surrounding residential areas. Existing wildlife areas may be extended along the park, whilst the re-profiling of the riverbanks is intended to improve safety awareness and access.

Proposed changes to the park

The park provides temporary flood storage down stream of the Wealdstone Brook and Brent Reservoir and the project is being designed to ensure this important function is retained. The Agency is assisting in developing this project through provision of technical assistance, and as the statutory body with responsibilities for the main river, will continue to have a leading role in the implementation and onward management of the scheme.

Tokyngton Park - aerial view

4. Brentford Regeneration

Site History

This historic area of London has suffered economic and social decline for many years. The Brentford area is the centre of a Single Regeneration Budget (SRB) project focusing on regenerating the area. The Grand Union Canal traditionally provided the main freight transport link between the Midlands and the River Thames at Brentford. The river and canal provide an ideal focus for rejuvenation of the area.

Ferry Lane – existing flood defences

Environment Agency Interests

- reviewing, maintaining and improving the flood defences
- improving public access and recreational use of the river
- creating new riparian habitat
- integrating the river into the overall regeneration plans for the area

Description of Schemes

The Agency has been involved in three housing schemes within the Brentford area designed to achieve environmental, social and economic improvements.

- *Ferry Lane* – The inter tidal zone adjoining this site provides the ideal habitat for the Two Lipped Door Snail (a red data book species). As part of repairing the current flood defence walls, protecting important habitats and creating new riverside access, various ecological surveys were undertaken and an ecological master plan for the site was prepared. The scheme also took the opportunity to increase tidal flood storage.
- *Brentford High Street* – This proposed project aims to improve the current flood defences adjoining the site. Other additional benefits include increased flood storage capacity; sensitive river management to improve riparian related habitat; improved access; and new moorings.
- *Brentford Lock* – Regeneration of this site has included the creation of a wetland area, new tidal habitats, improved public access and visual amenity, and the provision of new mooring facilities for canal boats.

An 'environmental balance sheet' has been used by the Agency on these schemes to ensure that any environmental losses are adequately compensated by appropriate enhancements.

Ferry Lane – tidal dock which forms part of the site

Brentford Lock – currently being redeveloped

5. Wandsworth Riverside

Location: Wandsworth, South West London
Rivers / Catchment: River Thames and River Wandle / Tidal Thames and Wandle catchments
London Borough: Wandsworth
Developer: Persimmon Homes Ltd
Date Started / Completed: Pre construction – planning permission
Types of Enhancement: Restoring Land; Improving Quality of Life; Sustainable Flood Defences; Delivering Biodiversity
Development Type: Mixed development
Contact details: Customer Services, Environment Agency, South East Area Office, 10 Albert Embankment, London, SE1 7SP

Wandsworth Riverside – artists impression

Site History

This enhancement site forms part of a wider regeneration initiative being led by the London Borough of Wandsworth. The 3.9 hectare site, which was formerly owned by Shell, is strategically important being located at the mouth of the River Wandle where it meets the River Thames. The site has been vacant for the past ten years, but was only cleared of buildings four years ago. Originally the site was an island within the braided channel of the Wandle mouth and the proposal attempts to reflect this historic drainage pattern in their design. The current proposal for the site is a mixed use development including retail, offices, recreational and residential activities.

Wandsworth Riverside – plan view

Wandle mouth – current flood defences

Environment Agency Interests

- creating and improving tidal habitat
- developing access to the river
- replacing and improving degraded flood defences
- improving visual amenity

Description of Scheme

Prior to the formulation of any proposals the developer prepared an ecological master plan. Identification of the environmental assets of the site allowed important landscape, historical and ecological features to be fully reflected in the final design. The proposals involved innovative techniques including an extensive area of 'ecological roofs' on the affordable housing units providing high level, secure nesting and roosting opportunities for birds.

Sustainable urban drainage techniques have been incorporated across the site. Surface water drainage from roofs will be stored in holding tanks for irrigation use during the summer period. Surface water will also be channelled to surface water ponds in the ecology zone and semi public gardens. Any overflow from these areas will be taken by surface water channel to the public drains or the ecological terraces. Improved access is an important feature of the design with split level footpaths being incorporated along the Thames to separate fast tracking cyclists and pedestrians from those peacefully enjoying the riverside.

The tidal flood defences at the mouth of the Wandle are currently in a poor state of repair and the project intends to retreat the current line of defence and create a new area of foreshore. Inter tidal terraces will be created along 60 metres of the river wall at the confluence of the River Thames and Wandle. The resultant wetland will support a diverse range of plant species. This will also provide high quality habitats for invertebrates, fish, birds and bats currently not found in the vicinity. The site also provides one of the most important locations along the River Thames for wading birds. In order to minimise the threat of disturbance a number of barges will be moored within the river to offer birds an alternative roosting habitat in the immediate area.

Wandsworth Riverside – site boundary

6. Wandle Park

Location Wandle Park, Colliers Wood, South London
Rivers / Catchment River Wandle / Wandle catchment
London Borough Merton
Developer London Borough of Merton, Groundwork Merton and Environment Agency
Date Started / Completed Completed – 2001
Types of Enhancement Sustainable Urban Drainage, Restoring Land, Improving Quality of Life, River Restoration, Sustainable Flood Defences
Length of Enhancement 500 metres
Development Type Environmental improvement
Contact details Environmental Improvements Team – Flood Defence, Environment Agency, South East Area Office, Swift House, Frimley Business Park, Frimley, Camberley, Surrey, GU16 5SQ

Site History

The River Wandle in Wandle Park was a silt laden concrete channel that was both physically unattractive and potentially dangerous. The scheme was a result of a partnership between the Agency, the London Borough of Merton, The National Trust and Groundwork Merton. A variety of funding sources were utilised, including the European Life Fund, Derelict Land Grant, Single Regeneration Budget (SRB2), Landfill Tax credits and commercial sponsorship. The scheme also involved funding from a Section 106 agreement secured as part of a development project by Sainsburys in the Colliers Wood area.

River Wandle – before restoration

Environment Agency Interests

- providing additional flood storage
- updating the gauging station and improving flood warning
- promoting fish migration
- improving public access and amenity
- the use of reed bed to trap pollutants and silts
- providing a demonstration site for urban river rehabilitation
- ensuring the scheme was implemented with the support of all parties, including residents groups

Description of Scheme

The diversion of the River Wandle carried out in the summer of 1999, was the main construction element involved in the scheme. This included a new flow gauging station, removal of the sterile concrete channel, construction of a reed bed for treating poor water quality, additional flood storage, tree surgery and footpath creation. The second phase of the scheme included the provision of play equipment, additional footpaths, new brick wall and railings to the park boundary, and the restoration of the two drinking fountains in the park.

