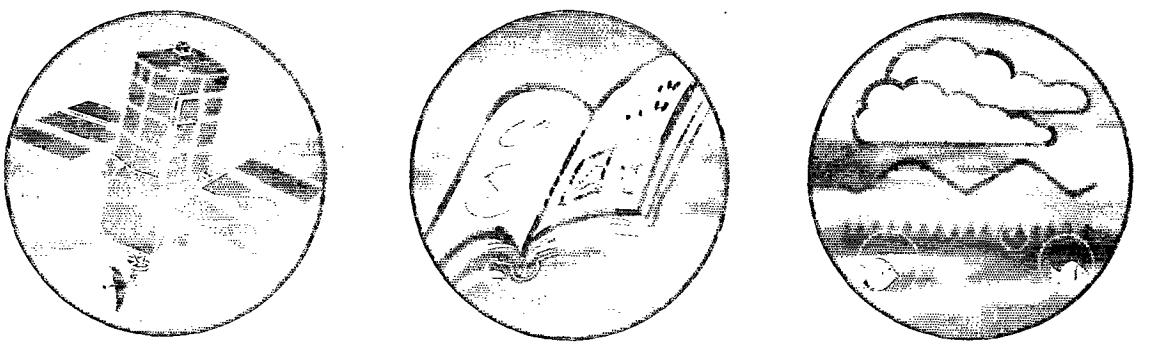
The Recreational Use of Flood Banks
Phase 1



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The Recreational Use of Flood Banks

Phase 1

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SO-7/98-B-BCAP

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VALIDATION OF REPORTS

TITLE: Sustainable Recreational Use of Flood Banks

STATUS: Report

DATE: 1998

JOB NO: ESWSB

AUTHOR(S): **Tessa Harding**

CHECKED BY: Stephanie Peay

APPROVED BY:

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Executive Summary

In addition to the functions inherited from its predecessor the National Rivers Authority the Environment Agency has a duty to promote recreation, particularly in the water environment. At the same time there is a perception within the Agency that recreational activities can interfere with the function of flood banks.

The current study outlines the range of recreational activities which occur on riverine, tidal and coastal flood banks and identifies the facility requirements of each. The factors which constrain the development of recreational activities are explored, and the conflicts which arise, both between recreational activities, and with the functions of the flood defences.

Information regarding the extent of each category of flood defence throughout the Agency regions was gathered through two separate questionnaires circulated to flood defence managers and fisheries, ecology and recreation managers. Twelve examples of schemes in which recreation had been successfully incorporated on flood defences were individually researched as good practice case studies, and the lessons used to guide the recommendations in the report. A literature review provided background information on areas such as the requirements of each activity and existing good practice.

Approximately half of the questionnaires were returned and at least one response was received from each region. Midlands (Lower Trent) was found to contain the greatest extent of riverine flood defences, whilst Anglian (Eastern) area supported the most tidal and coastal defences. Agency staff reported walking as the most widespread activity practiced on flood banks in general, followed by bird watching and nature study.

Lack of access rights and facilities for land based activities and launching points for water based activities were the most widely reported constraints on recreation, and in general water based activities were considered to be poorly provided for throughout the regions. Recommendations in terms of facility provision highlighted the need for a collaborative approach between local authorities and the Agency in order to raise capital. A more coordinated approach to the granting of land drainage consents for larger schemes was advocated, and consultation between recreational providers and Agency staff in identifying suitable locations for facilities which minimise interference with flood defence functions.

A number of mechanisms were described for increasing public access to privately owned flood banks. Recent initiatives such as Access 2000 may lead to more widespread voluntary access agreements, whilst agri-environment schemes such as Countryside Stewardship offer financial benefits to farmers for opening up areas for public access. The development of codes of good practice by sports governing bodies and their promotion to both affiliated members and casual recreational users is widely viewed as a method of demonstrating responsible recreational use to land owners.

Zoning of recreational activities, both in time and space provides a means of overcoming or avoiding recreational and nature conservation conflicts. Conflicts between canoeists and anglers, which were the most widely reported, may be overcome by dividing the water course into separate areas and reserving an 'undisturbed' zone close to the bank edge. Participation by recreational users in the management of a site through the wider use of liason groups was identified as a means of avoiding conflicts.

The provision of recreational facilities on the flood banks presents a number of potential problems for the maintenance of flood defences. Surfaced cycle paths in particular are considered to interfere with fundamental maintenance operations such as raising the crest of the bank to maintain flood defence capability. Agreements within the land drainage consent for recreational providers such as local authorities to finance any repairs required to the path as a result of flood defence functions is identified as one means of overcoming the problem.

The wider use of strategic and detailed site management plans provides a means of identifying potential conflicts at an early stage and integrating the various demands and requirements on the resource.

Keywords

flood banks; flood defences; riverine; tidal; coastal; guidelines; land based recreation; water based recreation

1. INTRODUCTION

Participation in sport and recreation has increased considerably in the past 20 years. In 1986 21 million adults were recorded as regularly taking part in indoor or outdoor sport, an increase of 7% since 1977. (DoE/Welsh Office 1991)

As part of its duties under the Environment Act 1995 the Environment Agency has a responsibility to "ensure that land or water in the Agency's control is made available where appropriate for recreational purposes" and to exercise a general duty "to promote the use of inland and coastal waters and land associated with them for recreational purposes ---".

The Agency do not currently operate a nation-wide policy on the development of floodbanks for recreational use. Where flood banks have been used for recreation in the past, most of this activity has been permissive rather than planned, and there are relatively few projects which have been actively promoted.

Generally there has been a perceived conflict between flood defence and recreational activities as these can impinge upon maintenance arrangements and some activities have the potential to weaken or undermine the structure of the flood defence asset.

The Agency has a major role to maintain, operate and improve flood defences, which includes the improvement of flood defences to reduce the risk of flooding, the maintenance and operation of flood defences and associated structures. (Environment Agency 1998).

As it is part of the EA's duty to promote recreation, this R&D study is designed to identify the requirements of recreational activities and the implication of these for flood defence, and set out guidelines on how recreation can be accommodated on flood defence assets. The study is intended primarily for use by flood defence managers and engineers and Environment Agency recreation officers.

Aims

- To determine the range of recreational uses of flood banks, their facility requirements and constraints
- To investigate the conflicts between the uses and functions of flood banks

Objectives

- To establish a set of guidelines for the development and promotion of recreational activities associated with flood embankments.

2. METHODOLOGY

The main elements of the project included:

- the broad definition of the EA flood defence asset on a national scale;
- a questionnaire survey of Area Flood Defence Managers and Recreational Managers (2x surveys) in order to ascertain the types of flood defences and recreational use of flood defences on a national scale and
- the exploration of a number of case studies to determine best practice and satisfactory resolution of problems or constraints

The actions associated with these elements were undertaken as follows:

1. A review of available published material on the provision of recreational facilities was undertaken. This included material from both the EA and external sources (e.g. the Sports Council). The availability of relevant international experience was also explored via the Internet. A brief telephone survey of relevant recreational organizations, such as the British Canoe Union, and the British Water Ski Federation was undertaken in order to gain a broader impression of the recreational use of flood defence facilities.

2. Two separate questionnaires were prepared and issued to all Area Flood Defence Managers (29 in total), and all Area FRCN managers (30) . The questionnaires were designed to gather information on:

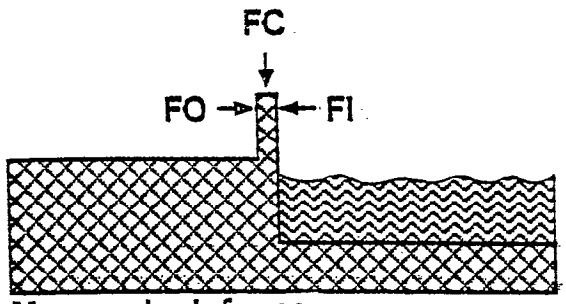
    - the extent and distribution of various classifications of flood defence asset on a national scale (fig. 2.1);
    - the types of recreation associated with each asset, any conflicts which may occur between different recreational users or with other uses;
    - the constraints imposed upon recreational development/expansion, classified into structural, resource or operational constraints
    - 'good practice' case histories within each area

3. Twelve good practice case studies were selected for further research from:

    - the range provided by the EA at the start-up meeting
    - examples known to Scott Wilson staff,
    - examples provided by area staff , both in the questionnaires and by telephone interview

4. The case histories were researched through a site visit and meetings with the various relevant personnel within the Agency, or, in a number of cases in the local authority. A pre-prepared questionnaire was used as a basis for the 'interview', in order to ensure that a consistent approach was taken by each researcher, and that all the relevant information was collected.. A review of any background information held on file was also carried out at the time of the

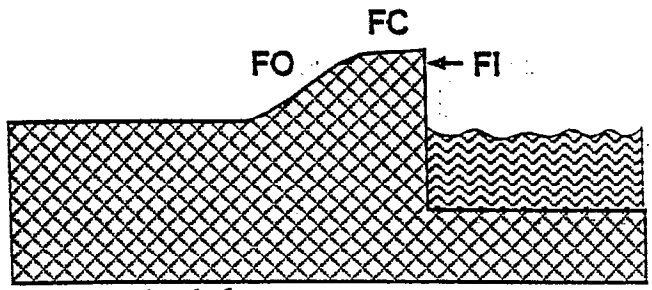
Flood Defences



Type 1

Man made defence

FI = Inward face
FC = Crest
FO = Outward face



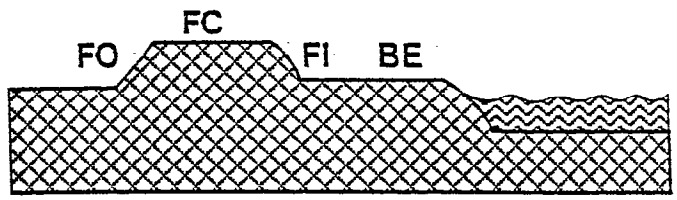
Type 2

Man made defence

Type 3

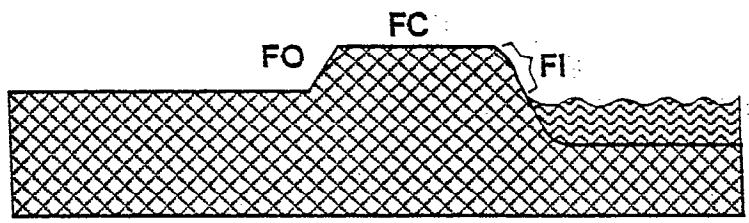
Man made defence

BE = Berm



Type 3a As (3) but natural defence (i.e. not man made)

Type 4 Man made defence



Type 4a As (4) but natural defence (i.e. not man made)

Figure 2.1 Types of flood bank referred to in text

interview.

5. A site visit was undertaken, normally with the interviewee, which allowed the researcher to gain a better 'feel' for the issues involved within each scheme. As part of the site visit a limited assessment was carried out of selected reaches of the defence structure (up to 1km in length).

6. Each case history includes an account of the range of recreational activities, both authorised and unauthorised, which occur within the scheme. Any problems encountered with regard to recreation are explored and the methods used to overcome or reconcile conflicting uses outlined.

3. RESULTS

3.1 Response to questionnaire survey

Of the 59 questionnaires circulated a total of 31 were returned; 17 from flood defence officers, and 14 from Fisheries, Recreation and Conservation officers. A list of questionnaire recipients is given in Appendix 6. The largest response was from Midlands regions, with questionnaires received from all four flood defence officers, and from three of the four fisheries, conservation and recreation officers.

3.2 Extent of flood defence resource

Table 3.1 shows the total lengths of riverine, tidal and coastal flood defences in each area. As this information was only requested on the flood defence questionnaires, no data is available for areas which returned only fisheries, recreation, conservation questionnaires. Of the 23 areas which responded the greatest length of riverine flood defence lies in Lower Trent area (1790 km), whilst Anglian (eastern) region maintains the greatest length of tidal (400 km), and coastal (110 km) defences.

3.3 Occurrence of recreational activities

The frequency of each recreational activity over all the Agency region is shown in Table 3.2. Walking was found to be the most widespread recreational activity throughout all the regions, occurring on riverine and tidal flood banks in all of the areas sampled, and in 13 of the 17 areas (76%) which have coastal defences. Bird watching was the second most widely reported activity, again both on riverine/ tidal, and coastal defences, occurring on riverine defences in 20 of the 21 areas (95%) and on coastal defences in 12 of the 17 areas (71%). Differences between the two category of defence emerge with the third most popular activity. Coarse fishing occurs on riverine defences in 17 of the 21 areas (80%), but was only recorded on sea defences in 3 areas (18%), and as such was ranked 14th. Nature study, the third most important activity on coastal defences, occurred in 9 of the 17 areas sampled (53%). It was the 4th most important activity on riverine defences and occurred in 76% of areas.

Riverine / tidal flood banks appeared to support a higher number of recreational activities (23) compared with coastal defences (20). The diversity of recreational activities practiced on flood banks throughout the regions was also found to be higher with an average of 9.3 for riverine/ tidal defences compared with 3.9 for coastal defences. Swimming was found to be the only activity which occurred more frequently from coastal defences (47% compared with 33% on riverine defences.

3.4 Recreational Constraints

The constraints on recreational use of flood banks were sub-divided into those which are related to:

- the structure of the defence;
- the resource (e.g. land ownership and access)
- the operation of the defence (e.g. the condition of embankments or the timing of maintenance.)

For the resource and operational constraints respondents were requested to state whether the issue was influenced or under the control of the Agency.

3.4.1 Structural damage to flood defences caused by recreation

In 9 of the 17 areas flood defence managers identified structural damage to the flood defences caused by recreation. The most common damage was caused by fishermen excavating the inward face of the defence to create suitable casting points (8 areas). The bank crest, particularly on riverine defences was found to be the face which incurred the most damage, particularly from walking (5 occurrences), horse riding (4 occurrences) and motor vehicles (3 occurrences). Other reported damage included wash from boats causing scouring to the toe of the inward face (3 occurrences).

3.4.2 Structural constraints

Table 3.3 shows the range of structural constraints identified by flood defence engineers. 11 of the 17 respondents felt that there were no specific structural constraints on recreation. The susceptibility of earth embankments to erosion was identified most frequently as a structural constraint, in several cases in association with the narrowness of the defences. The presence of unsafe structures, river control structures and outfalls was identified only once as a constraint.

3.4.3 Resource and operational constraints

Table 3.3 shows the resource and operational constraints which were considered to be most 'important', i.e. those which were recorded most frequently. The absence of public rights of way was the most widespread constraint on recreation, although only four respondents felt that this was under Agency control, compared with 17 who felt it was outwith the Agency's control. Lack of access points was also considered a widespread constraint. Perceived responsibility for access provision was almost equally split between those who felt that it was the Agency's responsibility and those who felt it lay outside its remit.

Operational constraints were generally less widespread than resource constraints. The principal operational constraint was felt to be the lack of man-power and/or financial resources to maintain recreational facilities. Again, perceived responsibility for this was fairly equal with 10 respondents attributing responsibility to the Agency, compared with 12 who felt it was not within Agency control. The weak condition of embankments, and unspecified nature conservation restrictions were also widely

identified as operational constraints.

Lack of launching points was the most prevalent constraint in terms of water-based recreation. Figures for this correspond fairly closely with the lack of access points for land-based recreation (10/13 for access points under Agency control/not under Agency control; and 9/12 for launching points under Agency control/not under EA control). Navigation rights were considered to be largely out of Agency control, but were considered to be a constraint by 19 of the 31 respondents.

3.5 Recreational conflicts

On the basis of the questionnaires returned there appears to be relatively few conflicts between recreational activities. Those which were identified are shown in figure 3.2. The most frequently encountered conflict was between canoeing and fishing, which was identified by five FCR officers. Overall, however, more individual types of conflict were encountered between land-based recreational activities, in particular between walking and cycling, and between fishing and shooting, than between water based activities. Fishing interacts with both media, and as such was found on occasions to conflict with both water-based (canoeing and pleasure boating) and land based (walking and shooting) activities.

3.6 Actions to promote / encourage recreation

Table 3.6 provides details of the actions being carried out to promote and encourage recreation in each area. At a strategic level the adoption of recreational policies through Local Environment Agency Plans appeared to be the most widespread means of increasing recreational use of flood defences. The construction of new recreational facilities was also cited as a widespread means of promoting recreation (11 areas) as was the provision of public information boards (9 areas). Negotiation of access rights and the construction of car parking facilities were the least used method of encouraging recreation. (4 occurrences each)

3.7 Case studies

The twelve case studies researched for the project are listed in Table 3.9.

Table 3.1: Length of flood defences in each region

			Length of defence (km)		
Region	**Area**	**Catchment**	**Riverine (km)**	**Tidal (km)**	**Coastal (km)**
North East	Ridings -	Don & Aire	1056.62	86.74	
	Ridings -	Hull & Humber	85.7	80.5	12.1
Anglian	Eastern		50	400	110
	Central		544	130	87.3
Southern	Hants & IOW		No data	25	16
	West Sussex	R. Adur	3.3	40.5	6.2
	West Sussex	Chichester		No data	17
	East Sussex		144	16.83	16
North West	Central		146	70	41
	South		No data	<10	No data
South west	Devon		No data	No data	5
Thames	West		28		
Midlands	Upper Trent		40		
	Lower Trent		1790	168	
	Lower Severn		118.4	89.9	51.4
	Upper Severn		80		

Key

Category of defence not present in region/area

No data Information not recorded on questionnaire

Table 3.2: Occurrence of recreational activities on riverine, tidal and coastal flood defences

Activity	Riverine/Tidal		Coastal	
	Total no. of areas in which activity occurred	Total expressed as % of total no. of areas with riverine defences	Total no. of areas in which activity occurred	Total expressed as % of total no. of areas with riverine defences
Walking	21	100	13	76
Bird watching	20	95	12	71
Fishing (coarse)	17	80	9	53
Nature Study	16	76	8	47
Canoeing / kayaking	15	71	8	47
Picnicing	14	66	7	41
Cycling (touring)	11	52	6	35
*Horse riding	11	52	5	29
Pleasure boating	11	52	5	30
Fishing (game)	10	47	4	24
Sailing / windsurfing	8	38	4	24
Rowing	8	38	4	24
Shooting	7	33	3	18
Swimming	7	33	3	18
Jet skiing	6	28	2	12
Rafting	6	28	1	6
Cycling (mountain biking)	5	23	1	6
*Motor cycling	5	23	1	5
Water skiing	4	19	1	5
*4x4 vehicles	3	14	0	0
Duck racing	1	4	0	0

*Illegal activities on flood banks under Flood Defence bylaws

Table 3.3: Structural damage to flood banks associated with recreation (in order of frequency)

Recreational activity causing damage	Type of defence	Position of flood bank	Details of damage	No. of reports
Angling	Riverine	Inward face/ berm	Anglers excavating bank to provide suitable casting areas	7
Walking	Riverine / tidal	Bank crest	General erosion	5
Horse riding	Riverine / tidal / coastal	Bank crest	General erosion	4
Boating, sailing	Riverine	Inward face	Scouring of bank foot by boat wash	3
Motor vehicles/ motorcycles	Riverine/tidal/ coastal	Bank crest, inward, outward faces	General erosion	3
Cycling / mountain biking	Riverine / tidal / coastal	Bank crest	General erosion	2