Overview of enhancements

The scheme presented a number of challenges including an area of contaminated land which required the construction of a containment cell. Retaining public access to the area during the construction process and maintaining the sewer outfall throughout also presented a number of problems.

The project was officially launched in November 1999 by a number of dignitaries, including Beverley Hughes MP, Minister for Regeneration at DETR, who confirmed Government support for this and similar projects. The site has also been visited by the River Restoration Centre and senior engineers from Israel and Venice.

The project partners have now embarked on a five-year monitoring plan to measure the success of the project.

River Wandle – restored channel

7. Priory Park

Location
Colliers Wood High Street, Merton, South London
Rivers / Catchment
Pickle Ditch / Wandle catchment
London Borough
Merton
Developer
Pillar Development Limited, The National Trust and Groundwork Merton
Date Started / Completed
Completed – 2000
Types of Enhancement
Sustainable Urban Drainage
Improving Quality of Life
Sustainable Flood Defence
Delivering Biodiversity
Length of Enhancement
250 metres
Development Type
Retail park
Contact details
Customer Services,
Environment Agency,
South East Area Office,
10 Albert Embankment,
London, SE1 7SP.
Groundwork Merton
14 The Apprentice Shop,
Merton Abbey Mills,
Watermill Way,
London, SW19 2RD

Priory Park – before redevelopment

Site History

This enhancement scheme is located adjacent to the site of the former Merton Priory. Pickle Ditch follows the original line of the River Wandle prior to its diversion during the 13th century to service the mills of Merton Priory. The name is derived from the old saxon word 'pightle', which means small piece of land. The sites recorded history dates back to the 12th century when King Henry I gave Merton to his godson. It was he who subsequently founded the original mill on this site. In more recent times the sites became associated with the arts and crafts movement of the 19th century with both William Morris and Arthur Liberty locating their factories close to the site.

Environment Agency Interests

- river restoration and landscaping
- improving public access
- improving public awareness and education

Description of Scheme

This scheme involved 250 metres of channel enhancements to the Pickle Ditch, a tributary of the Wandle, as part of the development of a retail park. Unfortunately the developer, working in co-operation with Groundwork Merton, had to contend with various geo technical problems across the site, which has meant that the concrete channel forming the bed of river has had to be retained. To overcome these problems fixed planters were used within the channel using hazel faggotting to stabilise and protect in channel planting.

Aquatic plants were also taken from adjacent watercourses to ensure continuity of species within the local environment. Natural gravels were also spread across the existing bed of the river to help naturalise, as far as possible, the channel and provide additional habitat. The site is also colonised by a rare London plant species, Narrow Leaved Water Plantain, and particular attention was taken to conserve and enhance this species.

Improvements to the river corridor include a new footpath which has been adopted as part of the Wandle Trail, and interpretative information which has been incorporated into the hard landscaping surrounding the site. A particularly interesting feature of this scheme is that the developer attempted to reflect the site's historic past in the materials, landscaping and river corridor design.

The enhancements agreed as part of this scheme were secured by a Section 106 agreement, which the Agency was involved in negotiating. Members of the probationary service (community service volunteers) carried out some of the work on the river corridor under supervision of both Agency and Groundwork staff, as well as staff from Thames21.

Pickle Ditch – restored river corridor

Innovative interpretative information

8. Culvers Avenue

Location: Carshalton, South London
Rivers / Catchment: River Wandle / Wandle catchment
London Borough: Sutton
Developer: Fairview New Homes
Date Started / Completed: Completed – 1999
Types of Enhancement: Sustainable Urban Drainage; Restoring Land; Improving Quality of Life; River Restoration; Sustainable Flood Defence; Delivering Biodiversity
Length of Enhancement: 300 metres
Development Type: Residential development
Contact details: Customer Services, Environment Agency, South East Area Office, 10 Albert Embankment, London, SE1 7SP.

Site History

This 6.3 hectare site lies north of Carshalton village within a predominantly residential area. The River Wandle forms the western boundary of the site and Council owned allotments abut the northern boundary. Up until the late 1920's a single large riverside residence and four cottages occupied the whole site. In the 1930's the site was developed for Mullards Limited, later known as Phillips Electronics. In the 1940's over 6,000 people were employed on the site, however, by the 1990's activity had all but ceased.

Environment Agency Interests

- improving public access
- incorporating a buffer zone
- incorporating sustainable urban drainage techniques
- improving floodplain management

Description of Scheme

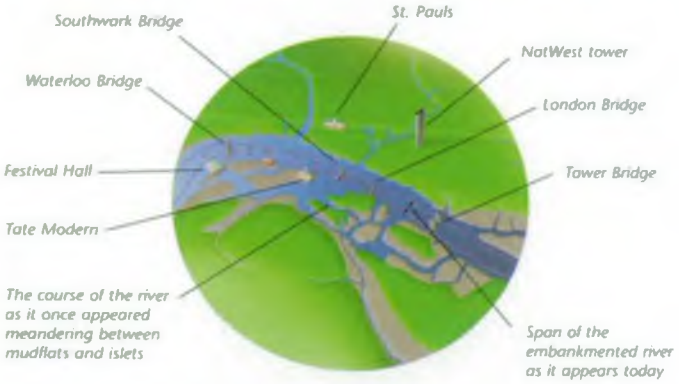
The majority of the site lies within the floodplain of the River Wandle. At an early stage the Agency informed the developer that any future development would not be able to raise ground levels without providing compensatory flood storage. The opportunity was also taken to use sustainable drainage techniques in order to control of surface water runoff from the site.

The local authority's planning brief for the site stipulated that a 15 metre buffer zone should be created along the River Wandle to enhance the existing river corridor. As part of this concept the opportunity was taken to rejuvenate the existing watercourse by re-grading the current banks and incorporating appropriate landscaping. A new watercourse was also created alongside the 'island site' which fell within the overall river corridor.

New footpaths, cycleways and bridge crossings were incorporated throughout the river corridor to increase its use by local people and to encourage local interaction. A series of meadows have also been planted to further enhance the ecological value of this revitalised river corridor.

9. Tate Modern

Location: Southwark, Central London
Rivers / Catchment: River Thames / Tidal Thames
London Borough: Southwark
Developer: Tate Modern and London Borough of Southwark
Date Started / Completed: Completed – 2000
Types of Enhancement: Improving Quality of Life, Sustainable Flood Defence
Length of Enhancement: 200 metres (approx.)
Development Type: Art gallery
Contact details: Customer Services, Environment Agency, South East Area Office, 10 Albert Embankment, London, SE1 7SP.



Historic course of the Thames through London

Site History

This case study is located adjacent to the River Thames at the former Bankside Powerstation which has recently been converted into Tate Modern with the help of lottery funding. The power station had been closed for a number of years prior to its conversion.