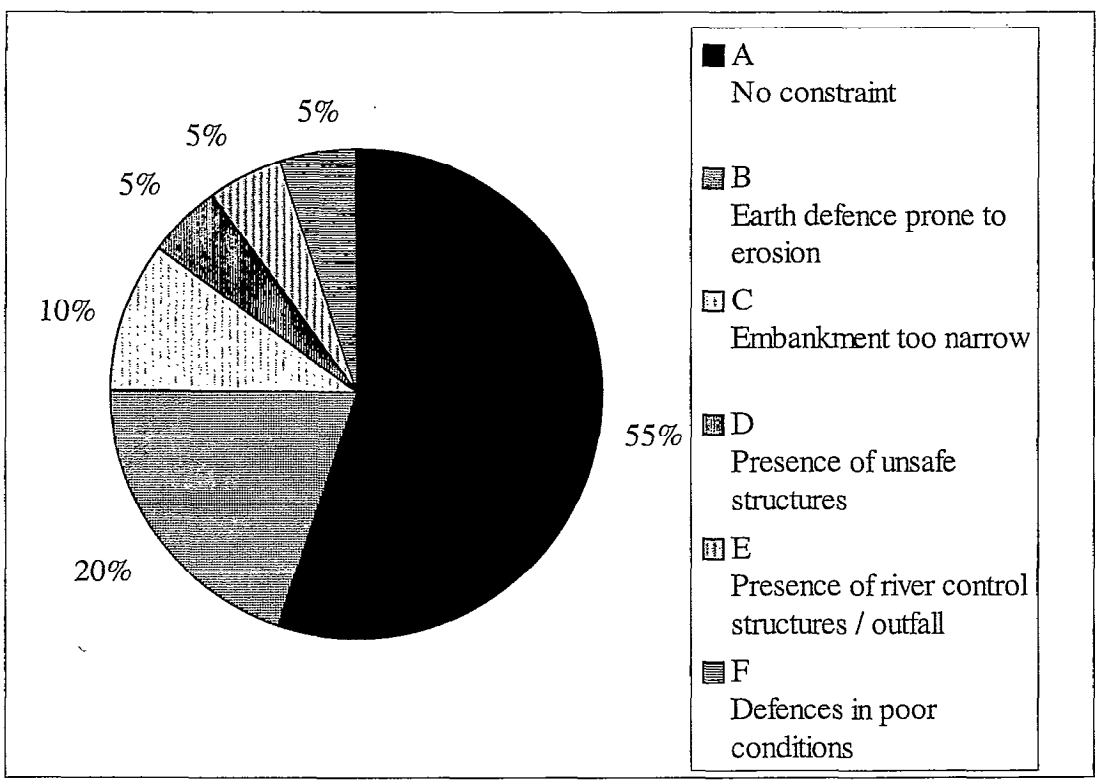


Fig. 3.1: Structural constraints on recreation (based on total number of responses)

Table 3.4: Principal resource and operational constraints on recreation (based on total number of responses)

Type of constraint	Details of constraint	Under EA control (no. of respondents)	Not under EA control (no. of respondents)	Rank importance (based on total no. of responses)
Resource	No public rights of way	8	16	1
Resource	Lack of access points	10	13	2
Operational	Lack of man-power / financial resources to maintain recreational facilities	10	12	3
Resource	Land ownership	4	17	5
Resource	No bridleways	6	15	5
Resource	No launching points	9	12	5
Resource	No navigation rights	3	16	7.5
Operational	Weak condition of embankments	11	8	7.5
Operational	Nature conservation constraints	7	11	9.5
Resource	Lack of access agreements	5	13	9.5

Table 3.5: Principal resource/operational constraints on recreation (based on Agency area)

Type of constraint	Details of constraint	% of Agency areas in which constraint identified
Resource	Land ownership	90
Resource	No navigation rights	90
Resource	No public rights of way	85
Operational	Riparian owner	85
Resource	Lack of access points	80
Resource	No bridleways	80
Operational	Lack of man-power / financial resources to maintain recreational facilities	75
Operational	Presence of dangerous structures	75
Resource	Provision of toilets	75
Operational	Nature conservation constraints	75
Resource	No access for canoeing/kayaking	75

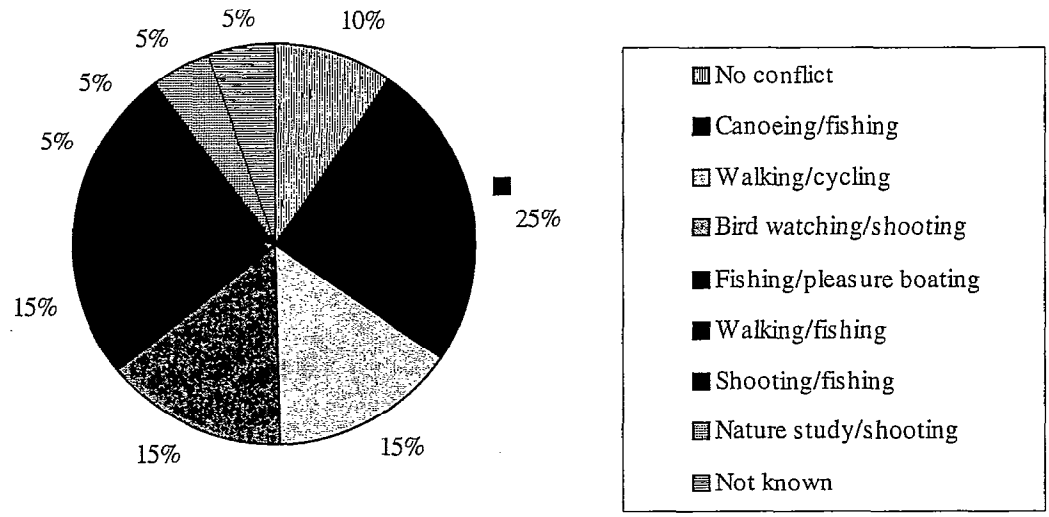


Fig 3.2: Occurrence of recreational conflicts (based on total number of responses)

Table 3.6: Actions to promote / encourage recreation

Details of action	Rank order of occurrence
Improved support through the adoption of recreational policies in Local Environment Agency Plans and Catchment Management Plans	1
Construction of recreational facilities	2
Public information boards	3
Surfacing of existing foot paths	4.5
Maintenance and construction of new footpaths	4.5
Maintenance / improvement of car parking	6.5
Negotiation of access rights	6.5

Table 3.7: Good practice case studies

Scheme name	Agency Region	Area office	Contact (Agency unless otherwise stated)	Type of defence
Saxon Shore Way / Riverside Park	Southern	Kent	Brian Barnet Jeremy Burgess (Medway Council)	Coastal
Pennington Marshes	Southern	Hampshire	Tim Kermode	Coastal
River Frome moorings	South West	South Wessex	Judith Crompton	Riverine / tidal
Parrett Trail	South West	North Wessex	Stewart Moodie	Riverine/tidal
Severn Beach defences	Midland	Lower Severn	Morris Portsmouth	Coastal
Sandwell Valley Trail	Midlands	Upper Trent	Andrew Crawford	Riverine
River Tome Washlands	Midlands	Lower Trent	Valerie Holt	Riverine
Gainsborough redevelopment	Midlands	Lower Trent	Tim Hall	Tidal
Trans Pennine trail	North east	Ridings	Roy Johnson	Riverine
Great Ouse Path	Anglian	Kings Lynn	Brian Butterfield (EA) Rob Marshall (Norfolk County Council) Chris Pearce (Kings Lynn Borough Council)	Tidal
Ouse Washes nature reserve	Anglian	Central	Mike Atkinson	Riverine
Colchester to Wivenhoe cycletrack	Anglian	Eastern (Kelverden)	John Claydon	Tidal

Table 3.8: Summary of good practice 'lessons' gained from case studies

Case study	Good practice 'lessons'
Saxon Shore Way/Riverside Park	• metal posts on the outward face of the flood bank to prevent access for cars • interpretation and wardens to inform visitors of conservation area whilst preventing access to sensitive sites
Pennington Marshes	• recreation facilities designed into new sea defence to compensate and add to existing facilities • access control structures to prevent motorcycles whilst allowing disabled access
River Frome moorings/footpath	• mooring platforms directly from riverside berm without causing damage to flood bank • yacht club built directly on flood bank with disabled access ramps on inward and outward flood bank faces • damaged bank repaired to • enable access for swimming whilst preventing mooring by boats • resolution reached between local authority and Agency over surfacing and widening of footpath • joint funding between local authority and Agency for footpath improvements
Parret Trail/canoe access steps	• extensive consultation at planning stage lead to identification of potential conflicts between recreation and nature conservation. Measures taken at this stage to avoid conflicts • steering committee involving all interested parties set up to guide development of the project • funding spread over wide range of organisations, including EU LIFE funding • liaison between Agency flood defence and local authority to identify mutually acceptable location for new canoe access steps
Severn Beach sea defences	• upgraded sea wall incorporating recreation and amenity facilities
Sandwell Valley trail	• ditch and hedge system designed by Agency behind flood defences to prevent unauthorised access to golf course • access control gate to allow disabled access whilst preventing access by motorcycles • land drainage consents issued under a single application for all structures along the walkway
River Tome Washlands	• designs for the new recreational scheme were guided by existing use and identification of potential use • network of surfaced paths and ramps designed specifically to allow disabled access • complaints by local residents of loss of privacy overcome by tree-planting at the foot of the outward face of the

	floodbank • aesthetic and nature conservation value of the site increased by creation of meanders and in-channel islands • funding of the scheme shared by local authority and Agency
Gainsborough	• informal recreation facilities designed into a new flood defences in a previously run-down urban area • grant aid awarded by the Department of the Environment for recreational facilities • raised blocks on the bank crest prevent access by cyclists for safety reasons • 'anti-graffitti' paint has been used throughout the scheme
Trans-Pennine trail, River Dearne	• separate route at the base of the flood bank for horse-riding to avoid conflict with other recreational users and to overcome the restriction on this activity imposed by the land drainage bylaws • clear way marking to guide users to the correct route • railings provided for public safety where drops from the bank crest are considered dangerous • informal consultation between local people and motorcyclists to overcome unauthorised use by motorcyclists
Great Ouse path	• consultation with local disabled access group to obtain design specifications for ramps • maintenance of the footpath by the council made a condition within the land drainage consent • designation of the path as an official cycle track under the Cycle Track 1984 provides legal backing to the restriction on access by motorcycles
Ouse Washes	• gates and waymarking used to divert the footpath from the crest of the floodbank to avoid disturbance to birds caused by walkers • disabled access ramps provided to a number of the bird hides • wooden board walks used to prevent damage to small areas of wetland habitat on the riverside berm.
Colchester to Wivenhoe cycle track	• before the scheme the flood bank was in a poor state of disrepair, and due to its low priority in flood defence was unlikely to be upgraded. The sealed footpath provides protection to the bank crest. • a collaborative approach in terms of funding has 'spread the load'. • objections by riparian owners were overcome by the negotiations initiatied by the Environment Agency

4 DISCUSSION

4.1 Incomplete data set and the application of FDMS

The relatively low response by regional staff to the questionnaire survey has implications for the accuracy and completeness of the data set. For example, in areas where a questionnaire was received from the flood defence manager only information relating to aspects such as conflicts between recreational activities is absent, thus leading to an inaccurate impression of recreational use. In addition, it has been impossible to make a complete assessment of the extent of each type of flood defence on a national basis. Telephone discussions with flood defence managers revealed that information regarding the length and location of defences was not easily compiled and hence completion of the questionnaires demanded too much time.

Potentially this type of data will become more accessible following the introduction of the Flood Defence Management Framework (FDMF) throughout all the Agency regions. The FDMF provides an objective method of identifying, justifying and prioritising flood defence works, and is based on a computerised management information system (known as the Flood Defence Management System), which stores data relating to all flood defence structure within an Agency region. The system divides rivers into numbered reaches of between 4 and 7 km, which form the individual management units. For each management unit data is stored regarding the condition and maintenance history of the flood defence asset. Individual regions are at various stages of developing and implementing the system.

4.2 Range of recreational activities occurring on flood banks

The complete range of activities which could potentially occur on flood banks was identified through background research, the results of the questionnaires and from discussions with the Environment Agency. The activities are listed in Table 4.1. Activities which could potentially occur on flood banks but which were not identified on the questionnaire survey are highlighted in bold. There may be several reasons to account for their absence. Most likely is that certain activities such as skate boarding, kite flying, art and photography may have been overlooked by Agency staff, often because they are unlikely to occur through an organised club or society.

The variation in the number and occurrence of activities between the regions may be a result of the following factors:

- Extent of the flood defence resource within the region
- The level of priority attributed to recreation and leisure development by the local authority in the county or region as a whole
- The willingness of flood defence engineers to approve recreation schemes
- The extent to which EA staff are aware of the activities which actually take place on the flood defence assets

Table 4.1: Range of activities which may occur on flood banks

Water based	Land based
kayaking	walking
canoeing	cycling
boating	fishing (coarse)
rowing	fishing
sailing/yachting	fishing (sea)
wind surfing	horse riding
jet skiing	bird watching
water skiing	picnicing
SCUBA diving	4x4 vehicles
swimming	nature study
dragon boating	shooting
aqua golf	**skate boarding**
model boating	**kite flying**
rafting	**art**
	photography

4.3 Facility requirements for recreation

Each recreational activity has a set of minimum requirements in terms of space and resource provision. The extent of these requirements and the associated cost often dictates whether an activity is likely to occur. The essential requirements of each recreational activity which may be encountered on flood banks, and any additional facilities which may be required is outlined in Table 4.2. A more detailed description of the requirements of each activity is provided by Dangerfield (1981).

Activities such as walking and angling require no facilities as such and occur on flood banks rights of way throughout the country. Similarly, canoeing can occur without any official launching points provided the bank profile is sufficiently shallow (British Canoe Union, per comm.). However, once the number of participants in each of these activities exceeds a critical number bank erosion may occur (see section 4.5.1). The provision of additional facilities such as surfaced paths or launching points may then be required.

Other activities require formal facilities regardless of usage intensity. This includes most of the water-based activities such as sailing, cruising and water skiing, which require, at a minimum fixed mooring points at the bank edge and usually access points across the flood bank. These may take the form of steps, ladders or landing stages.

Of the land-based activities listed cycling and horse-riding generally require a surfaced path to prevent erosion, particularly as damage to surfaces by these activities tends to bring them into conflict with walkers.

For some activities the requirements vary according the level of skill of the participants. For example, experienced walkers who are able to read a map will not require (and may actively avoid) way marked routes, which will generally be preferred by the more inexperienced walker. However, if there is no maintenance, the path may

become blocked by obstacles such as heavy vegetation or barbed wire forcing walkers to use alternative routes which may bring them in to conflict with land owners.

4.3.1 Additional requirements for recreational facilities

Whilst most of the water-based activities may occur given adequate launching facilities, the provision of land based facilities such as changing rooms and toilets allows for a degree of 'comfort' , and is likely to attract additional participants, even if only by formalising the activity at that particular location.

Participation by disabled people may require the provision of additional facilities, such as hand rails and access ramps. Details of these facilities are discussed in detail in the technical report.

4.3.2 Overlaps in facility requirements

Some requirements overlap, for instance way marking on walking tracks, cycle ways and bridleways assist in directing people to the public right of way and provide an opportunity for circular routes. They may also act as a management tool; for instance, markers can indicate the category of route, thus excluding unauthorised activities. For example, the Road Traffic Act 1930 makes an illegal for motorbikes to use footpaths or bridleways. In some cases gates or other barriers are required to discourage or prevent unauthorised use

Similarly, certain water-based activities, in particular, water skiing, sailing and cruising may share facilities such as slip-ways and changing facilities. However, in most cases the owner (or club that maintains the slipway) has preferential rights to its use, and thus close liaison between user groups is required to ensure that all interested parties have access to the resource (British Water-skiing Association, pers.comm).

Table 4.2: Recreational activities and their requirements

Activity	Essential requirements	Other facilities
6Land based Activities		
Walking	• Adequate, safe footpath network • Access permission • Map of route	• seating/picnic areas/toilets • Information regarding alternative routes • Waymarking/interpretation • Inter-connecting network of paths
Cycling	• Adequate cycle path network • Safety provision for waterside routes • Surfaced path for touring bikes	• Circular routes, avoiding road crossings • Signage/way marking • Parallel paths to prevent conflict with other users • Attractive route, incorporating features of interest.
Angling	• Licence for coarse and game fishing • Access points • Appropriate bank shape if access points or fishing platforms not available • Underwater gradient no more than 1:10 for wading	• Access to boats for sea, and some inland fishing • Fishing platforms
Horse riding	• Safe crossing points at roads	• Way-marking
Bird watching	• Good vantage points • Low disturbance	• Bird hides
Picnicking/art/ photography	• Good views • Clean, undisturbed area	• Seating • Rubbish bins • Car park nearby • Toilets
4x4 vehicles	• Access rights • Track of sufficient width	
Gun and field sports	• Safe area away from other recreational users • Clear vantage points	• Vehicular access

Water-based activities		
Canoeing/kayaking/rafting /rowing	• Gently sloping bank for launching (no more than one foot above the water's edge). • Access to large stretches of water	• Artificial launching points for racing canoes, and for the disabled • Where large groups are to be accommodated, changing facilities, toilets etc.
Water skiing	• Slip-way with 1:6 gradient • Access to large areas of open water	• Shore-based changing facilities • Toilets
Jet skiing	• Suitable launching points • Access to large open water areas	• Shore-based changing facilities • Toilets
Bathing	• Access to water's edge • Gently sloping banks and shallows • No under water hazards, strong currents or tides • Safety equipment, (e.g.life ring/life line) • Good water quality	• Access/egress steps where banks too steep for informal access
Sailing/cruising	• Slipways • Mooring points • Access over flood bank	• Shore-based facilities, e.g. yacht club • Re-fuelling points

4.4 Constraints on recreation

The questionnaire survey identified a number of key constraints on the development of recreational activities on flood banks. Land ownership and restricted public access, both for water and land based activities were widely reported as constraints on the development of recreational use. Flood defence bylaws and restrictions due to nature conservation were also identified.

4.4.1 Land ownership

In a small number of areas, such as Anglian (North), the riverine, tidal and coastal flood defences are under the ownership of the Agency as a single resource. However, in most other areas the defences are under the ownership of a series of private individuals, or in some cases by a local authority. In these cases the Agency has only permissive rights of access to main rivers to carry out routine maintenance of the defences, according to its duties under the Water Resources Act 1991. It has no rights to facilitate the development of recreational facilities.

The ownership of flood banks by private individuals poses a number of potential restrictions on the development of recreational use. These restrictions are principally related to rights of access, but may also include the following financial and legal issues:

- compensation for loss of use (e.g. grazing)
- public liability
- responsibility for maintenance or recreational facility

4.4.2 Rights of access

Statutory rights of access vary according to whether access is required to the bank or the water course itself. Whilst many riverine, tidal and coastal flood banks have a footpath, this generally allows for use by walkers only. Table 4.3 provides a list of the acts of Parliament which facilitate access for each of the land and water based activities.

Riparian owners own the river bed as well as the banks. A public right of navigation for rivers exists only where it can be shown to have been acquired by the public (Dangerfield 1981). Where a public right of navigation does exist it is only a right of passage. It does not necessarily include any rights of access to or from the bank, or rights to the fishery. Fishery rights are usually held by the riparian owner or are let separately from the adjacent land owner.

Whilst there is a presumed public right of navigation on all tidal and coastal waters, this does not confer a right of access to the banks. For example the River Stour at Denham in Essex has had a public right of navigation since 1700, and has been recommended by the Sports Council as a potential area for the development of water-based recreation. The banks, however, are under private ownership and have no access points or public right of way to riparian owner and may be leased to other parties.

Legal rights of access to the countryside are currently under review by the Government. The Country Landowners Association with financial support from the Countryside Commission is taking action under the Access 2000 initiative "to improve the quality, diversity and quantity of managed public access and recreation in the countryside". Furthermore, in response to the House of Commons Agricultural Committee report MAFF are now reviewing the access arrangements of schemes covered by the Agricultural Environment Regulations. As farmers are often encouraged to prioritise riparian land for Countryside Stewardship arrangements, this may have direct benefits for access to river and flood banks.