The scheme falls within the area known as the 'Tate Environment' where the London Borough of Southwark have initiated a number of environmental improvement projects. This includes the riverside walk from Blackfriars Bridge to Cardinal Cap Alley. It also forms part of the Borough's Bankside Improvement Scheme which aims to provide a continuous high quality pedestrian environment along the south bank. This incorporates the new Millennium Bridge and Bankside walkway, downstream of Tate Modern between Windsor Walk and Southwark Bridge.

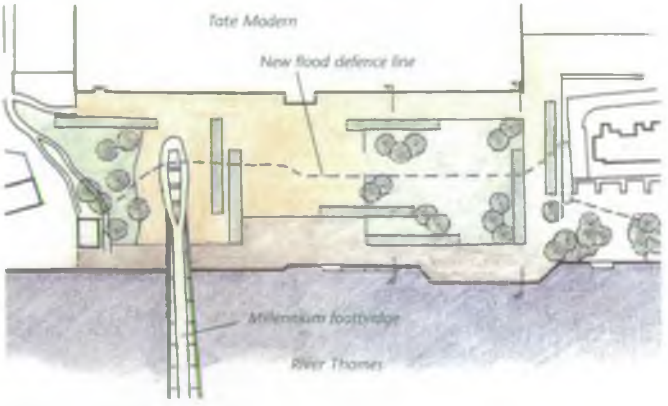
It is interesting to note that during the Roman period the Bankside area was little more than a series of marshes and islands linked to the River Thames. Since then development has reclaimed the land and narrowed the course of the original river to its present position.

Environment Agency Interests

- maintaining the integrity of the tidal flood defences
- improving public access to riverside
- improving the visual landscape of the River Thames and the Thameside environment

Description of Scheme

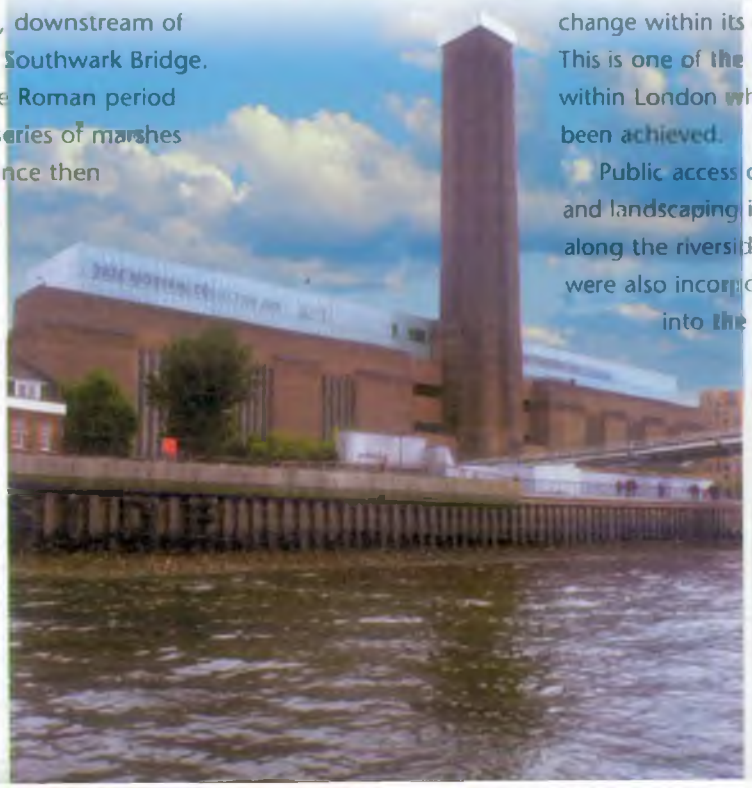
The Tate Environment proposals were the subject of extensive negotiations between the Environment Agency, the Borough and their consultants. As a result, the opportunity to remove the interim defences and retreat the line of the flood defence was identified and incorporated into the final design. This has opened up the views to and from the river, and enhanced the relationship of the site to the River Thames by re-profiling the riverside area and removing the top of the riverside wall.



Plan view – realigned flood defence

The re-alignment of the previous flood defences has significantly reduce the maintenance required for these structures. The scheme has also reduce the risk from the future threat of increasing flood levels caused by climate change within its design. This is one of the few locations within London where this has been achieved.

Public access considerations and landscaping improvements along the riverside path were also incorporated into the design.



10. Lockes Wharf

Location: Isle of Dogs, East London
Rivers / Catchment: River Thames / Tidal Thames
London Borough: Tower Hamlets
Developer: St George Plc
Date Started / Completed: Ongoing – currently in Phase 4
Types of Enhancement: Improving Quality of Life; Sustainable Flood Defences; Delivering Biodiversity
Length of Enhancement: 267 metres
Development Type: Residential development
Contact details: Customer Services, Environment Agency, South East Area Office, 10 Albert Embankment, London, SE1 7SP.

Site History

Lockes Wharf lies on the north bank of the Thames opposite Deptford Creek. The site is currently being developed by St George Plc for housing. The old timber flood defence frontages required replacing and the Agency was keen to see this valuable riverside habitat conserved. Prior to redevelopment for housing this 3 hectares site was used as a foundry. The contamination resulting from the previous use led to a number of technical constraints when it came to replacing the tidal flood defences.

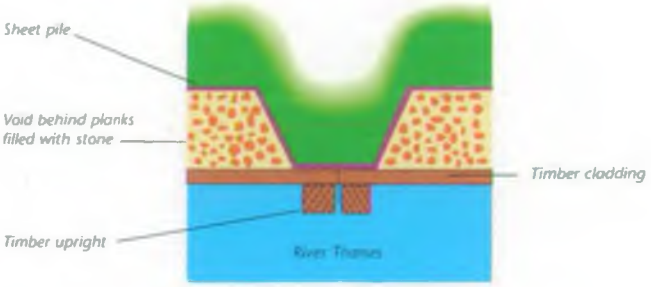
Environment Agency Interests

- repairing the flood defences
- minimising the loss of foreshore and obtain appropriate compensation
- retaining and improving ecological interests
- decontamination and remediation
- improving public access to the riverside
- retaining visual and historic amenity

Existing and replacement flood defences

Description of Scheme

The replacement flood defences fronting the site were constructed from steel sheet piling but clad with timber boards. These were designed to be similar in appearance to the existing historic timber wall. Timber cladding has been applied elsewhere on the Thames, but this design had additional ecological value by using angular gravels poured into the voids between the boards and the sheet piling. The small spaces between the timber boards allowed the passage of tidal water and invertebrates creating in effect a *'vertical foreshore'*.



Cross section of new flood defences

Biological surveys were carried out on the old timber wall and its replacement with remarkable results. Within one year the voids in the new wall were supporting the same variety of animals as had been found behind the boards of the old wall. The actual timbers themselves did not support as many animals as before, but this is because there has been insufficient time for algal growth to form within which most invertebrates live. The wall will be surveyed again in the near future and it is likely expected to be as ecologically valuable as the previous wall.

Unfortunately contaminated material behind the flood defences made encroachment onto the foreshore unavoidable and the Agency is currently negotiating with the developer to compensate for this loss elsewhere along the Tidal Thames within London.

New flood defences under construction

11. Deptford Creek Regeneration

Location Deptford, South East London
Rivers / Catchment River Ravensbourne and River Thames / Ravensbourne and Tidal Thames catchments
London Borough Greenwich and Lewisham
Developer Various
Date Started / Completed Started 1996 – currently under construction
Types of Enhancement Sustainable Urban Drainage, Improving Quality of Life, Sustainable Flood Defence, Delivering Biodiversity
Development Type Urban regeneration, including residential, industrial and recreational
Contact details Customer Services, Environment Agency, South East Area Office, 10 Albert Embankment, London, SE1 7SP.
Lewisham Environmental Projects Coordinator, Creekside Office, 60 McMillan Street, London, SE8 3HA

Site History

Deptford Creek is a historic area of London, which has suffered from neglect and urban decline for many years. The area has been the focus of a Single Regeneration Budget (SRB) project attempting to facilitate urban regeneration over the past few years. The SRB project has brought together a number of partners including English Heritage, London Wildlife Trust, the London Boroughs of Greenwich and Lewisham, the Agency and local residents.

The regeneration of the area surrounding the creek started with the construction of the Docklands Light Railway Lewisham Link and SRB funding being secured from Government. An essential part of the project has been the involvement of local communities.

Mill Wharf – renewed flood defences

New techniques have also been pioneered for the removal of rubbish from the creek, a perennial problem found in urban rivers. In addition to the environmental improvements, the regeneration programme has also been closely involved in developing the social and community aspects of the project. Initiatives have included a floating education centre, development of a management strategy for the creek, and initiatives to improve community participation and environmental awareness. These enhancements are the first of many within this area and will hopefully provide the lead for improving the local environment in the future.

Environment Agency Interests

- objection to tidal barrier across the creek
- creation and improvement of tidal habitat
- improving public awareness and education
- developing access to the river
- replacing and improving degraded flood defences
- improving visual amenity

Description of Schemes

The Deptford Creek regeneration covers a large area from the mouth of the creek to Deptford Bridge. A number of enhancements have been initiated through the redevelopment of several different sites within the area. These include:

- *Mill Wharf, Normandy Wharf and the Waste Transfer site* – renewal of poor flood defences undertaken by the Regeneration Partnership;
- *Greenwich Reach 2000* – located at the mouth of the creek this scheme has included the preparation of an ecological master plan which led to the incorporation of ecological roof systems, and managed retreat of the flood defences within the design;
- *Transco Inlet* – this neglected slipway is to be restored into a natural beach extending to the current tidal foreshore within the creek;
- *Labans Dance Centre* – this building has included an ecological roof system as part of its innovative design and will act as a focal point for the local community within the creek when constructed.

Deptford Creek mouth – Victory Wharf (left) and Greenwich Reach 2000 (right)

12. Brookmill Park

Location: Lewisham, South East London
Rivers / Catchment: River Ravensbourne / Ravensbourne catchment
London Borough: Lewisham
Developer: DLR Ltd, CGL Rail and LRG
Contractors:
Date Started / Completed: Completed - 1998
Types of Enhancement: Improving Quality of Life; River Restoration; Sustainable Flood Defences; Delivering Biodiversity
Development Type: Light railway system
Contact details: Customer Services, Environment Agency, South East Area Office, 10 Albert Embankment, London, SE1 7SP.

Site History

The concrete flood channel of the River Ravensbourne at Brookmill Park in Lewisham was chosen as the route of the Docklands Light Railway. The route minimise tree loss and reduced the visual impact of the railway on the park and surrounding area. The river was been diverted along a 300 metre meandering course featuring a realistic gravel bed, native landscaping on sloping river terraces and wildlife features. The standard of flood protection has been increased and a waterproof membrane has been used to prevent the pollution of groundwater. An ornamental lake within the park has been reconstructed as a more natural feature. This enhancement has also become an example of good practice for surrounding developments involving the River Ravensbourne.

River Ravensbourne – before restoration

Environment Agency Interests

- replacing the heavily engineered flood channel by a more natural channel to provide ecological, landscape and recreational benefits
- increasing flood defence standards of service
- minimising the risk of groundwater contamination

Description of Scheme

The new channel is designed to accommodate flood flows and comprises of a 3-stage channel providing for habitat diversity, both aquatic and terrestrial. The stages include a low flow notch with a sinusoidal alignment located within a 7.5m wide gravel/rock channel, and will accommodate normal river flows. The second stage is bounded by a narrow marginal strip, which will sustain marginal plants and will be subject to frequent flooding due to high flows and the tidal influence. The higher stage widens out to create a flood meadow with grassed banks. A polypropylene membrane liner has been laid at least 1m deep to protect the chalk aquifer beneath the river diversion.

Provision has been made for sustainable habitats for fish and invertebrates. These include the creation of a series of pools (up to 20 metres long) and riffles above the low flow notch to provide an acceptable depth of water. Large fish shelters have been provided at the mid-point of each pool. The gravel/rock bed material used will provide the voids necessary to encourage invertebrate and fish life.

The hard substrate for algae and associated invertebrates consists of stone deflectors to enhance habitat diversification. The deflectors will also create a cleansing velocity through the pools to protect the banks from erosion. Native aquatic, emergent and riverside landscaping is being undertaken using species capable of withstanding relatively hostile and variable water flows. The steeper slopes will be covered with reeds and vigorous grass species tall enough to obscure the harder engineered aspects of the scheme.

River Ravensbourne – after restoration

The creation of this river diversion has led to a slightly over engineered solution, however it has acted as a catalyst for more sensitive proposals involving the River Ravensbourne in the future. Current proposals for Seagar Distillery and Broadway Fields, for example, both include in-channel enhancements to the river.

13. Worseley Bridge Road

Location: Worseley Bridge Road, Bromley, South East London
Rivers / Catchment: River Pool / Ravensbourne catchment
London Borough: Bromley
Developer: Barratts
Date Started / Completed: Completed – 1998
Types of Enhancement: Improving Quality of Life; River Restoration; Sustainable Flood Defences; Delivering Biodiversity
Length of Enhancement: 200 metres
Development Type: Residential development
Contact details: Customer Services, Environment Agency, South East Area Office, 10 Albert Embankment, London, SE1 7SP.

Site History

Located on the former site of Lewisham College this residential development lies within the floodplain of the River Pool, a tributary of the River Ravensbourne. The Agency was concerned that redevelopment of the site should not encroach on the floodplain or lead to an increase in water levels elsewhere. Historic flooding records indicate that the site last flooded in 1968.