Table 4.3: Legislation relating to recreational activities

Recreational activity	Legal rights requirement for authorised use	Relevant Act(s) of Parliament	Enforcement authority
Land based			
Walking	Public right of way (excluding permissive use)	National Parks and Access to the Countryside Act (1949) Wildlife and Countryside Act (1981)	Local authority through public consultation Local authority in consultation with English Nature
	Land drainage consent for surfaced path	Land Drainage Act 1991	Environment Agency
Cycling	Designation of public right of way as cycle track Land drainage consent	Cycle Track Act 1984 Land Drainage Act 1991	Local authority through consultation Environment Agency
Angling	Fishing rights Rod licence	Salmon and Freshwater Fisheries Act (1975)	Environment Agency
Horse riding/motorcycling, 4x4 vehicles	• All three activities are considered likely to cause damage to flood defences and therefore authorised access requires specific land drainage consent under the Land Drainage Act 1991.	Land Drainage Act 1991	Environment Agency
Water-based activities			
Canoeing, Water skiing, Jet skiing, sailing	Public 'right of navigation'	Transport Act 1968	Navigation/harbour authority (which may be Environment Agency, local authority)
Bathing	public right of way to gain access to area		

4.4.3 Lack of access facilities

The requirements in terms of access facilities for each recreational activity are listed in Table 4.2 and discussed in section 4.3. The lack of provision of access facilities in many of the Agency regions may be attributed to a number of factors, in particular:

- limited resources for recreation in general;
- prohibitive flood defence requirements;
- absence of rights of way onto privately owned land;

A shortage of resources and manpower has been identified as a separate constraint in many Agency areas. Whilst the Agency has a general duty to further recreation there is often little budget allocation for actual direct services.

The problem has been overcome in a number of Agency areas through collaboration with other funding sources such as local authorities. For example, on the River Parrett in Somerset, the Agency has contributed towards a series of canoe access ramps at Langport. Flood defence engineers have also provided advice on the most suitable location for the ramps in terms of flood defence requirements. Alternatively, access facilities may be funded entirely by the Agency as a means of preventing damage to flood defences resulting from unauthorised access. In Bedfordshire, a series of fishing platforms were installed on the River Ivel and on the River Ouse in Cambridgeshire following a history of damage to the flood banks caused by fishermen excavating steps and casting points on the steep inward face of a Type 3 flood bank.

The flood defence functions of the Agency with regard to structures on flood defences are discussed in detail in section 4.4.5. Whilst the Agency is required to reinstate any permissive access points when constructing new defences (see case study 2) any new structure leading over or through a flood defence requires land drainage consent. Although an applicant has the right to appeal against a refusal by the Agency, this is often expensive and time consuming.

4.4.4 Nature conservation constraints

Areas which are designated for nature conservation reasons are often sensitive to disturbance, both to noise, in the case of birds, or to trampling. Depending on whether the site is designated access restrictions may apply. For example, the owner or occupier of a site designated as a SSSI under the Wildlife and Countryside Act 1981 must inform and consult with English Nature before carrying out any 'potentially damaging operations'. Operations which relate to recreation and access include:

- Use of vehicles or craft likely to cause damage or disturb features of interest
- Recreation or other activities likely to damage features of interest
- Introductions of or changes in game or waterfowl management

National Nature Reserves (NNR's) and Local Nature Reserves are also managed in collaboration with local authorities for the benefit of wildlife and access restrictions for certain activities may apply, according to the sensitivity of the site.

4.4.5 Flood defence duties in relation to recreational facilities and use

Section 109 and 110 of the Water Resources Act 1991 enables the Agency to prevent the erection of any unauthorised structures within 8m of a riverine flood bank or 15m of a sea defence, subject to the granting of land drainage consent. In addition sections 8, 23 and 24 of the Land Drainage Act 1991 empower drainage boards to control obstructions on any watercourse and in some cases on the bank (Department of the Environment 1992). Thus, land drainage consent must be obtained from the Agency for any recreational facilities located on a flood bank. This includes surfaced paths, way-marking posts and furniture, as well as actual buildings such as toilet blocks or changing facilities.

The procedure for granting consent varies between the various Agency regions. For example, in Midlands (Lower Trent) area a 'blanket' consent was granted for all works relating to the Sandwell Valley walkway, whilst in South West (North Wessex) area, each individual structure on the River Parrett trail required an individual land drainage consent application.

In general however, the following suite of factors influence whether consent is granted:

- the potential of the structure to compromise the integrity of the flood bank.
- the current condition of the flood bank and its suitability to allow the particular use
- the land use and economic value of the area protected by the flood bank and thus its strategic importance within the catchment.

The latter of the three factors is considered the most important. For example, the Agency is more likely to grant consent if the flood defence in question only prevents flooding of low grade agricultural land than if the defence protects an urban area. In the example cited above, flood defences for the River Parrett protect a number of small towns including Bridgewater and Langport. The river floods on a frequent basis (every year or every two years), inundating surrounding agricultural land and thus the flood defences which protect the town are of strategic importance. In contrast, the Sandwell Valley forms a natural flood plain in the centre of Birmingham and thus the flood banks which line the River Tame do not protect residential properties and are of a lesser strategic importance.

4.5 Conflicts between recreational activities

From the questionnaire survey of Agency regions fishing was found to conflict most frequently with other activities, and with canoeing in particular. Whilst this is largely due to the perception that fish are disturbed by other, particularly water-based activities, there are also a number of 'perceived' reasons why this may be the case:

1. Fishing has one of the highest participation rates of any recreational activity in the UK, and therefore the likelihood of encountering anglers may be higher than for other activities;
2. As a recreational pursuit angling probably pre-dates many other activities, and therefore the presence of other recreational users may be more readily perceived as an 'intrusion'. This is illustrated by a comment from one Agency recreation officer that whilst canoeists felt that there were far too few canoe access and more should be provided the response from anglers was that there were too many already
3. Anglers often enjoy the sport as a means of 'escaping' from the rest of the world. It is therefore understandable that they may be sensitive to the presence of other people.

Conflicts between anglers and land-based recreational activities may be resolved through 'zoning' of the bank. Zoning is a principle adopted for many years by site managers which separates activities, either in time or space, or both, to avoid conflict. It is most frequently used in sites of nature conservation sensitivity to prevent disturbance or trampling to wildlife (Sidaway 1991), but is also used widely to resolve conflicts between recreational activities.

The provision of fishing platforms, for example at the toe of the inward face of a flood defence creates a 'zone' for angling at the waters edge. Depending on the gradient and height of the flood bank this may be a sufficient distance from the bank crest to prevent disturbance by other bank users whilst allowing space for fishing rods and other equipment.

Conflicts between angling and water based recreation may be more difficult to resolve. Canoeists often choose the more challenging 'white water' areas in the upstream reaches of a river, which are also favoured by game fishermen. Conflicts between fishing and boating arise when lines are caught or fish dislodged and disturbed (Dangerfield 1981).

Limited zoning may also be possible within the water course, depending on its width, and by siting the moorings off the main river the problem of disturbance may be partially overcome. However, possibly the most effective means of resolving conflicts is through recreation liaison groups. Angling in particular is generally well organised with local clubs providing a focus and 'voice' for participants. Liaison groups headed by the Agency have provided an effective method of resolving conflicts in a number of regions.

4.5.1 'Sensitive' activities

Activities which are highly sensitive to disturbance, such as bird watching, may require more specialised methods to safeguard their interests. Many riparian birds, particularly wildfowl are particularly sensitive to disturbance, and will take flight when approached closer than a few hundred metres (Liddle and Scorgie 1980). Others become accustomed or 'habituated' to repetitive. However, disturbance is particularly acute when walkers are silhouetted against the sky or 'skylined'. The Ouse Washes in Cambridgeshire is an internationally important site for a number of wildfowl and wetland species and attracts a large number of birdwatchers each year (see case study 11). Conflicts between birdwatching and walking have been resolved by diverting the footpath from the top of the flood bank onto the toe of the landward face of the flood bank.

4.5.2 'Noisy' sports

So-called noisy sports, which include water skiing, jet skiing and power boating, often conflict with other, more passive pursuits through general noise and disturbance, and may if unmanaged present a safety hazard to other recreational users. The Environment Committee (1995) advocate the provision of alternative sites for noisy sports 'close to large urban centers so as to reduce leisure travel with its attendant fumes and congestion'.

4.5.3 Recommendations

Provision for all types of recreation in local and regional plans offers a long term means of avoiding conflicts between activities, by providing alternative sites for incompatible pursuits. However, within the context of this study, the most effective means of avoiding or overcoming conflict is principally through liaison between recreational user groups and by zoning of incompatible activities.

4.6 Recreation and maintenance of flood defences

In some instances damage to flood defences occurs as a result of recreational use. Throughout the Agency areas the most common type of damage was found to be erosion of the crest of earth embankments by walkers, and in many cases unauthorised users such as cyclists and motorcyclists.

4.6.1 Erosion of the bank crest

The likelihood of erosion and the rate at which it will occur depends on the nature of the surface and the intensity of use to which it is subjected. Earth embankments are seeded with a grass mix giving a close, durable sward, which aids drainage if the bank is over-topped and lends stability to the surface of the bank. If the intensity of

trampling to the bank crest exceeds the 'carrying capacity' of the sward the vegetation will be abraded and the earth bank exposed. Further use of the surface results in the formation of a 'gully' which inevitably becomes the preferred route for walkers and other users and is thus further eroded. As rain or flood water then exploits the gully and tunnels outwards and downwards the defence becomes at risk of failure.

Research into the effects of trampling pressure on different vegetation types has been carried out for a number of National Parks and popular tourist attractions. English Heritage commissioned a study into the causes of path erosion at Stonehenge, and as a result were able to calculate an approximate 'carrying capacity' i.e. the maximum number of visitors that the site was able to accommodate before erosion occurred. In so called 'honeypot' areas where visitor pressure was most intense the paths were re-seeded with a grass mix containing more durable species than the natural sward such as perennial rye grass (*Lolium perenne*) (English Heritage, pers. Comm.)

One solution to the problem of erosion on flood banks is to provide a sealed path along the crest of the defence. Cycle tracks are usually surfaced with a material such as tarmac, concrete or gravel which is durable and offers a smooth ride. The benefits in flood defence terms are that apart from preventing erosion the sealed surface sheds water from the crest of the defence and prevents tunneling and puddling by rain or flood water, thus prolonging the life of the flood bank (SUSTRANS, pers.comm).

However, sealed paths also present the following problems for flood defence engineers:

1. Earth flood banks usually undergo a certain degree of settlement over a prolonged period of time which reduces their efficiency in preventing flooding. As a result one of the key maintenance requirements is raising of the bank crest. If the bank is surfaced with grass this process is relatively straight forward and simply entails adding material to the crest of the bank, and reprofiling and compacting it. However, if a sealed path has been laid on the crest of the bank, the surface must be removed and replaced when the work has been completed. It has been the experience of flood defence engineers in some regions that the Agency then becomes responsible for the cost of the path reinstatement.

2. Maintenance vehicles cause damage to sealed paths, particularly if the path is tarmac. In many cases the path is sufficiently wide to allow maintenance vehicles to travel along it, but the weight of the vehicle on the edges of the surface causes cracking and subsidence.

The following observations were made during this study of successful cycle track schemes:

1. The Great Ouse path was constructed on flood defences which had recently been upgraded to the correct height to withstand a 100 year flood event (see case study 11). The bank was heavily compacted during construction to avoid the need for any raising of the bank crest in the foreseeable future. The provision of a sealed path does not therefore present any problems in terms of structural maintenance of the bank.

2. The cycle path which connects Colchester and Wivenhoe in Essex, runs for some of its length of tidal and sea defences. The function of the defences is to protect mostly agricultural land. As such they are considered strategically by the Agency to be of low importance and will not be upgraded in the near defences which otherwise would not have been financed.

3. When land drainage consent was granted for the Great Ouse path in Kings Lynn the Agency stipulated that the applicant (in this case Norfolk County Council) must agree to finance any repairs to the path that were incurred as a result of damage caused by maintenance vehicles.

4.6.2 Erosion of the inward face

Erosion of the inward face of the bank by fishermen was reportedly widely throughout the Agency regions. This problem appears to occur mainly on Type 3 (see Appendix 3) riverine flood banks which have no riverside berm to provide a flat surface for casting. In some cases fishermen have been known use a spade to dig a step or platform in the bank slope, thus causing damage that may seriously reduce the integrity of the flood bank.

One method of overcoming the problem is to ban fishing from stretches of river which have this type of flood bank, however, this would be impossible to enforce and would inevitably move the problem elsewhere. In a number of Agency areas, including Bedfordshire (R. Ivel), Cambridgeshire (R. Ouse) and Chichester (R. Adur) fishing platforms have been provided as a means of overcoming the problem. On the R. Ivel and Ouse whilst construction of the platforms was funded entirely by the Agency, maintenance of the platforms and the promotion of their use is the responsibility of the local angling club.

4.6.3 Scouring of inward face by boat wash

The energy required to drive a boat is dissipated as wash through the water column and directed to the banks and bed, often resulting in severe erosion. The amount of wash created depends largely on the speed and displacement of the boat. (Liddle and Scorgie 1980). The problem of erosion to the toe of the inward face of the flood bank by boat wash and riverside moorings was reported in a number of Agency areas.

This problem is largely avoided if a fringe of riparian vegetation such as reeds is retained at the bank edge. Reducing speed limits also reduces the amount of wash produced by boats.

4.7 Conflicts between recreation and other users

4.7.1 Recreation and agriculture

In rural areas conflicts may arise between agriculture and recreation where rights of way lead across farmed land. The following conflicts are the most widely reported:

- Trampling of crops
- Gates left open
- Disturbance of stock by dogs

All three conflicts can be avoided if a responsible attitude is adopted by recreational users. The Countryside Commission provide a series of recommendations known as the 'Country Code' which if practiced should avoid conflicts between recreational users and farmers.

More severe methods may be adopted if the agricultural use of a site is particularly sensitive. For example at Pilling Lane End on the Lancashire Coastal Trail the public right of way which runs along the flood defences is closed each year during the lambing season due to previous problems with uncontrolled dogs. Local authorities and the statutory wildlife agencies also have by-law making powers in relation to the control of dogs.

5.0 CONCLUSIONS AND SUGGESTIONS FOR FURTHER WORK

The questionnaire survey of recreational use of flood banks throughout the Agency regions showed that whilst a range of activities, both land and water based, currently occur passive land based activities such as walking, bird watching and nature study were found to be most widespread. A number of potential activities were identified, including art and photography, model boating, and skate boarding, although the demand for additional activities has not been assessed. This study focused more closely on development of the recreational activities identified in the questionnaire survey.

Facility requirements for certain recreational activities, such as walking, cycling and canoeing, may vary according to level of usage and the ability of users, whilst for others such as sailing a minimal level of facilities are required regardless of the above factors. Land based activities and hence facility requirements generally involve the crest of flood banks or sea wall, whilst facilities for water based activities utilise the inward face, or in the case of Type 3 flood banks the riverside berm.

Public footpaths often follow the crest of riverine flood banks and sea wall and in most cases this activity occurs without causing damage to the surface of earth flood

banks, provided usage intensity remains below a threshold level. Further investigation is required to determine the exact conditions in which damage occurs.

The increasing popularity of cycling has led to a demand for surfaced paths on flood banks. The provision of surfaced paths on flood banks represents one of the principal conflicts between recreation and flood defence. Surfacing the crest of the flood bank can interfere with routine maintenance operations, in particular bank raising, which must be carried out in many cases to maintain the flood retention capacity of the bank. Whilst this is undoubtedly a constraint in many cases the results of this study have established a set of guiding principles for the provision of surfaced footpaths.

In general water-based recreation was reported by Agency staff to be poorly provided for in most regions. Further study is required to determine whether this shortfall reflects an actual lack of demand or whether an existing demand is not currently being met. It seems probable that the two factors are closely linked and that a combination of facility provision and improved promotion may be required to redress this shortfall.

Lack of access and launching points was identified as a fundamental constraint on certain types of water-based activity, such as sailing and pleasure boating which require formal access facilities such as slipways and mooring points. However, scope for the development of motorised sports such as water skiing and jet skiing is likely to focus on coastal areas rather than rivers due to lack of space and conflict with other recreational users. Schemes such as Project Greensail initiated in East Anglia aim to identify and restore original access points through sea walls specifically for recreational use.

Constraints on recreational use were identified by flood defence and FER managers and within the questionnaires. Land ownership issues and restricted public access were reported throughout the Agency regions as the principal constraint on recreational use of flood banks. In most regions flood banks are under private ownership and the Agency has permissive powers to carry out routine maintenance according to their statutory obligations under the Water Resources Act. Increasing public access to privately owned land may be achieved through voluntary access agreements, or through agricultural schemes such as Countryside Stewardship.

Conflicts between recreational activities were resolved in several regions through liaison groups headed by the Agency itself. Activities such as canoeing and angling are often represented both nationally and locally by sports governing bodies who are often prepared to enter into negotiation where disputes arise. Zoning of water and land resources are identified as a further means of avoiding disputes. Further research and practical investigation are required to determine the feasibility of zoning recreational activities within the limited area of a flood bank.

One of the key aims of the study was an investigation of the conflicts, both actual and perceived, between the flood defence duties of the Agency and the recreational use of flood banks. A number of initial principles have been established in relation to the provision of surfaced paths on flood banks; a key concern for flood defence engineers. These principles are outlined as guidelines in section 6 below. A differentiation is made here between earth flood defences, which may be prone to erosion, and hard

defences such as sea walls. A more comprehensive survey of flood banks throughout the Agency regions is required to determine the parameters which control erosion of flood banks. For example, the relative damage caused by livestock grazing on flood banks compared with recreational use and the combined effect of these two factors may be investigated. The extent to which conflicts between flood defence maintenance and recreation are real or perceived requires further 'on the ground' verification as field surveys in this investigation focused specifically on examples of good practice.

6.0 GUIDELINES OF THE DEVELOPMENT OF RECREATION ON FLOOD BANKS

6.1 LAND BASED RECREATION

Constraint	Walking	Cycling	Angling	Bird watching
Flood defence maintenance **Earth defences (bank crest)**	Compatible with low and medium usage. Erosion may occur with high usage near urban areas or 'honeypot' sites. • Path surfacing may be required (see cycling)	Compatible at very low usage • Surfaced paths required at medium/high usage to prevent erosion. • Flood defences of low strategic importance which may not otherwise receive maintenance benefit from surfacing. • Where Agency need to raise bank crest periodically land drainage consent should stipulate that footpath operator should be liable for expense.	Generally compatible on type 3 flood banks with berm provides flat surface for casting. Damage often caused to Type 2 flood banks by fishermen digging casting points on inward face. • Provision of fishing platforms by Agency, which are then maintained by local angling club, provide solution.	Compatible, although erosion may occur at popular sites. • Facilities may include surfaced paths and bird hides. • Wooden bird hides located on the crest of flood banks may be removed temporarily if bank raising is required.

Constraint	Walking	Cycling	Angling	Bird watching
Hard defences	Compatible	Compatible	Compatible	Compatible
Nature conservation	Risk of visual disturbance to birds at sensitive sites. • Footpaths should be diverted from the crest of the flood bank where possible. • Access for dogs should be restricted in sites designated for birds • Where there is a risk of trampling to sensitive vegetation fencing off footpaths or boardwalks over the area to prevent damage. • Screening of footpaths using wattle fences, reed beds or live willow screens	Risk of visual disturbance. • Cycle ways should be diverted from the crest of flood bank to the toe in sites designated for birds. • Type of path surface should reflect environment in which it is located, i.e. tarmac paths should generally be restricted to urban areas • Where there is a risk of trampling or damage cycleways should be fenced to prevent access for motor cycles	Unlikely to cause visual or noise disturbance. Trampling and erosion may be a problem in sensitive areas. • Designated casting points and fishing platforms provide a solution • Fishermen should be encouraged to stay on designated rights of way between casting sites • Code of good conduct should be publicised by angling clubs.	Compatible

Constraint	Walking	Cycling	Angling	Bird watching
Access rights	• Recreational activities should utilise public land where possible. • Voluntary agreements under the Access 2000 scheme or arrangements for access. • Paid agreements under MAFF schemes such as Countryside Stewardship also provide an ideal solution. • Sports governing bodies provide a liaison service to arrange access agreements for particular recreational activities. • Codes of good practice should be publicised amongst club members and casual users, and enforced where possible to avoid conflicts with land owners.			
Conflicts with other recreation	Few conflicts • Principal conflict with cyclists on narrow paths may be avoided by providing passing places • Segregating cyclists and walkers with line along centre of path may be of some benefit in urban areas.		Reported conflicts with most other forms of recreation, and with canoeing in particular. • Liaison groups involving sports clubs provides a means of resolving disputes. • Zoning to prevent disturbance of fish by boats and canoes may be feasible on larger water courses. • Initial planning of new recreational areas should involve all interested parties	Conflicts with other forms of recreation which cause disturbance, e.g. walking, cycling, horse riding, motor sports (see guidelines for walking and cycling). • Zoning of sensitive areas to exclude other forms of recreation. • Acquisition of fishing rights to prevent use by anglers. • Strict management of walkers and cyclists possibly by ranger or warden. • Diversion of rights of way from the crest of flood banks to prevent 'skylining'.