Environment Agency Interests

- reducing the risk of flooding
- creation of riparian habitat
- removal of hard channel walls
- creating a pleasant environment and improving visual amenity
- improving public access to the river corridor
- developing maintenance access

Description of Scheme

This scheme involved the partial restoration of 200 metres of river channel and floodplain as part of a residential development. As well as including natural species within the landscaping scheme, a riverside walk was incorporated to allow public access to the restored river corridor. A particular feature of this scheme was the inclusion of flow deflectors in the river to restore more natural conditions within the newly created channel.

To ensure that flood defence issues were resolved to the Agency's satisfaction, the developer employed consultants to model the detailed extent of the actual floodplain across the site. They concluded that any development would need to provide a flood defence bund on the left hand side of the bank of the river, and that the natural flood route over Meadow Road would need to be kept clear from obstructions. Both these requirements were included within the final scheme.

An important aspect of this enhancement scheme was the integration of the river corridor within the site. Rather than alienating the river corridor this natural feature became an integral feature of the overall scheme.

In channel flow detectors

14. Greenwich Peninsular

Location: Greenwich Peninsular, London
Rivers / Catchment: River Thames / Tidal Thames catchment
London Borough: Greenwich
Developer: British Gas and English Partnerships
Date Started / Completed: Completed – 1999
Types of Enhancement: Restoring Land; Improving Quality of Life; Sustainable Flood Defences; Delivering Biodiversity
Development Type: Residential, leisure and commercial development
Contact details: Customer Services, Environment Agency, South East Area Office, 10 Albert Embankment, London, SE1 7SP.

Site History

Fronted by the River Thames to the north and north east, this highly contaminated and largely derelict site, has been completely regenerated and provided the focus for the country's Millennium celebrations. More than 6 million people visited the exhibition, presenting a unique opportunity for the project to demonstrate a best practice model in urban environmental management.

Environment Agency Interests

- managing contaminated land from previous industrial uses
- restoring tidal defences and threat of encroachment
- promoting innovative riverbank design
- promoting access and education initiatives

Ecological park

Description of Scheme

The project presented a number of examples of innovative environmental design. These included:

- *Flood defences* – British Gas and English Partnerships worked closely with the Agency to create a best practice riverbank scheme at the Millennium site. A length of 1.24km of the existing river site frontage needed to be replaced. The design of these tidal defences incorporated a number of features: retreating a 130 metre length inland by 10 metres to create an extensive intertidal habitat; boardwalks for public access; viewing points; an area of salt marsh with a series of terraces between the site and the old flood wall; planting of newly created habitats; and the use of timber fenders to improve the appearance of the wall and provide some habitat for estuarine animals and plants.
- *Ecological park* – situated within the peninsular, the ecological park contains a freshwater lake with timber boardwalks surrounding it. Incorporated into the park design are bat boxes, kingfisher post and nesting tunnels, floating rafts and bird hides. The Thames Path is screened from the park by a camouflaged (timber clad and tree lined) wall to minimise the disturbance to birds on the park. The Greenwich peninsular was frequently used by migrating birds prior to the construction of the Dome and the park now acts as an alternative roost for these birds.

Tiered tidal flood defences

- *Green piers* – within the tidal zone surrounding the site, a number of redundant structures were found within the river. Instead of removing these structures some have been retained and turned into ecological features. Recycled material has been added to their surface and natural succession has led to colonisation with local plant species. Using terracing techniques to create different levels, water features have also been incorporated.
- *Low-energy foodstore* – Sainsbury's have constructed a low-energy foodstore on the Greenwich Peninsular site that incorporates a wide range of new technologies. The design includes: natural lighting; reuse of heat from refrigeration systems for underfloor heating; surrounding earth mounds for insulation; a nature area with footpaths; recycling of water collected from the building's roof; and testing of renewable energy including wind turbines and solar-powered cells.

The innovative and environmentally sensitive ecological designs presented a completely new set of opportunities and constraints to be addressed by the developer, planners and ecologists. The Millennium site is a unique illustration of the new approach to ecological design that the Agency is looking to promote at other suitable sites in London.

15. Leyton Relief Road

Location: Leyton, North East London
Rivers / Catchment: Dagenham Brook / Lee catchment
London Borough: Waltham Forest
Developer: Highways Agency
Date Started / Completed: Under construction
Types of Enhancement: Sustainable Urban Drainage; Restoring Land; Sustainable Flood Defences; Delivering Biodiversity
Development Type: Road scheme
Contact details: Customer Services, Environment Agency, North East Area, Apollo Court, 2 Bishops Square, St Albans Road West, Hatfield, Herts. AL10 9EX.

Site History

The development of the link road is part of the overall infrastructure improvements currently being undertaken within the Lee Valley, and is also part of the Stratford improvements. The road will link the A104 Lea Bridge Road to the A106 Ruckholt Road.

Retention pond – under construction

Environment Agency Interests

- Sustainable Urban Drainage Systems
- pollution prevention
- minimise risk of flooding
- habitat creation

Description of Scheme

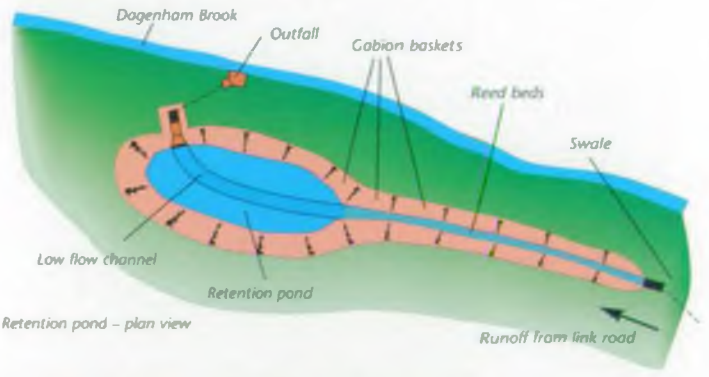
The need to control the additional surface water runoff from this new length of road has instigated this enhancement scheme. Runoff will be managed through the use of two retention ponds. These ponds have been created as off line features from the Dagenham Brook which runs parallel to the new link road.

Within the design of the storage ponds a variety of surface water control techniques have been used. For this project retention rather than detention ponds have been used. Whilst both types of storage pond offer significant but different benefits, retention ponds hold water on a permanent basis, proving the opportunity for additional habitats. Hydrobrakes have been used in both ponds to act as a control mechanism to limit the final surface water discharge to the Dagenham Brook. The area was previously used as a railway marshalling yard which presents a potential contamination risk to the water environment during the construction stage. Consequently both ponds

Retention pond – completed

have been lined to prevent any possible risk of infiltration from disturbed contaminants.

The ponds have been contoured to create marginal shelves to plant reed beds. This not only has aesthetic benefits, but also improves the water quality through root zone action. Both ponds have also been fitted with cut off valves to enable them to be closed in the event of a pollution incident on the link road.



Retention pond – plan view

16. Fresh Wharf Estate and Hewett's Quay

Location: High Bridge Road, Barking, East London
Rivers / Catchment: River Roding / Roding, Beam, and Ingrebourne catchment
London Borough: Barking and Dagenham
Developer: Fresh Wharf Estates
Date Started / Completed: Ongoing
Types of Enhancement: Improving Quality of Life; Sustainable Flood Defences; Delivering Biodiversity
Development Type: Industrial and Retail units
Contact details: Customer Services, Environment Agency, North East Area, Apollo Court, 2 Bishops Square, St Albans Road West, Hatfield, Herts. AL10 9EX.

Current situation – Fresh Wharf Estate (right) and Hewett's Quay (left)

Site History

These sites are located on opposite sides of the tidal River Roding and are two of the key areas of opportunity identified within the overall Single Regeneration Budget (SRB) for the Roding Valley area. The SRB project has a total of 24 schemes covering physical improvements, training, child care, health provision and community development. A budget of £2.6 million and matched funding of £14 million is managed by Barking and Dagenham as the overall programme managers.

The area was traditionally used by the fishing industry, but once this had ceased the chemical and paint industry took its place leaving a legacy of contaminated land adjacent to the river. The area is currently occupied by a number of small workshops and industrial units.

Environment Agency Interests

- maintain the integrity of the tidal flood defences
- protect the tidal foreshore
- improve public access
- improve visual amenity of the river corridor

Description of Scheme

The scheme involves the redevelopment of a large industrial area predominantly on the west bank, but also extends over to the east bank, of the River Roding. The proposal will allow the area to continue to develop its current industrial use, but will also include a large retail component.

Environmental enhancements will take the form of a new 10 metre wide river corridor, including a footpath and cycleway providing new access to the river. The enhancement will include landscaping and planting of indigenous species, which will create a substantial green area in a location that is otherwise heavily urbanised and currently allows little opportunity for the public access to the river. Additional enhancements will include the partial removal of a substantial length of sheet piling on the north bank of Hand Trough Creek, which is a designated Site of Metropolitan Importance for Nature Conservation. This will be associated with terracing of the soil behind the sheet piling to create areas for the existing reed beds to colonise whilst also protecting the adjoining foreshore.

Another important element of the scheme is the inclusion of a proposed public transport link between the site and other retail, industrial and residential areas within neighbouring Newham, to the south. These ideas have been developed through a partnership between the Agency, the developer, and the Borough in securing economic and social regeneration for the area. Opportunities for developing floating conference facilities in the river are also being considered.

Hand Trough Creek

The Agency has had a long history of involvement in the regeneration of the Town Quay area. In 1999 the Agency hosted a rubbish clearance and awareness day for the local people, which involved various educational activities for local school children. The Agency also held its Millennium festival in the local Abbey Grounds and produced an education pack for schools outlining the important environmental, social and economic role of the river within the Borough.

Barking Barrage – downstream of enhancement sites

17. Gallions Reach Urban Village

Location: Thamesmead, South East London
Rivers / Catchment: Thamesmead Canals / Marsh Dykes catchment
London Borough: Greenwich
Developer: Thamesmead Town and Tilfen Ltd
Date Started / Completed: Completed – 2000
Types of Enhancement: Sustainable Urban Drainage; Restoring Land; Improving Quality of Life; River Restoration; Sustainable Flood Defence; Delivering Biodiversity
Length of Enhancement: 500 metres
Development Type: Residential development
Contact details: Customer Services, Environment Agency, South East Area Office, 10 Albert Embankment, London, SE1 7SP.
Tilfen Ltd: Harrow Manor Way, Thamesmead South, London. SE2 9XH

Integrated access – footpaths and cycleways

Site History

This enhancement scheme forms the eastern part of the former Woolwich Arsenal site, which dominated the area in the nineteenth century. Woolwich Arsenal continued as an important munitions factory until the end of the First World War, with its eventual closure in 1967. Following clearance of buildings, much of the site was capped with sand because of the presence of toxic substances. The site still retains a London Ecology Unit designation as a Site of Metropolitan Importance for Nature Conservation despite many changes in the ten years since its designation. Recent surveys have revealed that 193 invertebrate and 178 terrestrial species, including 5 data book species, are found upon the site. Unfortunately due to the contaminated nature of the ground, full retention of the existing habitats on site is not possible because of the need for extensive remediation.

Environment Agency Interests

- reducing the risk of flooding
- creation of wetland habitat
- reducing the risk of pollution from contaminated material
- improving visual amenity
- provision of educational and recreational facilities
- providing maintenance access for Agency staff

Description of Scheme

The newly constructed 500 metre long western section of Gallions Canal has now been completed. This new canal will eventually link up with the Twin Tumps area creating the new 1.5km long Thamesmead canal. The Agency did not accept the initial proposal for a concrete channel, and a more natural river bank was created using geo-textiles and rock gabions. The heavy contamination of the site required innovative techniques involving the use of a wetland system to treat surface water runoff. The main contaminants found are compounds of Ammonia and these are being treated using natural gravels as a filter.

New canal – balancing recreation and ecology

The accommodation of the site's existing biodiversity was also an important consideration, with artificial habitats created specifically for Water Voles within the water treatment system. The approach to the management of waste materials arising from the redevelopment was a particularly interesting feature of this site. Contaminated material has been treated on site rather than being transported elsewhere and existing topsoil has been recycled across the remainder of the site. Footpaths and cycle paths which criss-cross the canal and fishing platforms have also been provided.

The creation of the canal is just one part of this overall project. It also includes the protection of the existing brownfield habitats, and the Thames footpath and its corridor which adjoins the site. This enhancement scheme is particularly note worthy as it demonstrates a number of innovative techniques to protect and develop brownfield habitats and manage contaminated material.

18. Channel Tunnel Rail Link

Location: Dagenham, East London
Rivers / Catchment: Gores Brook, Roding, Beam and Ingrebourne catchment
London Borough: Barking and Dagenham
Developer: Union Railways (North) Ltd
Date Started / Completed: Under construction – started September 2000
Types of Enhancement: Restoring Land; River Restoration; Sustainable Flood Defence; Delivering Biodiversity
Development Type: Rail scheme
Contact details: Customer Services, North East Area, Apollo Court, 2 Bishop Square, St Albans Road West, Hatfield, Herts. AL10 9EX.

Culvert under construction

Site History

Gores Brook intersects the Channel Tunnel Rail Link (CTRL) at the point where the railway line from St Pancras emerges from its tunnel beneath London. To minimise the impact upon the Brook, a 700 metre diversion of the watercourse has been required by the Agency. Consent under the Channel Tunnel Rail link Act 1996 was granted for this scheme in February 1999.