Constraints	Horse riding	Motor sports	Gun & field sports
Flood defence maintenance	• An alternative to banning the activity altogether is to provide an alternative route for riders at the landward toe of the flood bank. • Where rights of way have previously been surfaced riding may be permitted provided a code of conduct is followed regarding other users. Paths used by horses will be more prone to erosion.	Often the cause of erosion to the inward and outward face of earth flood banks as motorcyclists often favour slopes rather than flat surfaces such as the bank crest. Unauthorised use on permissive rights of way often difficult to police. • Designation of rights of way as footpaths or cycletracks formalises access rights and enables police enforcement. • Access control structures at road access points	Generally compatible, except where four wheel drive vehicles, needed to carry equipment, are taken onto the flood bank
Nature conservation	(see guidelines under walking and cycling)	Disturbance to wildlife. High risk of erosion to sensitive areas (see guidelines above)	Disturbance to wildlife. • Zoning, both spatially and temporally through the provision of refuges provides a means of accommodating the activity
Access rights	Prohibited activities under flood defence bylaws, although, particularly motorcycling occurs unofficially in many areas		

Constraints	Horse riding	Motor sports	Gun & field sports
Conflicts with other recreation		Conflicts with most other recreational activity due to noise and nuisance. Higher speeds relative to other users may be safety hazard • Recognition of motor sports within the wider planning process and provision of alternative areas will help to solve the problem.	Safety risk to other users. • Zoning overcomes this problem if enforced effectively. • Observation of code of conduct essential • Activity restricted to permit holders only

6.2 WATER BASED ACTIVITIES

Constraints	Canoeing	Water skiing/Jet skiing	Sailing/cruising
Flood defence maintenance			
Earth defences	Compatible at low usage levels. Erosion to the inward face of type 2 banks may occur at regularly used launch sites and launching facilities may therefore be required. • Steps recessed into the flood bank represent the ideal launching arrangement from a flood defence perspective. They are not, however, suitable for disabled access • For launch structures such as pontoons and platforms advice from flood defence managers should be sought in the location of launching facilities as these structures may trap debris and present a flood risk if located incorrectly Close vehicle access to launch sites is usually required and changing facilities may be necessary. • Land drainage consent required for any structure on a flood bank	Erosion to the toe of the inward face of Type 2 flood banks or the berm of Type 3 flood banks can occur as a result of wash from rapid water craft such as jet skis, cruising vessels and motor boats used for water skiing • Agency speed restriction of 6kph on inland waters should be enforced. Enforcement role may be adopted by Agency river bailiffs • A fringe of riparian vegetation at the bank toe will help to protect the flood bank from erosion. Gabions at the bank edge may be needed in areas which undergo a large number of boat movements in order to protect newly planted areas	
Nature conservation		Disturbance to wildlife particularly birds, is the principal nature conservation conflict. Pollution by fuel for motor boats may also be of concern. • Ideally, sites for 'noisy' sports should be located away from areas designated for bird interest • Sports governing bodies such as the British Water Skiing Federation issue codes of conduct to minimise disturbance to wildlife.	

Constraints	Canoeing	Water skiing/Jet skiing	Sailing/cruising
Access rights	Public navigation rights required on rivers. Sports governing bodies such as the British Canoe Union may assist in negotiating rights of access		
Conflicts with other recreation	Principal conflict with anglers (see guidelines under angling)	Conflicts between water skiing and other forms of recreation, particularly angling. In many cases this is a perceived rather than an actual conflict. Appropriate management of sites in which 'passive' and 'noisy' recreational activities share a resource can often prevent conflicts	

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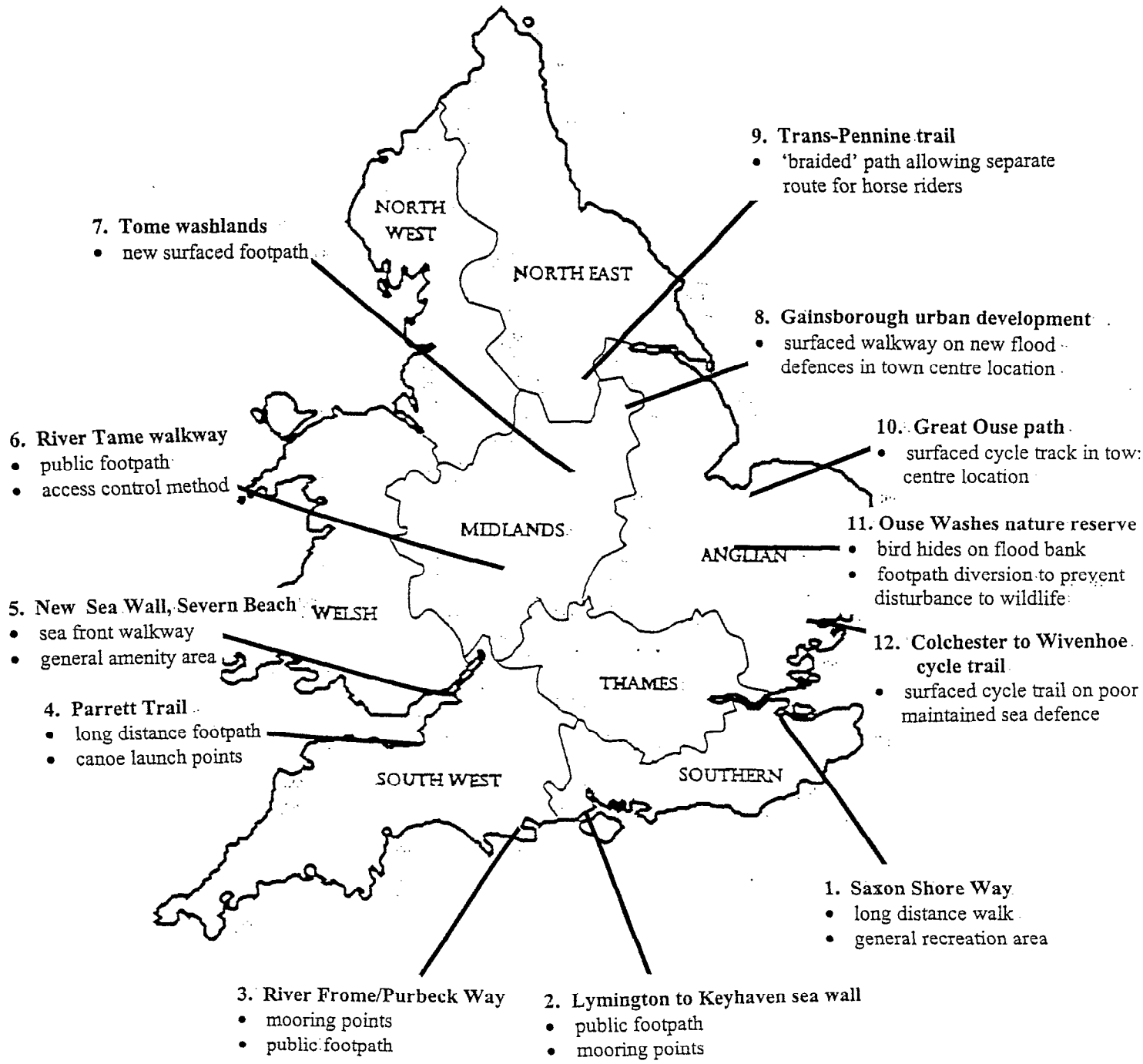
Appendix 1

Case Studies



Location map for case studies

CASE STUDY 1

Project Name:	**Saxon Shore Way / Riverside Country Park,**
Location:	**Gillingham, Kent**
Agency region & area:	**Southern (Kent)**
Grid Reference:	**TQ800689**
Length of study area:	**Saxon Shore Way = 140miles. Riverside Park = 2km**
Nature of floodbanks:	
Material:	**Earth**
Type:	**Coastal (Type 4)**
Ownership:	**Private**

Key points:

- **coastal defence with adjacent SSSI in estuary**
- **adjacent country park on flood defences**
- **recreational uses; walking, bird watching, cycling; all compatible**
- **recreational provision; gravel surfaced path, outdoor furniture, interpretation boards**
- **localised erosion due to unauthorised vehicles on bank. Solved by erection of barriers**

1. Background

The Medway estuary, located at the mouth of the Thames on the northern coast of Kent is comprised of a system of small creeks and inlets. Much of the coast between Rochester and Whitstable is designated as SSSI for its unique assemblage of salt marsh plants. The mudflats and marshes on the estuary also support approximately 50,000 over-wintering birds each year, and as such the area is also designated as a Ramsar site and a possible Special Protection Area. Opportunities for water-based recreation are limited and a strong emphasis has been placed by local authorities, statutory and non-statutory bodies on passive recreational pursuits, such as walking and cycling, which avoid undue disturbance to wildlife.

2. Details of scheme

2.1 Saxon Shore Way

The Saxon Shore Way extends from Gravesend to Rye and for much of its length on the Medway runs along the sea defences. It is a permissive public footpath promoted by the county council. For much of its length the path is unsurfaced, although in areas where erosion of the defences has become apparent a Type 1 road sub-surface has

been laid. Localised areas of erosion have occurred on stretches of the path which run through or close to urban areas such as Gillingham

2.2 Riverside Country Park

The Country Park lies to the north of Gillingham and incorporates a section of the Saxon Shore Way. It was developed by Gillingham Borough Council in 1987, prior to which it was an informal recreation area. It now receives approximately 300,000 visitors per year. At present the park consists of three main areas; Horrid Hill, a small wooded 'island' connected to the 'mainland' by a man-made causeway; Eastcourt Meadow, an area of unimproved coastal grassland and scrub, and Sharp's Green, a landscaped area behind the sea defences where picnic tables, a visitors center and an adventure playground have been provided . An extensive area of tidal salt marsh has developed within the embayment formed by Horrid Hill and the causeway, and the island itself provides spectacular bird watching opportunities. As a result, nature conservation is the key theme and 'selling point' for the park.

3. Recreational facilities

Provision for recreation consists of benches, picnic tables and a limited number of interpretation boards, both on and behind the sea defences. The furniture is 'rustic' and simple. A network of surfaced paths, accessible to disabled people, follow the top of the sea defences and extend inland to the visitors center and nearby car parks.

4. Details of sea defences

The defences are privately owned throughout the length of the Saxon Shore Way, and thus the Agency has permissive rights of access to maintain the defences.

4.1 Inward face

The inward face of the sea defences are surfaced with Kent rag-stone, which comprises large square blocks of a limestone type rock. In many places this is covered with a layer of grout, which prevents sea water scouring between the rag-stone and weakening the defence.

4.2 Crest

The crest or top of the flood bank supports the footpath. The height of the crest is a critical factor in determining the efficacy of the defence. Much of the maintenance work carried out by the Agency involves maintaining the height of the crest. The material which provides the surface of the crest varies according to the usage of the flood bank. In many stretches of the Saxon Shore Way, where visitor numbers are

low and recreational use is limited to walking, a layer of grass on the surface of the crest is sufficient. However, closer to urban areas where recreational use is higher the earth surface becomes eroded, forming a shallow trench which undermines the integrity of the defence. In these areas, which normally occur close to urban centres, the crest is surfaced with terram and covered with a layer of crushed limestone (Type 1 road sub-base). The Agency's flood defence section have paid for these upgrading works.

4.3 Outward face

The outward face offers stability to the flood bank and normally comprises a grassed revetment, which is mown at regular intervals between April and September. The slope on the outward face varies according to the loading placed on the bank.

4.4 Maintenance requirements

Re-surfacing and crest heightening require the use of heavy plant machinery and a temporary closure has been agreed for sections of the Saxon Shore Way when these operations are undertaken. If maintenance requires only hand tools or light machinery the footpath remains open and signs are erected during the time work is in progress. The grassed revetments which form the outward face are mown intensively throughout the growing season (April to September).

4.5 Maintenance responsibilities

The land on which the defences are located is privately owned throughout the length of the Saxon Shore Way. As the authority responsible for flood defence the Agency has a right of access to maintain the defences. As a maritime authority Medway Council jointly funds flood defence capital schemes.

5. Recreation issues

5.1 Recreation / flood defence

At Gillingham sea wall on the Saxon Shore Way the Agency has experienced problems with cars, motor cycles and quad bikes on the flood banks. This has caused damage to the crushed concrete path surface and to the grass revetment which forms the outward face. The 'source' of the problem was a blind-ending road which leads directly to the base of the flood bank, and had no obvious barrier to prevent access onto the defences. The problem was overcome by erecting metal bollards from the fence on the landward side of the defence up the outward face and connecting with a locked five bar gate on the crest. A kissing gate provides access for walkers. This arrangement has, thus far, prevented the problem re-occurring.

Proposals to upgrade the path to a cycle way are being opposed by the Agency on the

grounds that it will result in an increased maintenance requirement

5.2 Recreation / riparian owner

On some of the more rural stretches of the Saxon Shore Way, where land adjacent to the sea defences is used for grazing, riparian owners have periodically complained of footpath users leaving gates open and allowing stock to escape. This tends to present more of a problem when sections of the sea defence have been closed to public access for routine maintenance, and walkers have been diverted onto adjacent land.

5.3 Recreation/conservation

No conflicts have been reported between nature conservation and recreation. There is no obvious access to the salt marsh from the sea wall, and as the area is either inundated with water at high tide, or muddy at low tide it does not offer attractive recreation opportunities!

6. Funding and management of recreational facilities

The Riverside Country Park is financed and run by the newly formed Medway Council, a unitary authority, which replaces the individual borough councils for the towns on the Medway. Some money has been obtained from several external funding sources. Excluding staff costs the park costs £40,000 per year to run. This covers maintenance of grass, fences, litter bins etc.

The council has liased closely with English Nature on any works carried out close to the SSSI sites to avoid damage to the nature conservation value of the area. Some sea defence maintenance has been carried out by the Agency, although in general the council has undertaken maintenance in its role as a marine authority, to undertake coastal protection.

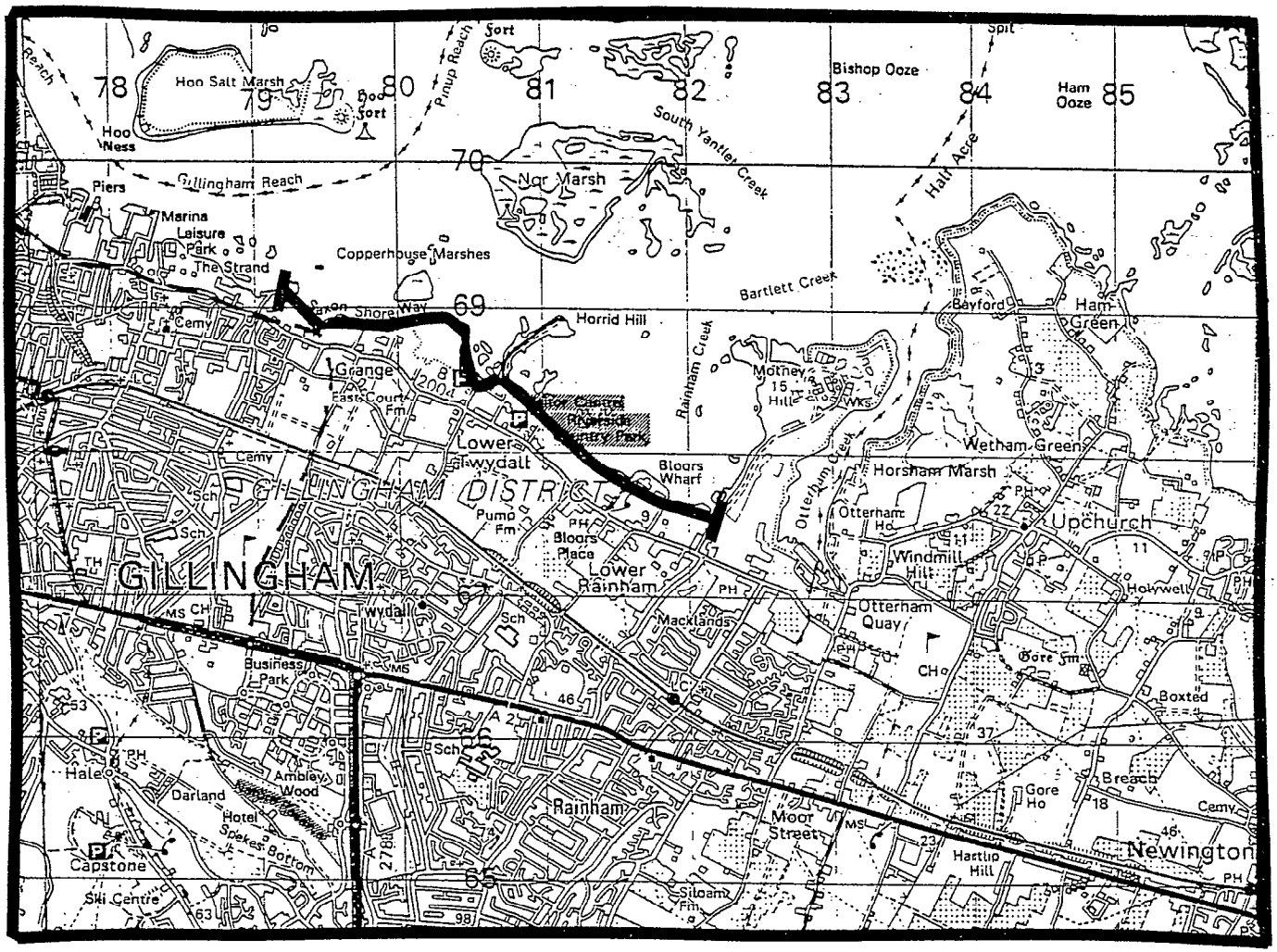
7. Proposed improvements to the scheme

The council, in association with SUSTRANS, have recently obtained lottery funding to upgrade a stretch of the Saxon Shore Way to a cycleway, which will form part of the Inverness to Dover route.