Environment Agency Interests

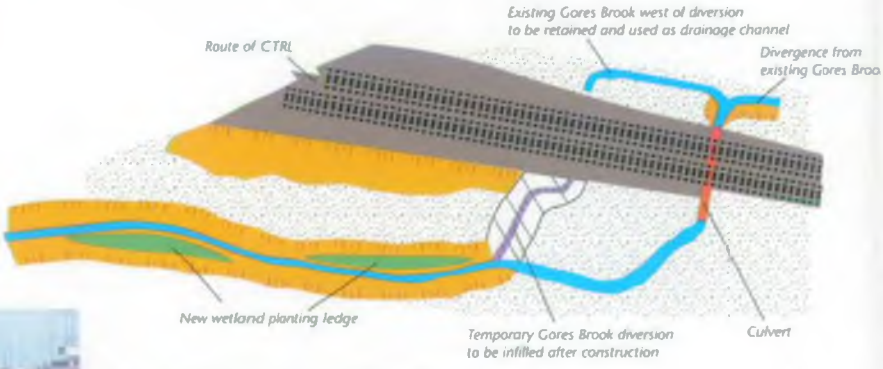
- hydraulic capacity of the channel
- channel enhancement
- contaminated land and protection of groundwater
- habitat creation

Dagenham Brook – construction of realigned channel

Description of Scheme

The construction of the CTRL from St Pancras to Ashford is well underway, with major construction works currently being undertaken in Kent. The overall project has been divided into a number of contracts, with the work to the north of the Thames planned to commence in the summer of 2001. At present, work is underway on diverting service crossings from the route prior to the start of the major works. The enhancement project is part of this preparatory work.

The project involves diverting Gores Brook as it passes under the new Channel Tunnel railway line. At this point the Brook is still under the tidal influence of the River Thames and care was required to ensure that any proposal did not increase the risk of flooding in the surrounding area. The creation of the river diversion will allow the existing channel to the west of the new culvert to be used as a drainage channel for runoff from nearby allotments, and to increase the storage capacity of the current Brook.



Dagenham Brook enhancement – plan view

The area surrounding the Brook is contaminated as a result of historic uses. Therefore, the new channel is to have a bentonite membrane to ensure that contaminated groundwater does not pollute the surface water of the Brook. Within the channel a marginal shelf has been created using gabion baskets to allow the planting of native species and to provide additional in-channel habitat. Natural gravels have also been used to create a natural river bed. An animal trough has been incorporated within the design of the new culvert to allow the migratory passage of local wildlife beneath the new railway line.

An Environmental Impact Assessment has been undertaken by the developer to minimise the environmental impacts of the project. This has allowed consideration of the environmental impacts during construction of the scheme. A minimum set of environmental requirements have also been agreed including a code of construction practice.

19. BICC Cables

Location: Church Manorway, Erith, South East London
Rivers / Catchment: Green Level Main Dyke / Marsh Dykes catchment
London Borough: Bexley
Developer: BICC Cables Limited and Groundwork
Date Started / Completed: Completed - 1999
Types of Enhancement: Sustainable Urban Drainage
Improving Quality of Life
Delivering Biodiversity
Length of Enhancement: 140 metres
Development Type: Car park
Contact details: Customer Services, Environment Agency, South East Area Office, 10 Albert Embankment, London, SE1 7SP.

Site History

BICC Cables Limited has been established on this site since 1882. The company provides an important source of local employment providing 650 jobs at present, and possibly 750 following further investment. The evolutionary development of the factory gave rise to site layout problems and the increasing demand for car parking facilities became a particular issue for the company. As part of creating a new car park on the site of a 2.3 hectares disused playing field the Agency required the implementation of sustainable urban drainage techniques. This was to prevent flooding and improve water quality affected by surface water runoff from the car park.

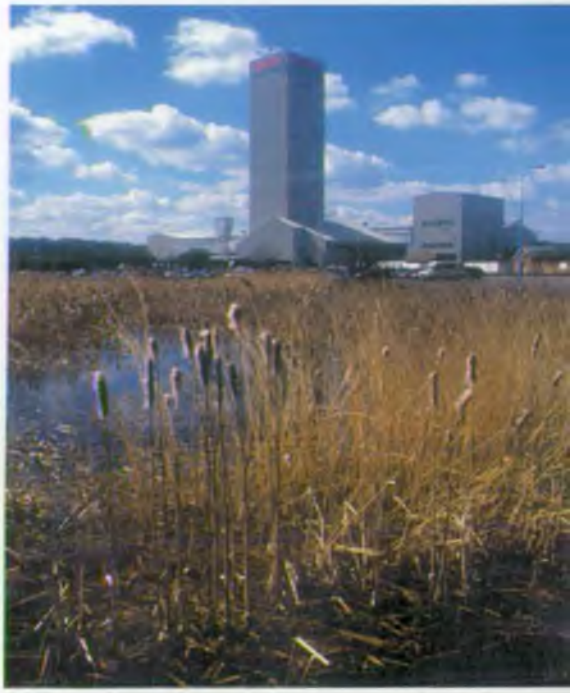
Environment Agency Interests

- creation of wetland habitat
- reducing risk of flooding
- reducing risk of pollution
- creating a more pleasant environment and visual amenity
- provision of educational facilities

Description of Scheme

A retention pond, 140 metres long and 30 metres wide, with a maximum capacity of approximately 500 cubic metres was constructed to cater for a storm with a return period of 100 years. A pumping facility into the Green Level Main Dyke was also incorporated to control water levels and avoid flooding in the surrounding area.

This permanent pool of water takes the form of a watercourse and lagoon. Extensive reed planting in the basin together with carefully chosen indigenous aquatic, emergent and marginal species has provided a valuable habitat. An educational facility with beach access was provided for local school children. This scheme provided the opportunity to create an area of visual interest and wildlife importance, which has influenced the character of the site. Consideration is being given to the designation of the site as a local nature reserve.



Employees of the company have shown a particular interest in the scheme and some additional maintenance work has now been undertaken on the surrounding watercourses within the site. The enhancement has also received an environmental award from the London Borough of Bexley and has been used as an example of how to deal with site drainage issues within the local area.

20. Morrison Pier

Location
Erith, South East London
Rivers / Catchment
River Thames, Tidal Thames
London Borough
Bexley
Developer
W.M. Morrison Supermarkets Plc
Date Started / Completed
Completed – 2000
Types of Enhancement
Improving Quality of Life
Sustainable Flood Defence
Length of Enhancement
300 metres
Development Type
Mixed use development, including supermarket
Contact details
Customer Services,
Environment Agency,
South East Area Office,
10 Albert Embankment,
London, SE1 7SP.

Morrison Pier – from police station site looking east to Corey's coal jetty 1898

Site History

Erith Deep Water Wharf terminal is located on the south bank of the River Thames downstream of the Thames Barrier. The site adjoins Erith town centre and extends for some 8.2 hectares including a pier that extends into the River Thames. It also has a substantial flood defence wall fronting the River Thames. The previous history of the site includes a range of industrial uses but it was last used as a warehouse for imported newsprint.

Environment Agency Interests

- improving public access
- improving the visual landscape and amenity
- promoting education initiatives
- protecting and improving current flood defences

Description of Scheme

The site was identified in Bexley's Unitary Development Plan for comprehensive mixed use development. The overall development includes housing, amenity, and retail uses. In outlining their brief for the site, the developer specifically included that any proposal would re use the deep wharf jetty with improved public access; increase the use of the river and riverside transportation; and improve the local environment through high quality design and integration of land use. In an attempt to meet these objectives, the developer had initially proposed to use the structure of the jetty to create an online marina. However, as a result of the concerns expressed by the Agency regarding the potential impacts on the tidal Thames environment this idea was dropped.

The regeneration of the redundant pier was essential to improving the environmental quality of the whole site and to provide an amenity resource for the local population. As part of the restoration, the surface of the pier was re-clad, together with the installation of lighting and furniture. New hand railing was also added to the pier to improve safety. The developer has taken the opportunity to integrate the pier into the riverside footpath through the use of interpretative information boards and signage.

The site is located downstream of the Thames Barrier and therefore flood defence walls need to be higher than in central London to cope with surge tides and are critically important in protecting riverside land. Particular care was taken by the developer to protect the moveable flood defence wall at the land end of the pier and the tie rods supporting the main flood defence walls adjoining the site.

Interpretative information board

The redevelopment of the site was also seen as a catalyst for other redevelopment in the area including those receiving Single Regeneration Budget funding, which is currently in place within the Borough.

The Way Forward

These case studies are a selection of examples of the every day work being carried out by the Environment Agency in London and demonstrate the effectiveness of the Area staff. The success of the schemes are evidence of the proactive involvement of the Environment Agency in the planning system. The case studies described here do not represent the whole picture regarding this work. There are of course many other schemes where the Agency has had a significant input which we hope to present in the future.

Partnerships are essential if substantial environmental improvements are to be achieved in London. What is clear from the case studies is that the development industry is becoming increasingly aware that environmental issues, once considered a constraint to proposals, can actually benefit the developer and the longer term sustainability of the site.

Tokyngton Park – Planning for Real™ exercise

The current impetus behind the urban renaissance initiative will mean that London is likely to see an increase in the number of contaminated sites coming forward for development. As we have seen at the Greenwich Peninsular early consultation with relevant partners can achieve substantial environmental benefits. We have also identified how partnership funding provides an opportunity to integrate the environment with social and economic issues. An essential element of this process is to use master plans to develop and coordinate a strategic vision and objectives for a project. This will help environmental considerations to be incorporated at an early stage.

It is hoped that in developing the Spatial Development Strategy for London that the GLA will give equal status to protecting and enhancing the environment alongside social and economic issues. If this balance is achieved the capital can look forward to a more sustainable future.

Acknowledgements
We would like to thank the following individuals and organisations that have given permission or provided information to help in the production of this report.

Case Studies

RAF Stanmore, Stanmore	• Laing Homes
Brent Cross, Hendon	• Brent Cross Shopping Centre • BDP
Tokyngton Park, Tokyngton	• Tav Kasmi - London Borough of Brent • Ian Simmons / Mark Seward - Halcrow Water • Moore, Piet & Brookes • London Borough of Brent Planning Services Landscape Design team • New Leaf
Wandsworth Riverside, Wandsworth	• Assael Architecture Limited • Persimmon Homes • Chorley Handford - Aerial Photography
Wandle Park, Colliers Wood	• Aileen Shackell - Groundwork Merton
Priory Park, Colliers Wood	• Aileen Shackell - Groundwork Merton
Tate Modern, Southwark	• Tate Modern • Keinast Vogt Parter • Charles Funke Associates • Ove Arup & Partners • Environment Agency, Thames Region - Landscape Architecture Group
Lockes Wharf, Isle of Dogs	• St Georges plc
Deptford Creek Regeneration, Deptford	• Jill Goddard - Lewisham Environmental Project Officer • Bookers • New Fairview Homes • Chorley Handford - Aerial Photography
Greenwich Peninsular, Greenwich	• Sainsbury's plc
Leyton Relief Road, Leyton	• London Borough of Waltham Forest
Gallions Reach Urban Village, Thamesmead	• Mark Philpotts - Tilfen Ltd
Channel Tunnel Rail Link, Dagenham	• Rail Link Engineering (RLE)
BICC Cables, Erith	• Pirelli • BICC Cables
Morrison Pier, Erith	• Morrison Supermarket

This report has been produced by the Technical Planning Section in Reading.

Project Manager
Hugh R Howes
Project Team
Richard Eales *Consultant*
Stuart Reilly *Consultant*
Contributors
Helen Ferdinand
Donna Casey
Trevor Odell
Rob McCarthy
John Mills
Kim Thirlby
Sarah White
Dave Webb
Chris Catling
Jim Linwood
Ian Blackburn
Lucky Wehalle
Siraj Tahir
James Burstow
Rachael Hill
Other
Keith Harding *Photographer*
Terry Roberts *Black Pearl*

THAMES REGION ADDRESSES

REGIONAL OFFICE
Environment Agency
Kings Meadow House
Kings Meadow Road
Reading
Berkshire RG1 8DQ
Tel: 0118 953 5000
Fax: 0118 950 0388

SOUTH EAST AREA OFFICE
Environment Agency
Swift House
Frimley Business Park
Camberley
Surrey GU16 7SQ
Tel: 01276 454 300
Fax: 01276 454 301

WEST AREA OFFICE
Environment Agency
Isis House
Howbery Park
Crowmarsh Gifford
Wallingford
Oxfordshire OX10 8BD
Tel: 01491 832 801
Fax: 01491 834 703

NORTH EAST AREA OFFICE
Environment Agency
Apollo Court
2 Bishop Square
Business Park
St Albans Road West
Hatfield, Herts AL10 9EX
Tel: 01707 632 300
Fax: 01707 632 500

www.environment-agency.gov.uk

ENVIRONMENT AGENCY GENERAL ENQUIRY LINE
0845 933 3111

ENVIRONMENT AGENCY FLOODLINE
0845 988 1188

ENVIRONMENT AGENCY EMERGENCY HOTLINE
0800 80 70 60

ISBN: 1 85 7055527

ENVIRONMENT AGENCY

Printed on CyclusPrint
Designed by Black Pearl Consultancy Ltd