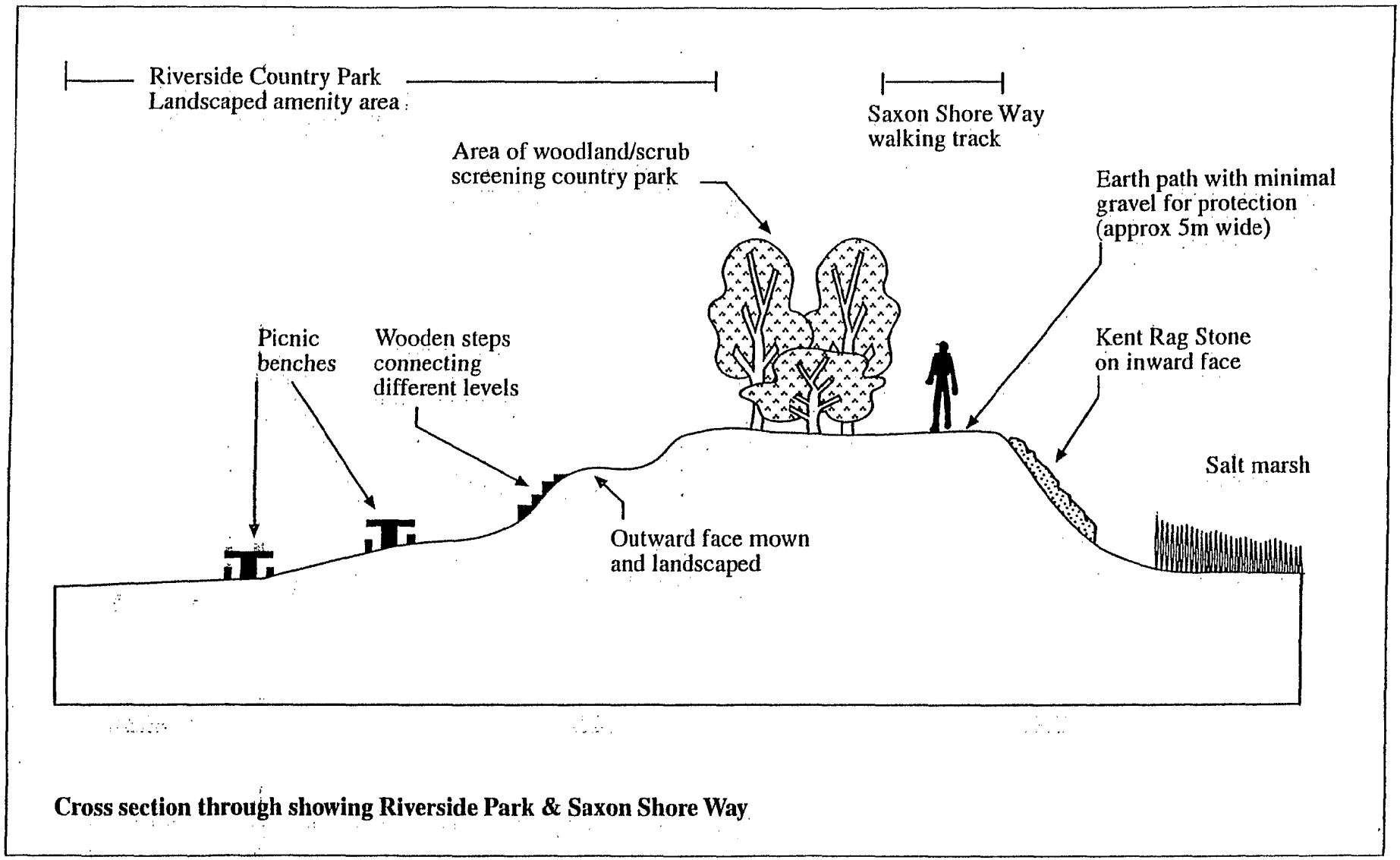
The areas of agricultural land adjacent to the Riverside Country Park have recently been acquired by the council in a move to extend the park.

Plate 1 : Saxon Shore Way, Gillingham, Kent

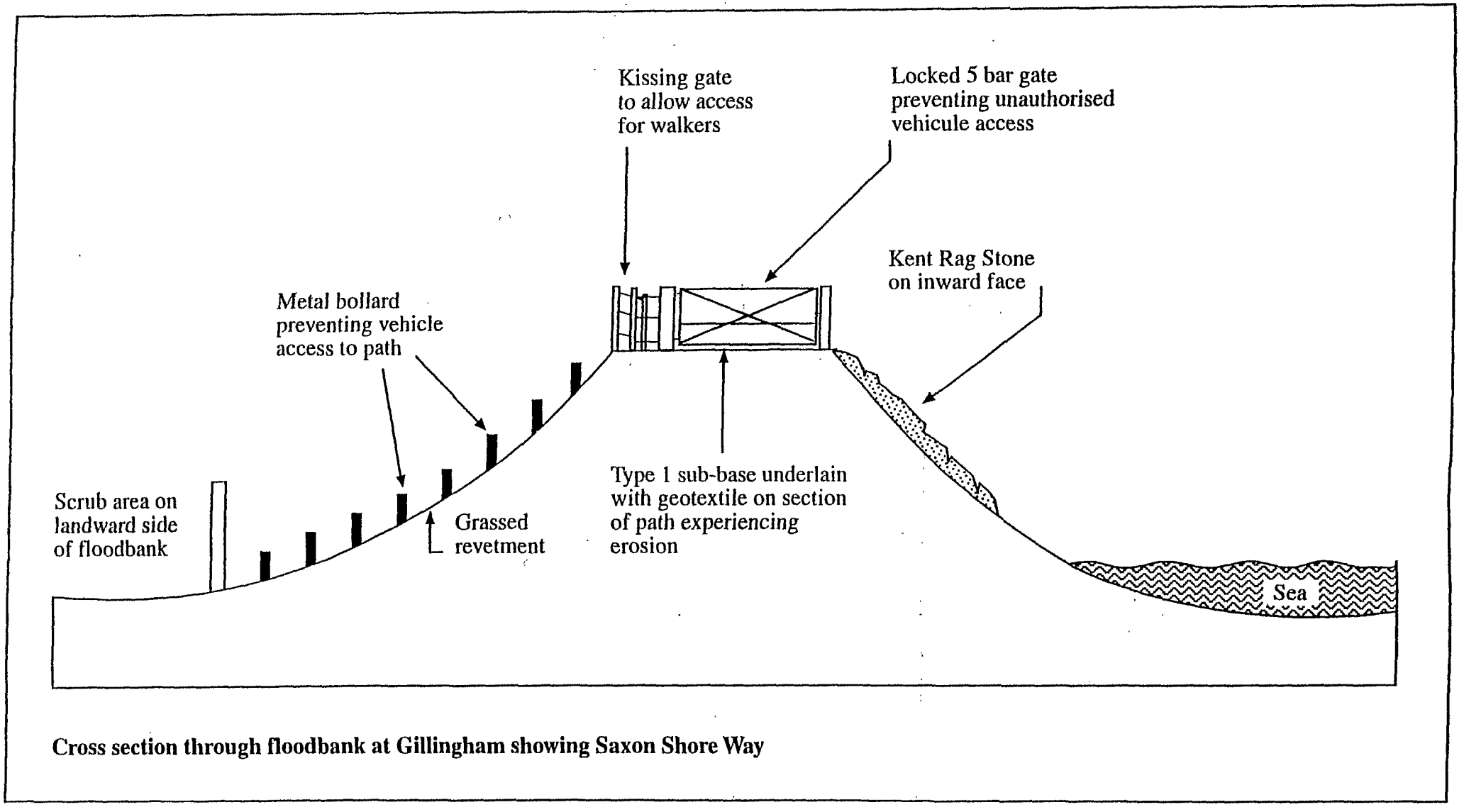
Plate 2 : Riverside Country Park, Gillingham, Kent



Map 1: Location map for Saxon Shore Way and Riverside Country Park (Scale =1:50,000)



Cross section through showing Riverside Park & Saxon Shore Way



Cross section through floodbank at Gillingham showing Saxon Shore Way

CASE STUDY 2

Project Name:	**Lymington to Keyhaven sea wall improvement**
Location:	**Solent coast, Hampshire**
Agency region & area:	**Southern (Hants.)**
Grid Reference:	**SZ313915 - 332953**
Length of study area:	**7km**
Nature of floodbanks:	
Material:	**Earth**
Type:	**Coastal (Type 1) and (Type 4),**
Ownership:	**County council and private owners**

Key Points

- **upgraded coastal defence with adjacent Pennington Marshes SSSI**
- **recreational uses walking, bird watching and sailing**
- **recreational provision: gravel walking track, way marking, mooring points and access ladders**
- **problems with vandalism and unauthorized access by commercial bait diggers**

1. Background

The area now known as Pennington Marshes was impounded during the 19th century as a salt pan to serve the salt working industry based in Lymington. With the advent of the railways salt could be transported into the area more economically and the industry at Lymington declined. Around the turn of the century the area was reclaimed for agriculture, and was managed as an area of coastal grazing until the mid-1980's, when it was designated as a National Nature Reserve. In 1989 high tides breached the defences and caused extensive damage to the sea wall and to the land behind. In response to the damage a strategy was devised to protect properties on either side of Lymington Estuary.

2. Details of scheme

The entire length of sea wall between Lymington and Keyhaven was replaced or up-graded in several separate phases.

3. Recreational use and facilities

The Solent is popular for sailing and the town of Lymington attracts large number of visitors during the summer months due to its position on the Solent coast and proximity to the New Forest. Land based recreational activities consist primarily of walking and bird watching. The popularity of the footpath pre-dates the new defences, although repairs to the sea wall and improved way-marking may have increased usage. Popularity for bird watchers lies in the status of the Solent as a Special Protection Area under the EU Birds Directive and the extensive mud flats between Hurst Spit and the Beaulieu river which support a number of species of waders.

A public footpath was incorporated into the new sea defence to replace the existing right of way. However, upgrading the sea wall provided an opportunity for improving and refining the recreational use of the path. One important issue to resolve was how to facilitate wheelchair access without allowing motor cycles, or other motorised vehicles onto the path. Advice was sought from Hampshire County Council, and a design which was considered best practice at the time of construction used at the various road access points along the route. Subsequent use of these 'gates' by disabled people has shown that some improvements may need to be made to the design.

Both Lymington and Keyhaven are popular sailing resorts and mooring points had been established along the sea defence where it passes through these towns. All original, and some additional mooring points were reinstated in the restored sea wall using the same design, which incorporates a ladder leading over the sea wall.

The original sea wall also had a number of gated access points for riparian owners, which the Agency was obliged to reinstate.

4. Sea Defences

The sea wall was designed by Mc Dowells consulting engineers for Southern Water, the then flood defence authority. Both English Nature and New Forest District Council were consulted regarding the route of the new defences. Minor changes were made to the route in response to concerns by English Nature that the new sea defence would impinge upon a series of lagoons, which represent an important element of the nature conservation interest of the site.

The new scheme incorporates two types of defence. The section that encloses the Pennington Marshes is a Type 4 flood bank, while the sections at Keyhaven to the west and Lymington to the east are a Type 1 sea wall.

4.1 Type 4 defences

A detailed plan of the structure of the Type 4 flood bank is provided in the accompanying figure. The original sea wall, which was considerably lower was used as a basis for the new wall, and material resulting from the re-profiling of the existing bank was used as fill.

4.1.1 Inward face

The inward face is constructed of cellular interlocking blocks of pre-cast concrete underlain with a geotextile filter fabric. The cellular blocks have been filled with a gravel/topsoil mix to provide a substrate for re-planted Rock Sapphire (*Crithmum maritimum*).

4.1.2 Crest

The crest or top of the flood bank supports the public footpath. The path is approximately 3m in width and surfaced with gravel. It was designed for its maintenance function rather than for the recreational use.

4.1.3 Outward face

The outward face is a two stage surface which incorporates a narrow maintenance path and a soakaway ditch. The inward face is underlain with a geotextile matting which provides a permeable surface to facilitate the development of vegetation in the overlying top soil. The ditch at the foot of the outward face provides additional habitat for the saline lagoon plants for which the site was designated, and water and salinity levels in it are controlled to maximise the value of this habitat

4.2 Type 1 sea wall

4.2.1 Lymington

On the west bank of the Beaulieu river the sea wall was designed to retain the character of the town harbour, and incorporates timber faced flood gates into stone clad flood walls. Sections on the eastern side of the river are made of reinforced concrete with box 'gabions' at the foot of the inward face

4.2.2 Keyhaven

The sea wall at Keyhaven is stone clad and incorporates a number of mooring rings and slipways.

4.3 Maintenance requirements

The sea wall was designed to require minimum maintenance work. The armouring on the inward face is designed to prevent erosion, dissipate wave energy and promote the

re-growth of vegetation. No raising of the bank crest will be required in the next 50 years.

Possibly as a result of the attention to 'authenticity' the sea wall at Lymington leaks in a number of places at high tide resulting in puddling around the quay area. There are no plans, however, to carry out further works on the defences in the near future.

5. Recreation Issues

5.1 Recreation / flood defence

No direct conflicts have been encountered between the recreational use of the flood defence and the maintenance requirements of the Agency. However, the provision of a surfaced path for maintenance and recreation purposes has facilitated the development of commercial bait digging in the area. Bait digging by hand has been practiced on the mud flats for some time, whilst commercial exploitation has begun only since the surfaced path was opened. The Agency has encountered some vandalism of the gates and padlocks to allow access to the defences.

5.2 Recreation / conservation

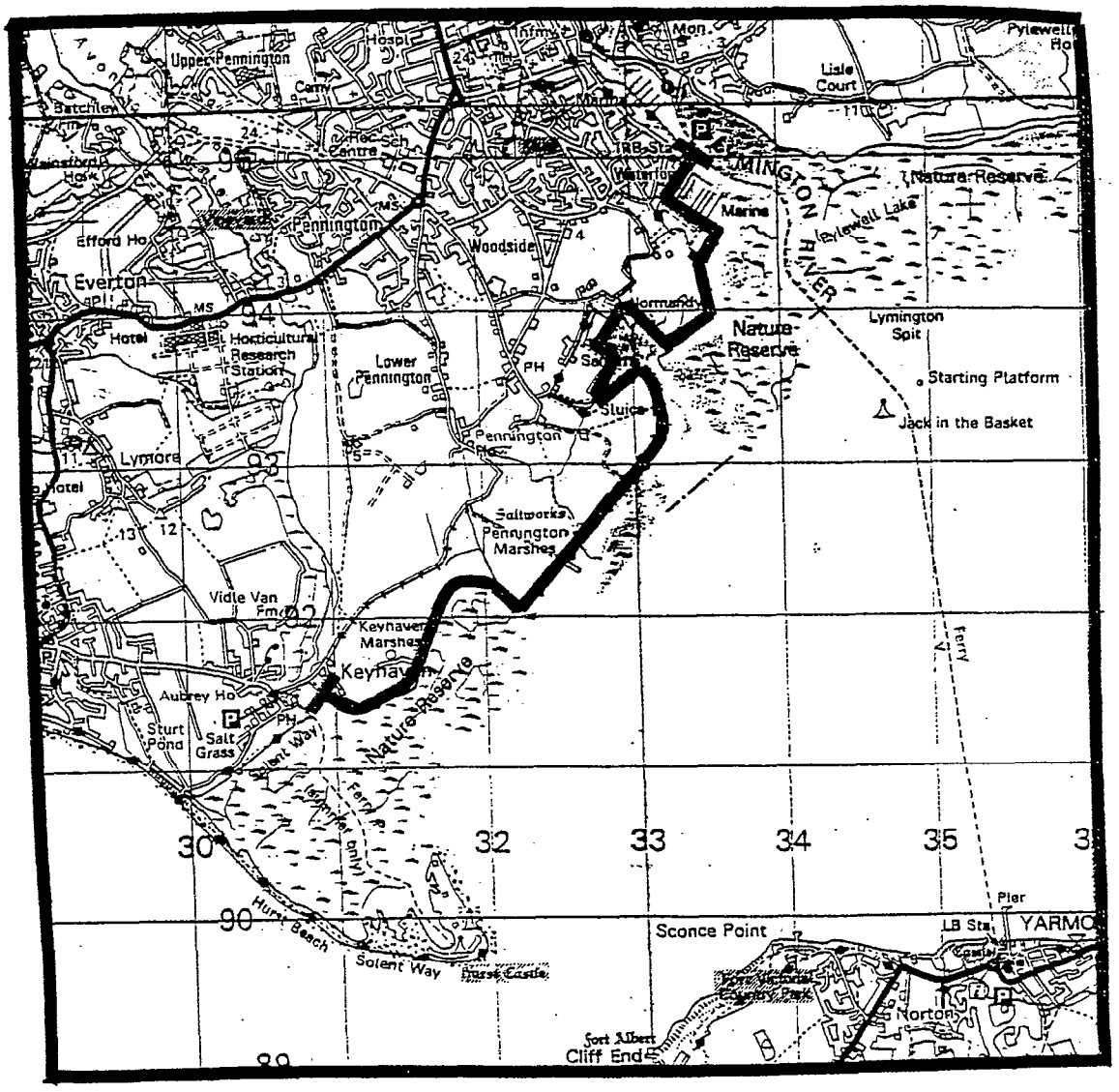
Although the stretch of defence between Lymington and Keyhaven attracts a large number of bird watchers and well as walkers no conflicts between these two principal uses have been reported.

6. Funding and management of recreational facilities

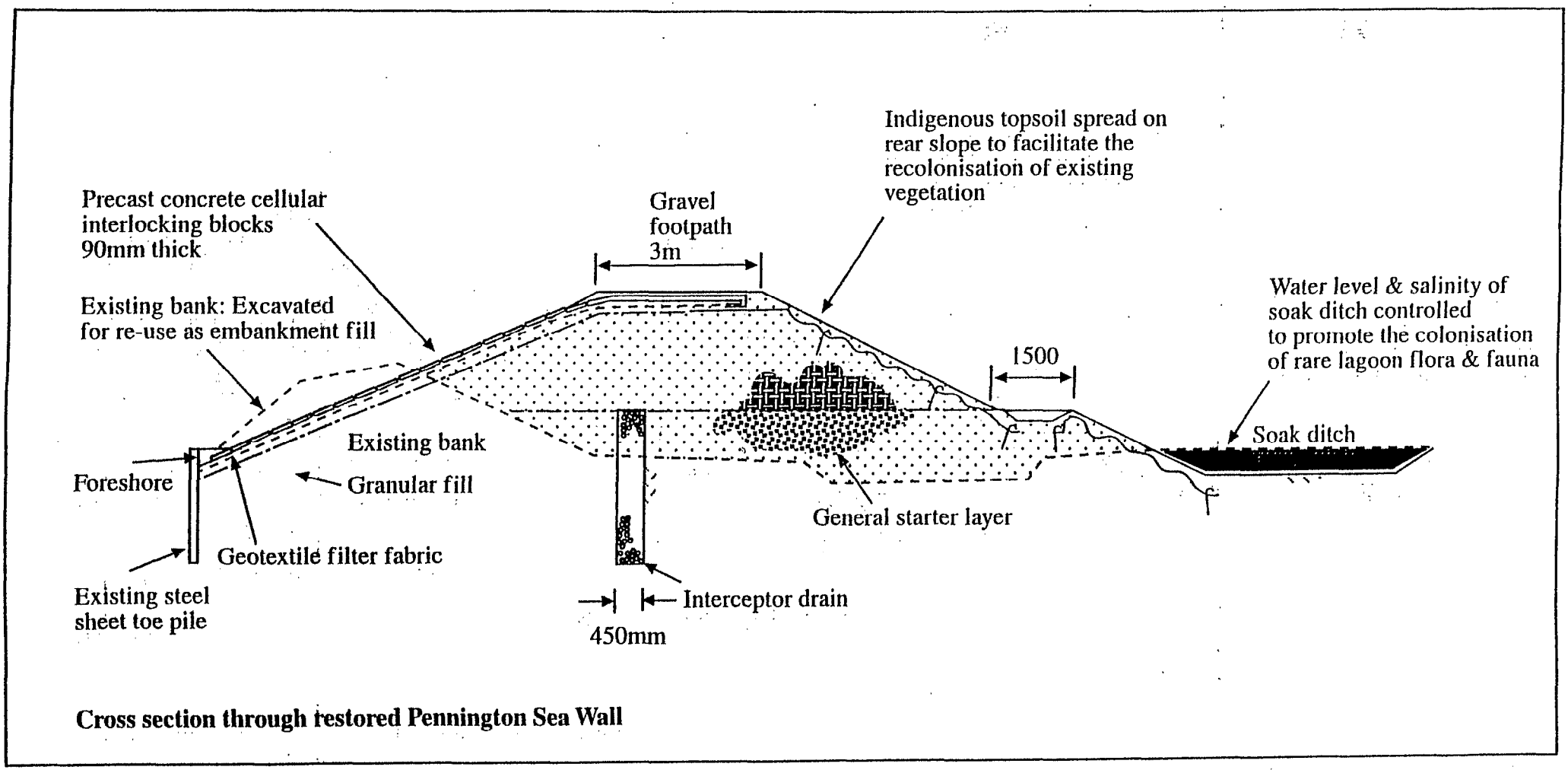
The project to upgrade the sea wall between Lymington and Keyhaven cost a total of £7 million and was funded by the Environment Agency from the flood defence local account, with a 25% grant from MAFF. A minimal proportion of the total cost was attributable to the recreational facilities.

Plate 3 : Access control structure, to prevent access by motorcycles to Lymington sea wall

Plate 4 : Mooring rings and ladders in the Lymington Sea wall, at Keyhaven



Map 2: Location map showing Pennington Sea wall, Lymington (Scale = 1:50,000)



Cross section through restored Pennington Sea Wall

CASE STUDY 3

Project Name:	**River Frome moorings and Purbeck Way**
Location:	**Wareham, Dorset**
Agency region & area:	**South West (South Wessex)**
Grid Reference:	**SY 927870**
Length of study area:	**1km (approx.)**
Nature of floodbanks:	
Material:	**Earth,**
Type(s):	**2 and 3**
Ownership:	**Private**

Key Points:

- **tidal stretch of river with adjacent SSSI, Ramsar site and pSPA**
- **riverside moorings accessed directly from flood bank**
- **yacht club on flood banks with disabled access**
- **footpath upgrading funded jointly by local authority and Agency**
- **improvements to existing path have nature conservation interest into account**

1.0 Background

Tourism is particularly important to the economy of Wareham and recreational use of the River Frome, particularly downstream of South Bridge, Wareham, makes a vital contribution to the overall tourist use of the area.

Much of the attraction of the area lies in its landscape and nature conservation interest, which is protected by a range of statutory designations. The River Frome lies within the Dorset AONB, and the south bank within the Heritage Coast. The Wareham Meadows SSSI, The Moors SSSI, and the Arne NNR all fall within the lower Frome catchment and in addition the tidal stretches of the Frome are also a proposed Special Protection Area and Ramsar site under the EU Birds Directive and Ramsar Convention on the Conservation of Wetlands of International Importance. Development within these sites is thus strictly controlled and permitted only 'where it is deemed to facilitate public access, enjoyment and appreciation of the coastal zone'.

2.0 Recreational use and facilities

Walking and other passive pursuits such as bird watching and nature study form an important component of the recreational use. A public footpath runs along the flood

bank on both sides of the River Frome, downstream of South Bridge, although direct access from the road is only possible from the south bank. The path on the south bank of the river forms part of the Purbeck Way which runs south to Corfe Castle and links to the South West Coast Path.

Sailing has become particularly important recreational activity on the Frome, with boat movements consisting largely of day-trips to Wareham. The Environment Agency controls 127 moorings situated in five blocks along the course of the river. These take the form of both buoyed, or swinging moorings in the channel, and a series of landing stages, accessible directly from the flood bank. A yacht club has also been provided under long term agreement by the Agency, at Redcliffe.

The area adjacent to South Bridge is a popular amentiy area with a quay and seating area on the north bank and access to allow children to swim and paddle in the river on the south bank.

2.1 Description of facilities

Footpath

The footpath generally follows the crest of the flood bank, except for a short section close to South Bridge, where it lies at the base of the inward face (see fig.s 1 and 2). The path is approximately 1.0m in width and is surfaced with crushed limestone. Re-surfacing of the path at the South Bridge end has improved drainage and reduced the occurrence of 'puddling'; a problem which makes the path impassable for limited periods during the winter months. The width of the path is dictated by the wheel-base of the maintenance vehicles which generally span its width. Widening of the path would lead to an uneven weight distribution over the surface and hence erosion to the path and underlying flood bank

Staged moorings

The staged moorings, illustrated in Plate 7, are accessed directly from the flood bank. The majority of the moorings are constructed from steel piping with a steel mesh walkway.

3.0 Tidal defences

A type 3 earth embankment lines the river for much of the stretch between South Bridge and Ridge with a short section of Type 2 embankment immediately adjacent to South Bridge

3.1 Bank crest

The bank crest is approximately 3m wide and is heavily vegetated on either side of the footpath, which is approximately 1m wide. The footpath is generally at a slightly lower level than the surrounding bank and is thus prone to flooding after heavy rain

3.2 Inward face

The short stretch of Type 2 flood bank adjacent to South Bridge has recently been repaired following severe undercutting of the inward face. While this short stretch of river provides the only access point for swimming, the eroded edge presented a safety hazard, particularly for children. It is now protected with large blocks of Purbeck stone, which provide safe access for swimmers but prevent boats from mooring alongside the bank. This was identified as the major cause of erosion in the past.

The inward face throughout the rest of the stretch is heavily vegetated with reeds and willow scrub. In general this is considered poor practice in flood defence terms as dense vegetation, and particularly mature trees are considered to destabilise the flood bank. However, the flood banks on this stretch of the Frome protect only low grade agricultural land within the SSSI and are not therefore considered to be of principal importance in strategic terms as they do not protect any residential properties.

3.3 Outward face

The outward face is also heavily vegetated with mature trees and reeds. A ditch which runs along the landward side of the face intercepts any water which overtops the floodbank

4 Recreation issues

4.1 Recreation and flood defence

The river and landward ditch are dredged on a ten year cycle. During the operation dredged spoil is deposited on the bank crest. The footpath is closed for the period of time required for the spoil to dry out.

Although boat speed is limited to 6 kph by Flood Defence Bylaws in order to protect the flood banks the Agency frequently receive complaints about excessive boat speed.

4.2 Recreation and conservation

In 1995 Dorset County Council proposed widening and resurfacing the footpath with gravel and widening the footpath to enable use by cyclists and wheelchairs. The proposal was turned down by the Agency on the following grounds as the route runs through a SSSI and Area of Outstanding Natural Beauty the proposed path would be out of keeping with the character of the area. However, the council have pursued the

proposal and the Agency have now agreed to improve the current surface and provide a series of passing places along the route.

4.3 Recreation/Recreation

Reckless behaviour by some boat owners poses a risk to children swimming and paddling. Hire rowing boats sometimes cause an obstruction to other river users

5. Funding and management of recreational facilities

The cost of maintaining the path and moorings is minimal. The upgrading of the footpath close to South Bridge cost £10,000. The Agency, the County, Borough and Parish Councils contributed to the work.

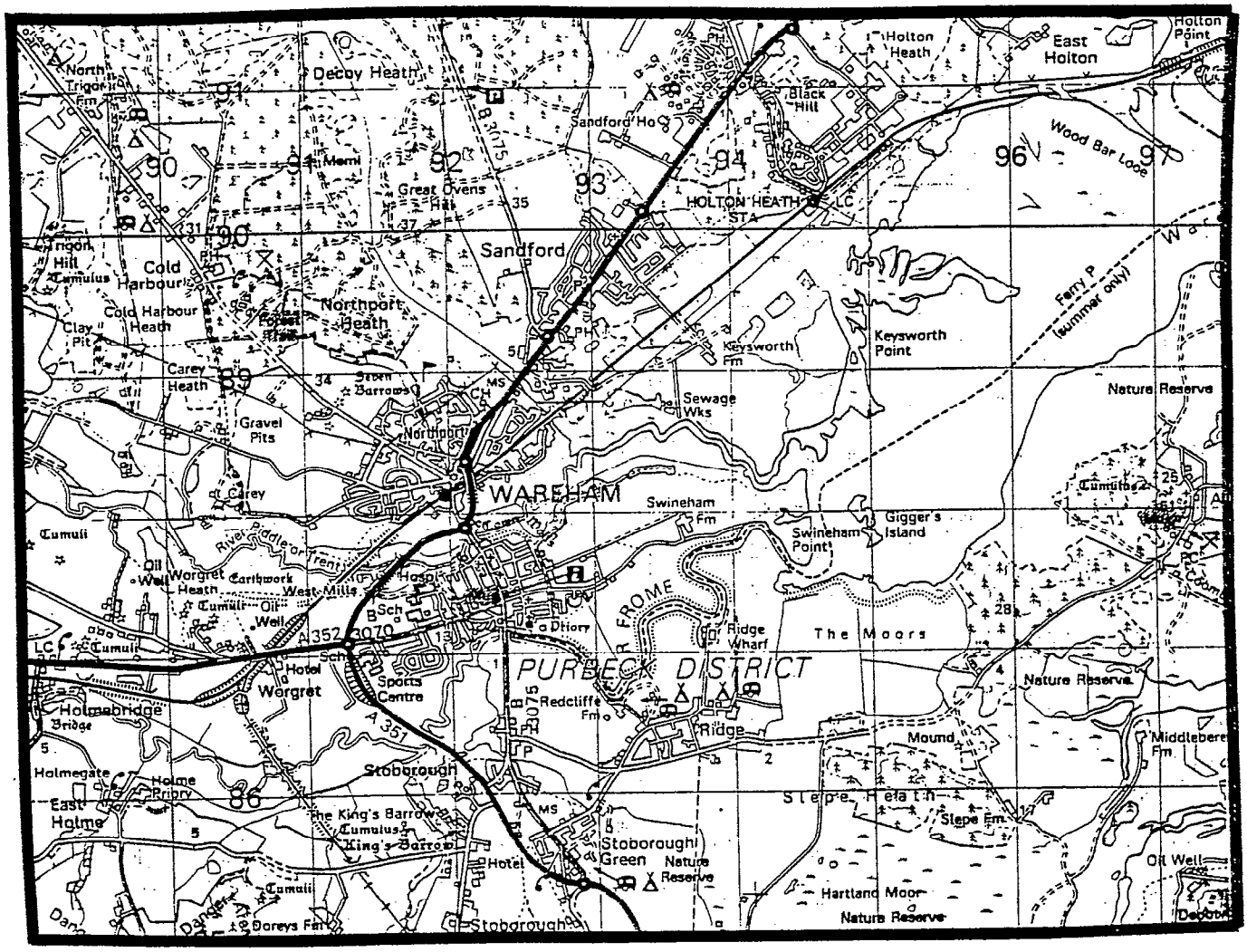
Management of the flood banks is undertaken in order to maintain the height of the crest. Maintenance work scheduled to take place in the winter months (October to March) when recreational use of the area is low, and when impacts on the ecology of aquatic and riparian habitats is minimal.

Plate 5 : Footpath on River Frome floodbanks, Wareham

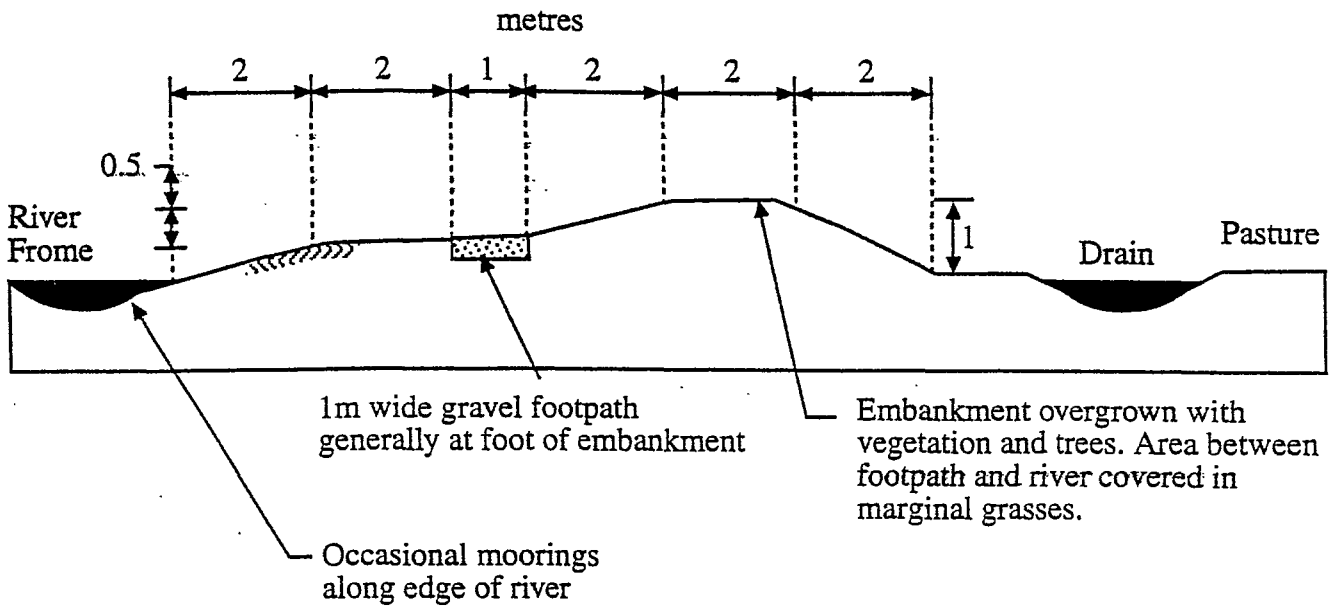
Plate 6 : New section of path adjacent to South Bridge, Wareham

Plate 7 : Mooring platform on River Frome, Wareham

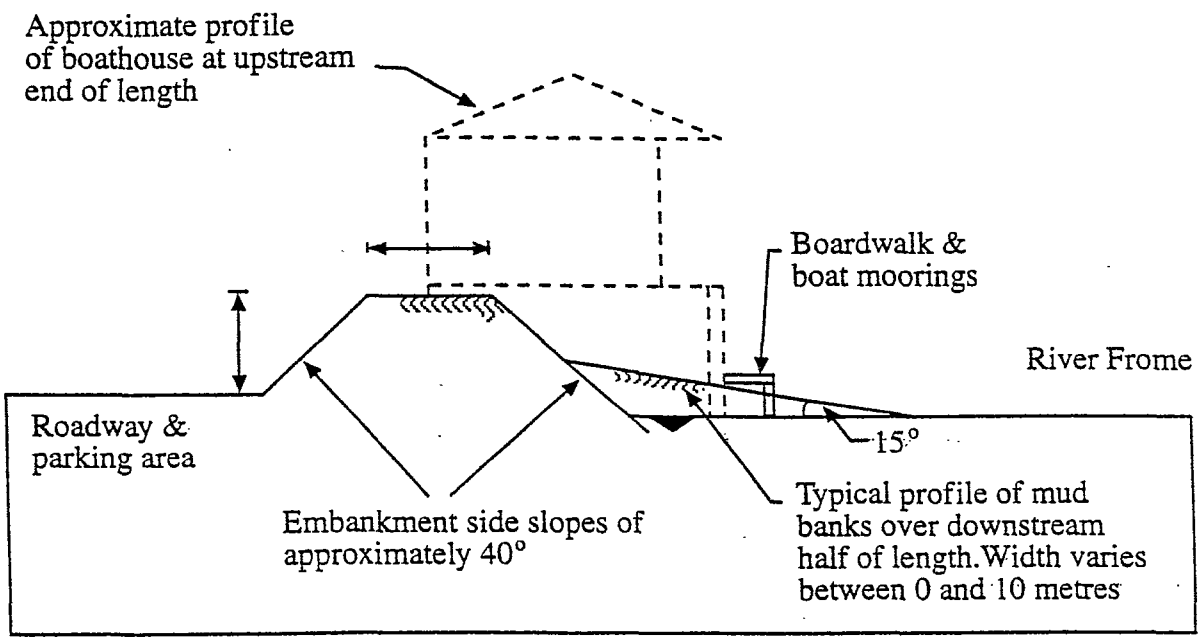
Plate 8 : Yacht club with disabled access on flood bank at Redcliffe, near Wareham



Map 3: Location map showing the River Frome at Wareham (Scale 1:50,000)



Cross section through River Frome flood bank downstream of South Bridge, Wareham



Cross section through River Frome flood bank showing Redcliffe Yacht Club

CASE STUDY 4

Project Name:	**Parrett trail/River Parrett canoe launch points**
Location:	**Bridgewater, Devon**
Agency region & area	**South west (North Wessex)**
Grid ref.	**ST 262422 - 270411**
Length of study area:	**Parrett trail = 80 km (Study area =1.5km)**
Nature of floodbanks:	
Material:	**Earth,**
Type(s):	**3 (Tidal, riverine)**
Ownership:	**Private**

Key points

- **permissive path following river from source to mouth and incorporating local interest areas**
- **extensive consultation process undertaken prior to development of footpath and steering group to guide futre development**
- **funding obtained from variety of sources including EU LIFE funding**
- **location of new canoe access steps on river agreed following consultation with Agency flood defence managers.**

1.0 Background

Tourism represents a key economic activity in the Somerset Levels; an area formerly known for brick and tile manufacture. Somerset District Council is keen to promote passive forms of recreation which also maximise the tourist potential of the area. A linear route along the banks of the River Parrett was identified as a way of promoting a better understanding of the countryside and the cultural heritage of the area whilst dispersing visitors over a wide area to avoid impacts on the environment.

2.0 Details of the scheme and recreational use

2.1 Parrett Trail

The Parrett Trail was opened in 1995 and covers an area of approximately 80km from the source of the river at Chedington in Dorset, to the mouth at Burnham on Sea. The trail links into several other long distance walking routes such as the Liberty Trail in order to provide a coast to coast link. As well as providing a recreational facility the trail has been used as a means of promoting the work of local artists and craftsman, and a series of sculptures and artistic displays have been constructed along the route.

For much of its length through the Somerset Levels it utilises a series of existing rights of way on the crest of the River Parrett flood banks, although in places it diverts away from the river into nearby towns and villages to incorporate sites of local interest. For example, through Bridgewater it follows the flood banks of the Taunton and Bridgewater canal

2.2 Canoe access steps

The canoe access platform will be located at Langport on the River Parrett and is being built by the local council in response to increasing demand for launching facilities by canoeists. At present facilities for canoiests consist of one set of wooden steps recessed into the inward face of the flood bank downstream of Langport.

Other recreation

The flood banks of the River Parrett are also used by anglers, and the Parrett trail is used unofficially by cyclists and horse riders

3.0 Tidal defences

The downstream stretches of the River Parrett are defended by Type 3 flood banks with a wide riverside berm. The defences are constructed from earth without any surfacing. The defences are privately owned throughout the length of the river although the Environment Agency has partial ownership for some stretches. The stretch of flood bank surveyed was located at the downstream end where the river flows through pasture land.

The flood bank and adjacent riverside berm lie within an area of pasture and are grazed by cattle. The footpath follows the bank crest, which is approximately 3m wide. No discernible signs of erosion as a result of the recreational use were detected, although trampling by cattle on the inward and outward faces had resulted in a loss of vegetation in places and the initial signs of erosion . Stiles are provided on the bank crest to allow access for walkers over field boundaries. The riverside berm is inundated at high tide has been colonised by salt marsh vegetation.

4 Recreation issues

4.1 Recreation and flood defence

No conflicts have been encountered between the flood defence duties of the Agency and recreational use of the Parrett Trail. The Agency is on the steering committee which oversees the development of the trail.

The proposal to site the new canoe access platform downstream of Langport was overturned by the Agency on flood defence grounds. Structure such as pontoons which extend into the channel tend to trap debris and increase the risk of flooding. Negotiation between the Agency and the council has resulted in agreement on a new site for the pontoon further upstream in a sheltered embayment.

4.2 Recreation and conservation

During the development phases of the trail the RSPB expressed concern about the potential for disturbance to birds where the path passed through the edge of the West Sedgemoor Levels and Moors Special Protection Area. The impacts of walkers on the birds in the area of the path is being monitored closely and the route will be diverted if negative impacts are detected.

4.3 Recreation/Recreation

Several anglers using the River Parrett flood banks have complained of disturbance by walkers on the Parrett Trail. Fears have been expressed about the use of the path by cyclists which may endanger the safety of walkers. Walking is treated as the priority activity on the trial.

5. Funding and management of recreational facilities

The Parrett Trail has received funding from a variety of sources including the county, district and borough councils, and the Somerset Arts Development Group. Funding for the post of project manager was obtained from the EU LIFE fund. The scheme is managed by a local artist who role it is to promote the path and oversee development of the various phases. A number of booklets and a guide pack have been produced to promote the path and to explain the interest along the route.

6. Successes of the scheme and proposed improvements

The appointment of a steering group to oversee and guide the development of the Parrett Trail has helped to ensure that the interests of local groups are accommodated and any potential conflicts identified in the early stages.

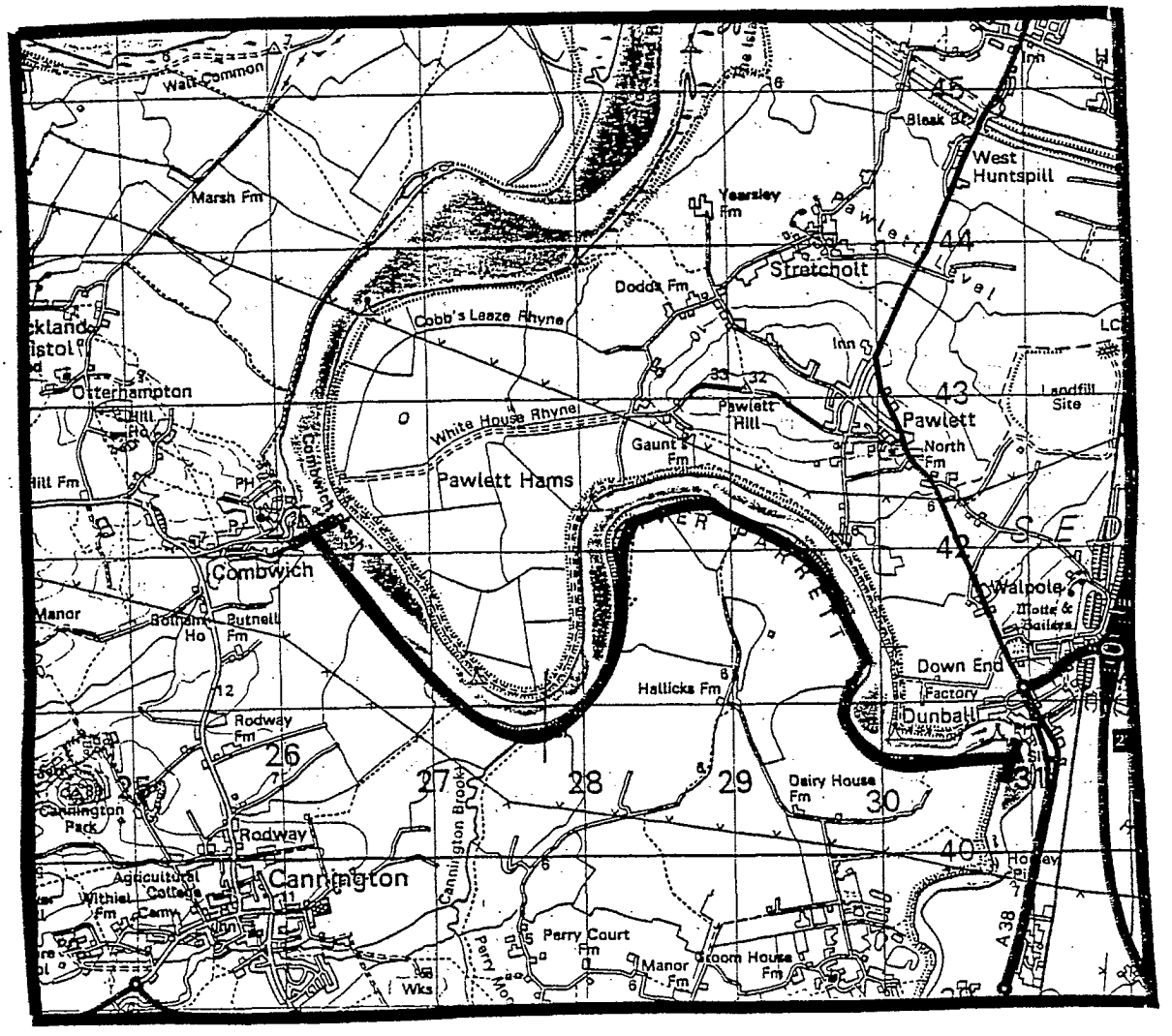
Effective promotion of the trail through open days and regular newsletters has ensured local involvement and increased usage of the trail.

Negotiation between the Agency and the local council has resulted in agreement in the location of a new canoe access platform.

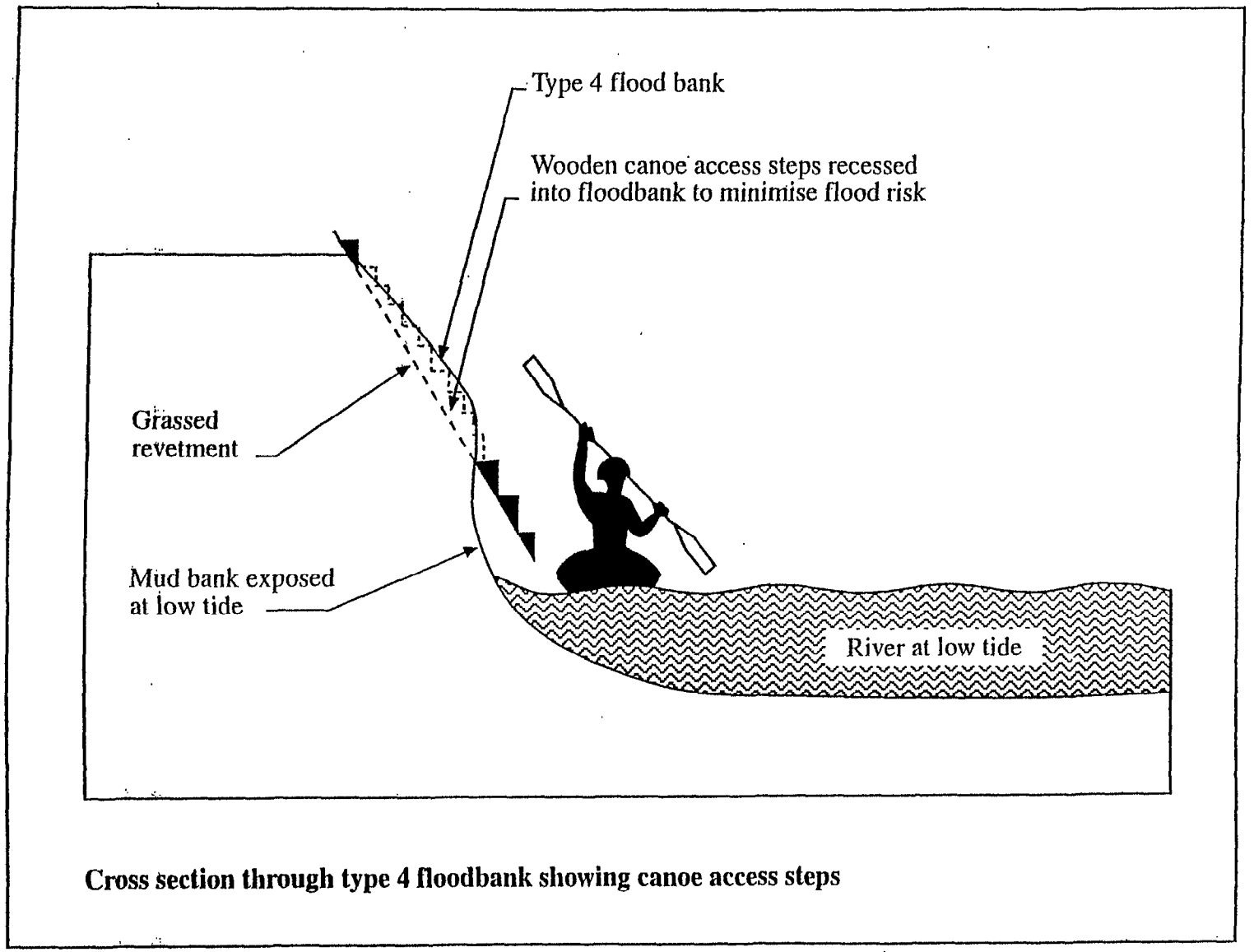
The Environment Agency is considering the possibility of moving the riverine flood banks further back into the flood plain in order to increase the nature conservation value of the river, and also to provide additional space for recreational facilities on the riverside berm. The feasibility of this proposition depends largely upon agreement with farmers and other riparian owners, and may only be possible through schemes such as Countryside Stewardship.

Plate 9 : Parrett trail on tidal flood banks at Combwitch, Somerset

Plate 10 : Existing canoe access steps on River Parrett at Langport



Map 4: Location map showing study area on Parrett trail
(Scale = 1:50,000)



Cross section through type 4 floodbank showing canoe access steps

CASE STUDY 5

Project Name:	**New Sea Wall, Binn Wall Sea defences**
Location:	**Severn Beach, Bristol**
Agency Region/area:	**Midlands (Lower Trent)**
Grid Reference:	**ST537847- ST450858**
Length of study area:	**1km (approx.)**
Nature of floodbanks:	
Material:	**Earth**
Type:	**Coastal (Type 4)**
Ownership:	**Private**

Key points:
- **Upgraded sea wall incorporating recreation and amenity facilities**
- **provides link with long distance walking trail: Severn Way**

1. Background

The New Sea Wall and the Binn Wall comprise the sea defences which protect the town of Severn Beach. Prior to the second world war the town was considered a sea side resort and the sea front area offered amusement arcades and an outdoor swimming pool. However, the area declined as a resort during the 1960's and following extensive damage to the sea wall as a result of storms the defences were re-constructed to incorporate a 'low key' amenity area.

The Binn Wall adjoins the New Wall and extends north to the new Severn road crossing. It has undergone a major re-construction works over the past five years to improve its flood defence capacity.

2. Recreational use and facilities

A public right of way runs along the crest of the flood bank and connects with the recently opened Severn Way to the north of the new Severn crossing. The route is a footpath throughout its length and thus provides authorised access for walkers only.

Provision for recreation consists of wide concrete walkway along the crest of the sea wall with, flights of steps leading onto the beach, and wooden benches on the landward edge of the bank crest. Several concrete walkways which extend onto a grassed amenity area on the landward side of the sea wall were added as part of upgrading works to the New Sea Wall several years ago.

3. Details of sea defences

3.1 Structure of the defences

The defences are privately owned throughout much of the study area, with short stretches owned by the Agency. For the privately owned sections the Agency has permissive rights of access to maintain the defences.

The new defences were constructed on an original earth embankment and incorporate a number of design improvements. The inward face is a two stage structure; incorporating a concrete maintenance path between two sloping stone-faced surfaces. The top of the upper surface incorporates a curved, concrete wave-return structure. The base of the wall is protected along much of its length by a 'bank' of large boulders.

The crest or top of the flood bank incorporates the walkway. Steel railings have been included along the top of the wall as a safety feature for walkers on the footpath. The outward face comprises a grassed revetment extending to the amenity area.

3.2 Maintenance requirements

The sea wall is a substantial structure designed to withstand a hundred year flood event. Maintenance of the inward face and crest is confined to routine repairs. The outward face is mown once between April and October.

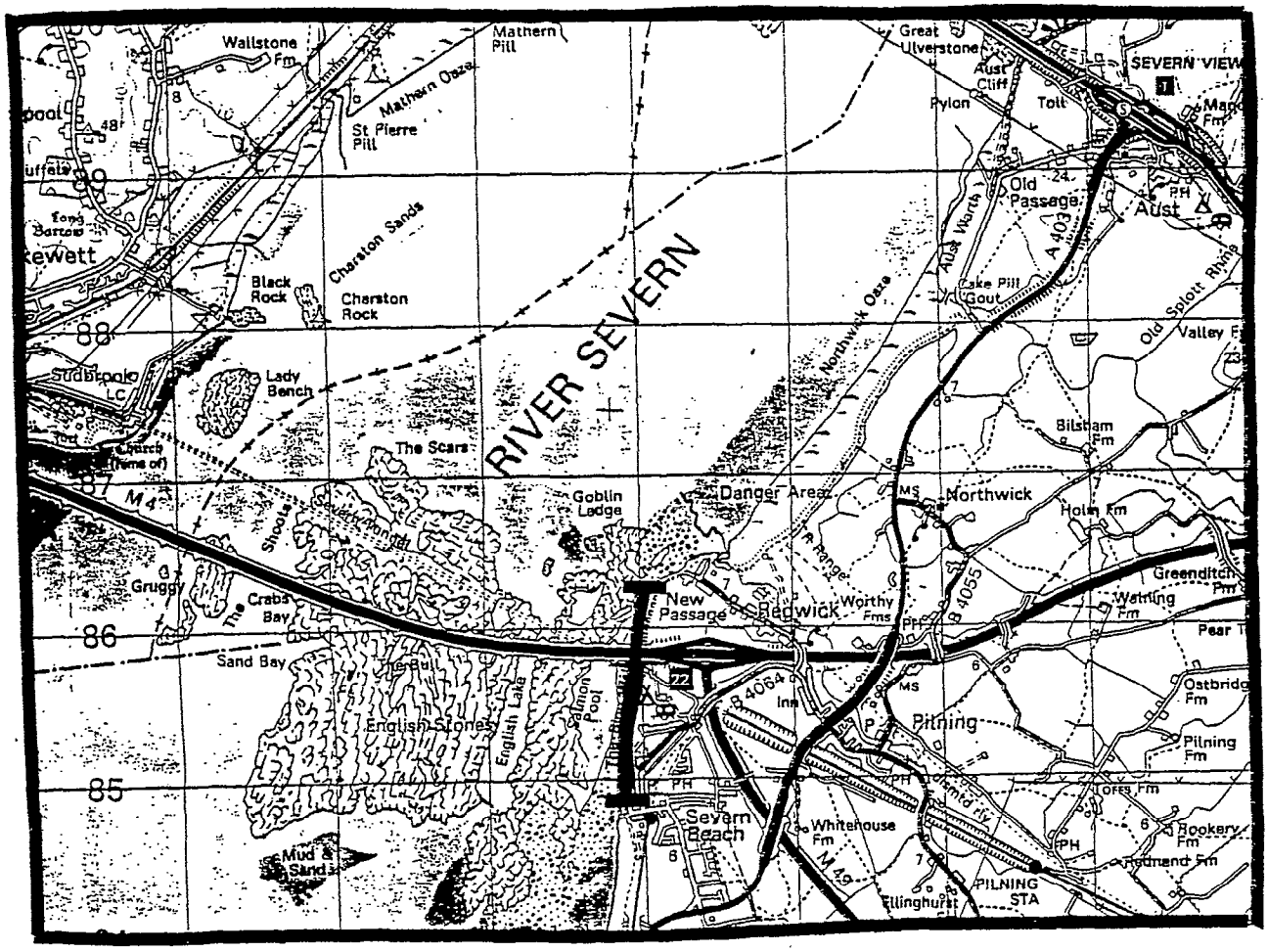
4. Recreation issues

5.1 Recreation / flood defence

No conflicts between the flood defence duties of the Agency and the recreational use of the area have been encountered on the New Sea Wall and the Binn Wall. However, a proposal by SUSTRANS to construct a cycle path adjacent to the flood defences to the north of the Severn crossing was turned down by the Agency on the basis that it is likely to cause damage to the earth flood defences. Alternative proposals to route the cycle track at the toe of the inward face of the bank are currently under discussion

5.3 Recreation/conservation

The Severn Estuary is designated as a SSSI and a candidate SAC. Small and degraded remnants of salt marsh occur in the intertidal area adjacent to the sea wall. More extensive areas of saltmarsh occur north of the new Severn crossing between the earth flood defences and the intertidal area. There have been no reported conflicts between recreation and nature conservation either at Severn Beach or on the Severn Way.



Map 5: Location map showing Severn Beach sea defences and Severn Way (Scale = 1:50,000)

Plate 11 : Walkway on New Wall Severn Beach, showing access control structure to prevent access for vehicles

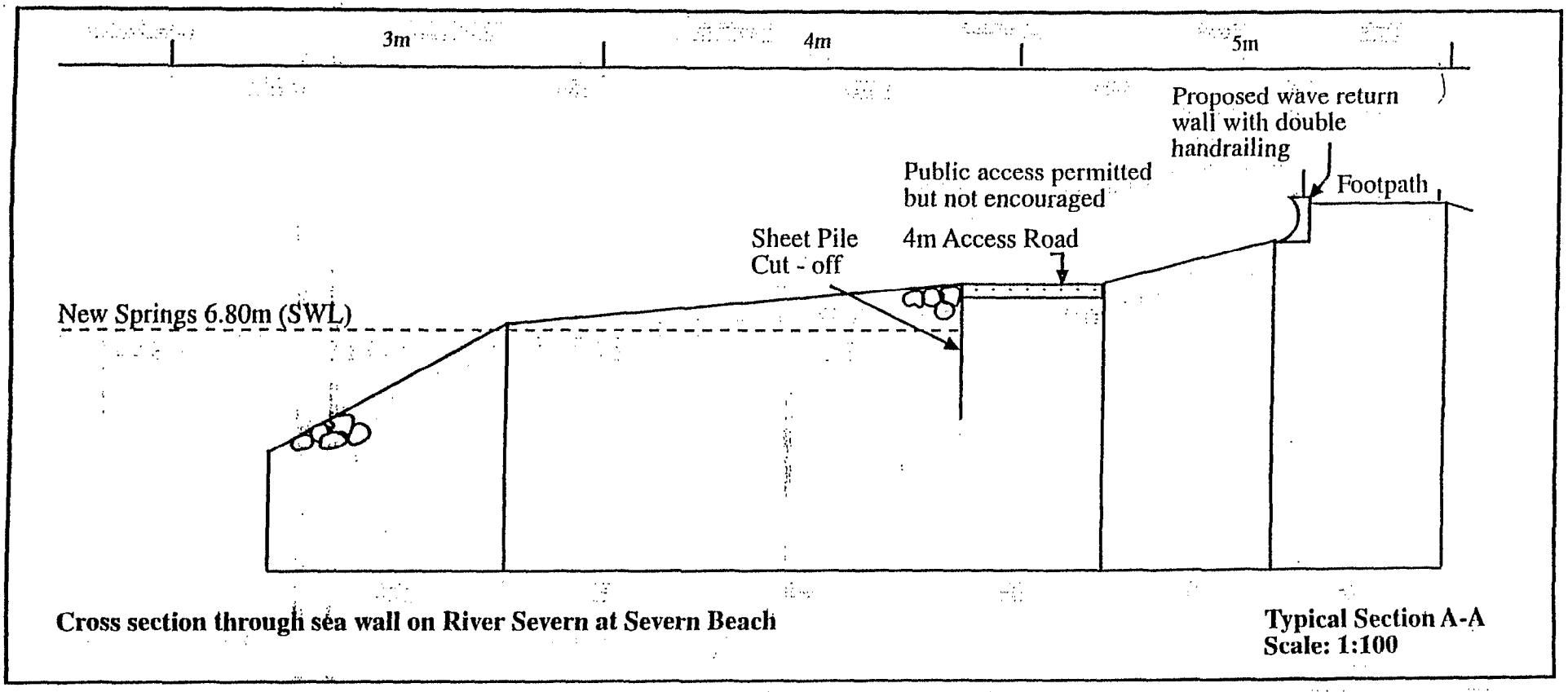
Plate 12 : Access ramp from Sea wall onto amenity area on landward side

6. Funding and management of recreational facilities

The improvements to the New Sea Wall and Binn Wall cost a total of £7.5 million of which approximately 5% was attributable to the recreation facilities and landscaping of the amenity area at Severn Beach. North Avon District Council and South Gloucestershire Council are responsible for the maintenance of the recreational facilities and the amenity area.

7. Proposed improvements to the scheme

No improvements to the recreational facilities on the Binn and New Sea Walls have been proposed, however, the stretch does connect with a long distance route known as the Severn Way which was officially opened this year and has been promoted extensively by the Environment Agency.



Cross section through sea wall on River Severn at Severn Beach

Typical Section A-A
Scale: 1:100

CASE STUDY 6

Project Name:	**Tame Walkway**
Location:	**Sandwell Valley Birmingham**
Agency region & area:	**Midlands (Lower Trent)**
Grid Reference:	**SF025930**
Length of study area:	**2.5km**
Nature of floodbanks:	
Material:	**Earth**
Type:	**Type 3 (Riverine)**
Ownership:	**Split between: Sandwell Metropolitan Borough Council and Birmingham City Council, with adjacent private ownership**

Key points:

- **Sandwell Valley comprises an area of green space in a predominantly urban area**
- **informal and unauthorised public access along floodbank and adjacent areas had resulted in conflict with private land owner**
- **creation of a moat has subsequently prevented trespass and increased both wildlife and aesthetic value of land associated with flood defence structure**
- **recreational uses: cycling, walking and riding are now encouraged**
- **recreational provision: includes surfaced paths and gate**

1. Background

The River Tame runs through Birmingham and surrounding conurbations. Despite a history of river pollution, land associated with the river in the Sandwell Valley experiences a high level of recreational usage. This is attributed to high population density in surrounding areas (including Birmingham, Walsall, Wednesbury, West Bromwich and Smethwick) with relatively limited easily available open land. One consequence of this fact is that the RSPB Sandwell Valley Reserve, situated adjacent to the flood defences, is the most used reserve of its type in the country.

2. Details of scheme

The scheme in the Sandwell Valley forms part of the Tame Walkway, a footpath which extends from near its source through to its confluence with the River Trent. Within the Sandwell Valley, the footpath is surfaced with crushed and rolled brick.

The scheme was proposed in 1987 following persistent trespass incidents. These

consisted of recreational users straying onto a private golf course which adjoins the flood defence banks. Designs to extend an existing but neglected ditch (possibly a former mill-race) which was present in adjacent woodland were formulated to prevent access to the private golf course and encourage responsible recreational usage of the floodbank. The scheme included provision of a surfaced track along the crest of the floodbank and incorporated appropriate reinforcement of the floodbank where necessary (using spoil from the ditch excavations) to ensure that structural integrity would not be compromised by recreational use.

The Scheme was completed in 1990. A moat, wide enough to prevent people jumping across now separates the floodbank and the golf course. A hedge has been planted along the far bank of the moat to provide a further visual and physical barrier. Both the moat and hedge contribute to the nature conservation value of the site, and both wildfowl and water voles are now common features of the site.

Recreational usage of the floodbank has increased as a result of the scheme.

3. Recreational facilities

A surfaced track consisting of crushed and rolled brick has been provided along the crest of the floodbank. The floodbank itself has been widened to reinforce the structure against damage from walkers. Decorative gates mark boundaries whilst allowing free pedestrian, cycle and wheelchair passage. Gradients have been designed to permit wheelchair access throughout the section. A car park adjacent to one end of the Scheme has also been provided which allows access to a slip way and associated lagoon. Private windsurfing and sailing are permitted on this area of water, which directly abuts the RSPB Sandwell Valley Reserve.

4. Details of flood defences

The Agency has negligible ownership within the section.

4.1 Inward face

This consists of a grassed revetment throughout the Scheme and slopes with a varying gradient. It generally slopes to a berm approximately 4m wide which provides stability and access for maintenance. Regular mowing is undertaken by the Agency.

4.2 Crest

The floodbank crest supports the footpath. As a result of the relatively high levels of usage, the crest has been surfaced to prevent erosion. Shallow trenches formed by walking along an unprotected crest would have comprised the banks integrity to an unacceptable level.

The crest has, for the majority of the floodbank, been widened through reinforcement of the floodbank faces. This helps to stabilise the bank and protect its structural integrity from the pressures of recreational use.

In addition, the wider crest now permits Agency maintenance vehicles to travel along it, reducing costs associated with mowing the faces of the floodbank.

4.3 Outward face

The outward face of the floodbank along the Sandwell Valley comprises a grassed revetment similar to the inward face. Again, this is regularly mowed by the Agency.

4.4 Maintenance requirements

To date, there has been no maintenance requirements to the surfaced crest. However, some areas of track have settled to a greater extent then the others and may require leveling if wheelchair access is to remain unaffected.

4.5 Maintenance responsibilities

Birmingham City Council are responsible for maintenance of the ditch/moat and associated hedge. Sandwell Metropolitan Borough Council are responsible for maintenance of the car park and associated litter bins. The Agency has responsibility to mow and maintain the floodbank itself.

5. Recreation issues

5.1 Recreation / flood defence

Intense use of the floodbanks by walkers has, in certain areas, created shallow ruts along both the crest and on faces where access onto and off the crest has been established. This exposes the bank substrate and weakens the structural integrity. This problem has been solved by surfacing the bank with crushed brick. A predicted issue of motorcycle usage of the track has been prevented by the installation of sand boxes, prohibiting access onto the floodbank by heavy motorbikes, whilst allowing access by pedal cycles.

5.2 Recreation / riparian owner

Trespass by the public using the floodbank onto a local golf course precipitated the scheme as described. The creation of a moat, wide enough to prevent access onto the course has solved this problem and allowed subsequent encouragement of recreational

usage on the floodbank. The members of the golf course have, however, expressed concern regarding certain usage of the floodbank. Horse riding in particular has not been promoted since there was a perceived risk of injury should a rider or horse be struck by a misdirected golf ball.

5.3 Recreation/conservation

No conflicts have been reported between nature conservation and recreation. Indeed, the resolution of the trespass issue has resulted in an increased conservation value of the site. Creation of a slow flowing ditch and an associated hedgerow along the perimeter of the golf course has provided a favourable habitat for watervole and other wildlife.

6. Funding and management of recreational facilities

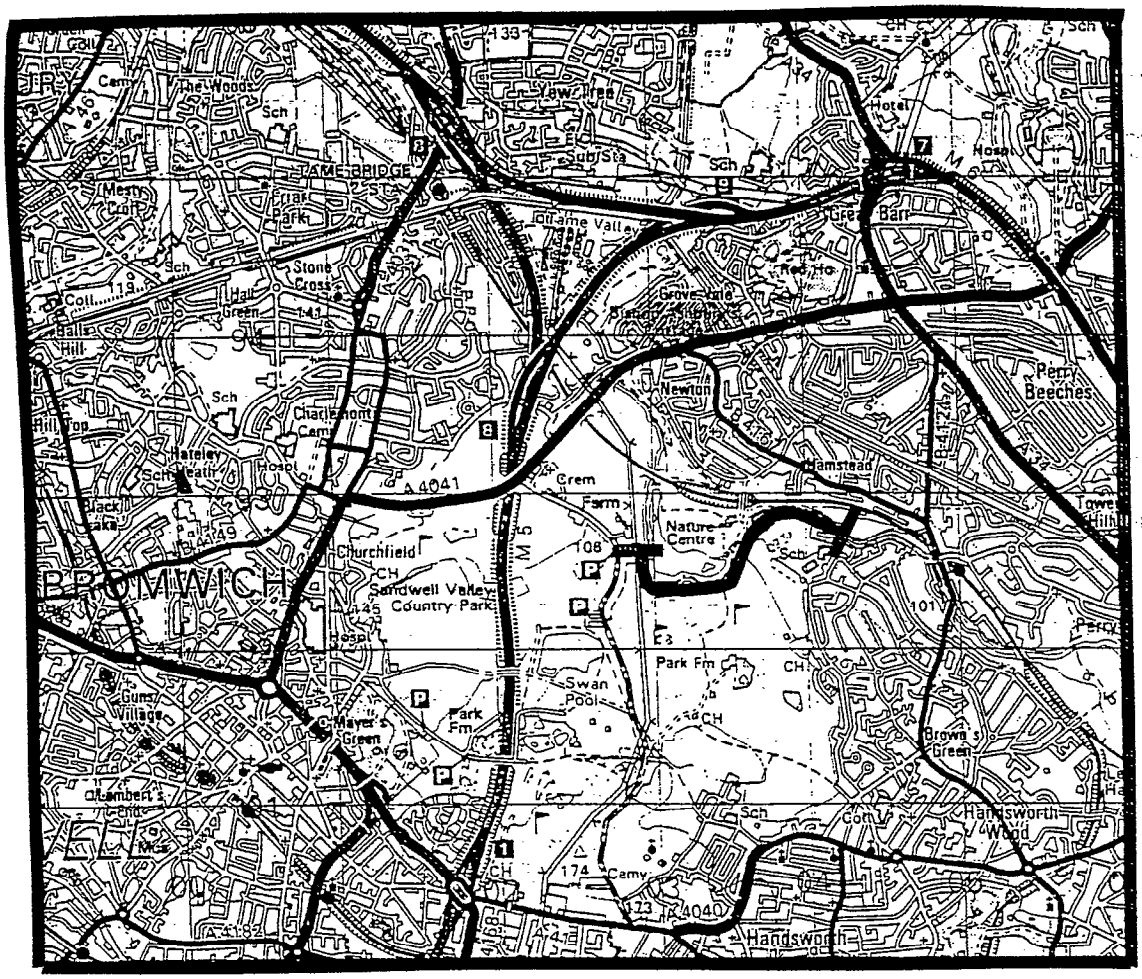
Different lengths of the scheme have been funded by Sandwell Metropolitan Borough Council and Birmingham City Council, in combination with the recreation and flood defence department of the Agency. The total cost attributable to the provision of the Scheme is approximately £80,000. Routine maintenance requirements include the upkeep of the surfaced track, management of the hedge and ditch.

7. Proposed improvements to the scheme

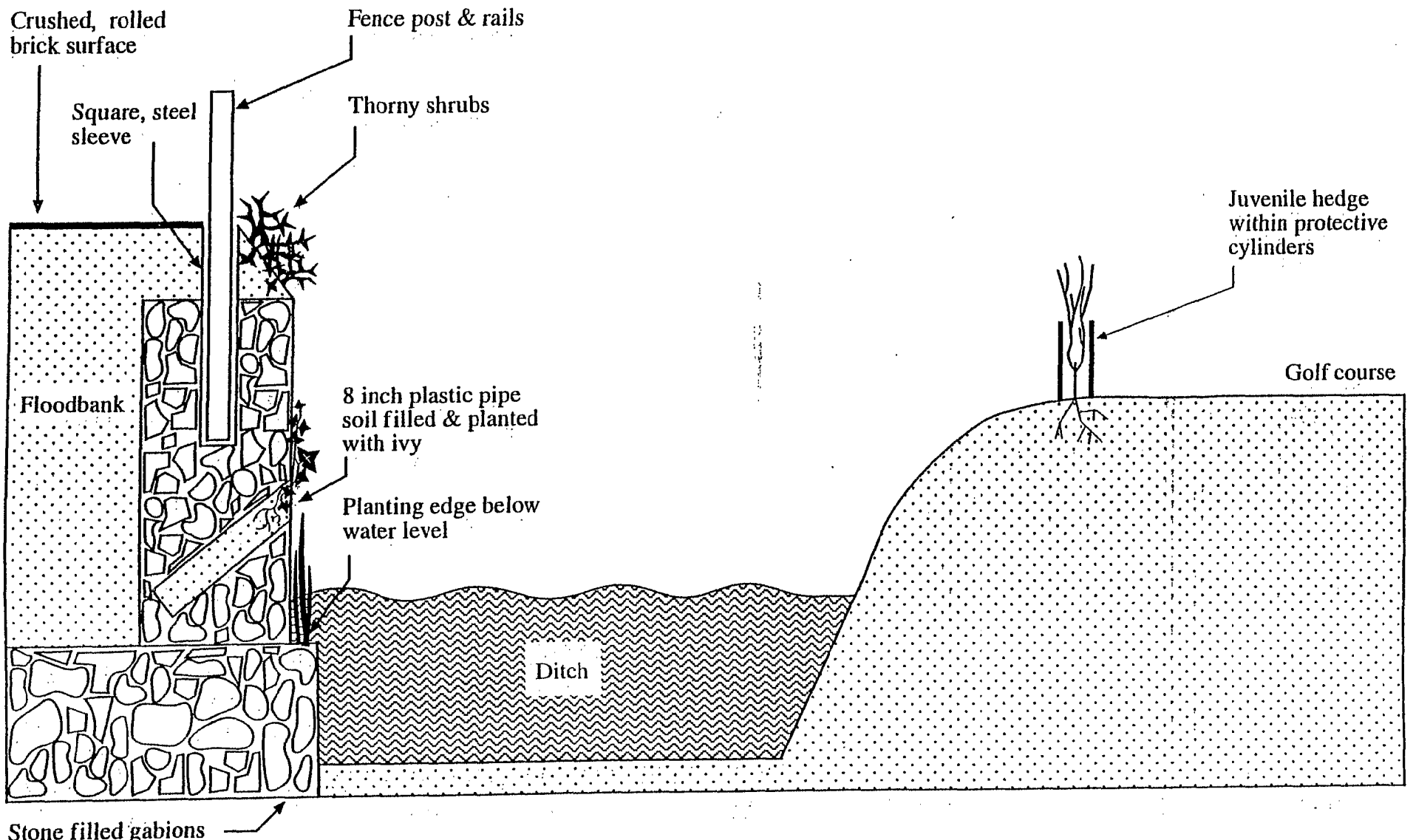
Extension of the walking along the River Tame to the east will enhance the recreational potential of the scheme. Access onto and off the floodbank crest has resulted in localised erosion. The installation of steps will help prevent this damaging the floodbank whilst improving the public safety.

Plate 13 : Tame Valley walkway, showing decorative gate to prevent access for motorcycles

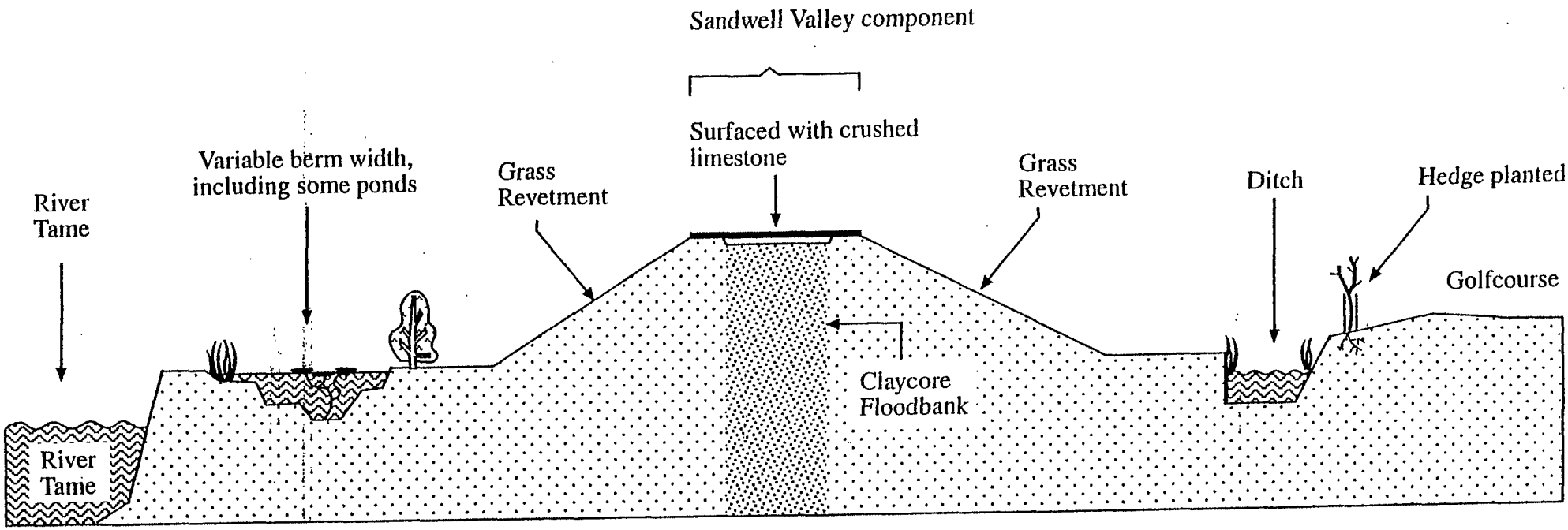
Plate 14 : Ditch and hedge system used to prevent trespassing on golf course



Map 6: Location map showing the River Tame walkway, Sanwell Valley (Scale = 1:50,000)



Cross Section of ditch at rear of River Tame floodbank; separating public recreational use from private golf course



Cross Section through River Tame floodbank at Sandwell Valley

CASE STUDY 7

Project Name:	**River Tome Washlands**
Location:	**Nottingham**
Agency region & area:	**Midlands (Lower Trent)**
Grid Reference:	**SK485347**
Length of study area:	**1.5km**
Nature of floodbanks:	
Material:	**Earth**
Type:	**3 (Riverine)**
Ownership:	**Agency**

Key points:

- **riverine flood defence with canal and disused rail sidings on adjacent land**
- **damage to floodbank had resulted from horse grazing and informal footpath use**
- **recreational uses now include walking/dog exercising and cycle riding, with separate paths for approximately half the length of the scheme**
- **forms a link in the proposed Dover to Inverness Sustrans route**
- **recreational provision; hard topped footpath / cycleway, footbridge over river meander and interpretation boards**

1. Background

The Tome Washlands, situated on the River Erewash has been used historically as a recreational resource for walkers and for horse grazing. Railtrack own the Totum Sidings on the east side of the river, and British Waterways are responsible for the Erewash Canal to the west, although the area is generally urban in nature. A permissive circular footpath route runs along the floodbanks on both sides of the river, although the scheme described is limited to the west floodbank. Damaged caused by horse grazing required that repair works be undertaken in order to maintain floodbank integrity. This commenced when the agricultural tenancy lapsed. The level of existing and potential recreation on the site helped influence designs for the provision of recreational facilities as part of these works.

2. Details of scheme

Repair and restoration work to the right hand floodbank of the River Erewash at Toton following damage by horse grazing incorporated hardtop surfaces along the crest, and for the downstream portion, along the berm of the inward face as well. The tracks were constructed by Sustrans in phases between 1995 and 1997 with a view that they

might form a component of the Dover to Inverness Sustrans route. At the time of conception, British Waterways were unwilling to allow the tow-path of the adjacent Erewash Canal to be used for this purpose. Various landscaping measures were incorporated to the river and banks to enhance conservation and amenity value. In addition, the flood bank was widened in order to better support recreational pressures.

3. Recreational facilities

Provision for recreation consists of surfaced walkway / cycle paths, a small footbridge, and an interpretation board. The network of surfaced paths ensures that the floodbank is accessible to disabled people. Chicanes in gates at the ends of the track prevent motorcycles from causing a nuisance to other users of the scheme.

4. Details of sea defences

The defences are owned throughout the length of the Tome Washlands by the Agency.

4.1 Inward face

The inward face of the floodbank comprises a grassed revetment which is mown regularly by the Agency. A surfaced track runs along the base of the inward face for the downstream portion of the scheme. The length and gradient of the inward face of the floodbank decreases as the tracks move upstream and the height of the inside berm gradually increases. Gabion baskets protect the river banks themselves on the right hand side of the downstream portion.

4.2 Crest

The crest or top of the flood bank supports the footpath / cycleway. The crest has been surfaced with crushed and rolled stone to form a hard top suitable for cycling and walking.

4.3 Outward face

The outward face offers stability to the flood bank and comprises a grassed revetment. Tree saplings have been planted along the downstream section of the outward face, and a post and rail fence runs along the base of the floodbank.

4.4 Maintenance requirements

The floodbank has been widened with earth to better support the predicted levels of recreational pressure. Regular mowing of the grass growing on these revetments is required. No maintenance of the surfaced tracks have been required or are anticipated in the near future.

4.5 Maintenance responsibilities

The Agency is the sole owner of the floodbank and all the recreational facilities associated with the scheme. Whilst the Agency undertakes basic regular mowing of the grassed revetments in order to maintain the floodbank, Erewash Borough Council have accepted responsibility for other mowing requirements associated with the scheme.

5. Recreation issues

5.1 Recreation / flood defence

No major issues have arisen between recreational activities and the flood bank. Access for maintenance has been improved by the scheme, since machinery is now better able to negotiate the floodbank crest. Cycle usage onto and off the floodbank, usually immediately adjacent to steps provided for pedestrian use, have resulted in localised erosion. Since horse grazing was perceived as the initial cause of floodbank damage, riding of horses has not been encouraged on the site.

5.2 Recreation / riparian owner

Whilst the agency is the sole owner of the land adjacent to the river, residential housing abuts a small length of road at the base of the floodbank at the far downstream end. Some complaints have been received because users of the floodbank both stand out against the skyline and so interfere with property views, and are also able to look down into the gardens of the properties. The planting of trees along the far side of the flood bank, and on the berm at the base of the near side of the floodbank aims to shield views and disperse skyline silhouettes respectively.

Railtrack own both land on the left side of the river and a bridge crossing the river at the downstream end. Maintenance of fences and of the bridge itself is not to the same standard as Agency property, and may suppress the amenity value of the circular walk. Consultations with Railtrack are anticipated in the near future.

5.3 Recreation/conservation

The area between the floodbank and the River Erewash, together with the river itself, are considered to be of some wildlife value, and comprise at least one Site of

Importance of Nature Conservation (SINC). Meanders have been constructed on both banks of the river which each maintain significant flows through them. The meanders create islands which are not generally accessible to the public. A pond has been excavated, and is fed by a blind drainage ditch, dug at the same time. Both the pond and the ditch now support a wide range of aquatic plants and animals. All these features increase the aesthetic and amenity value of the scheme, whilst providing obvious benefits to the wildlife potential of the site. Kingfisher and watervole are now common sights along the river.

6. Funding and management of recreational facilities

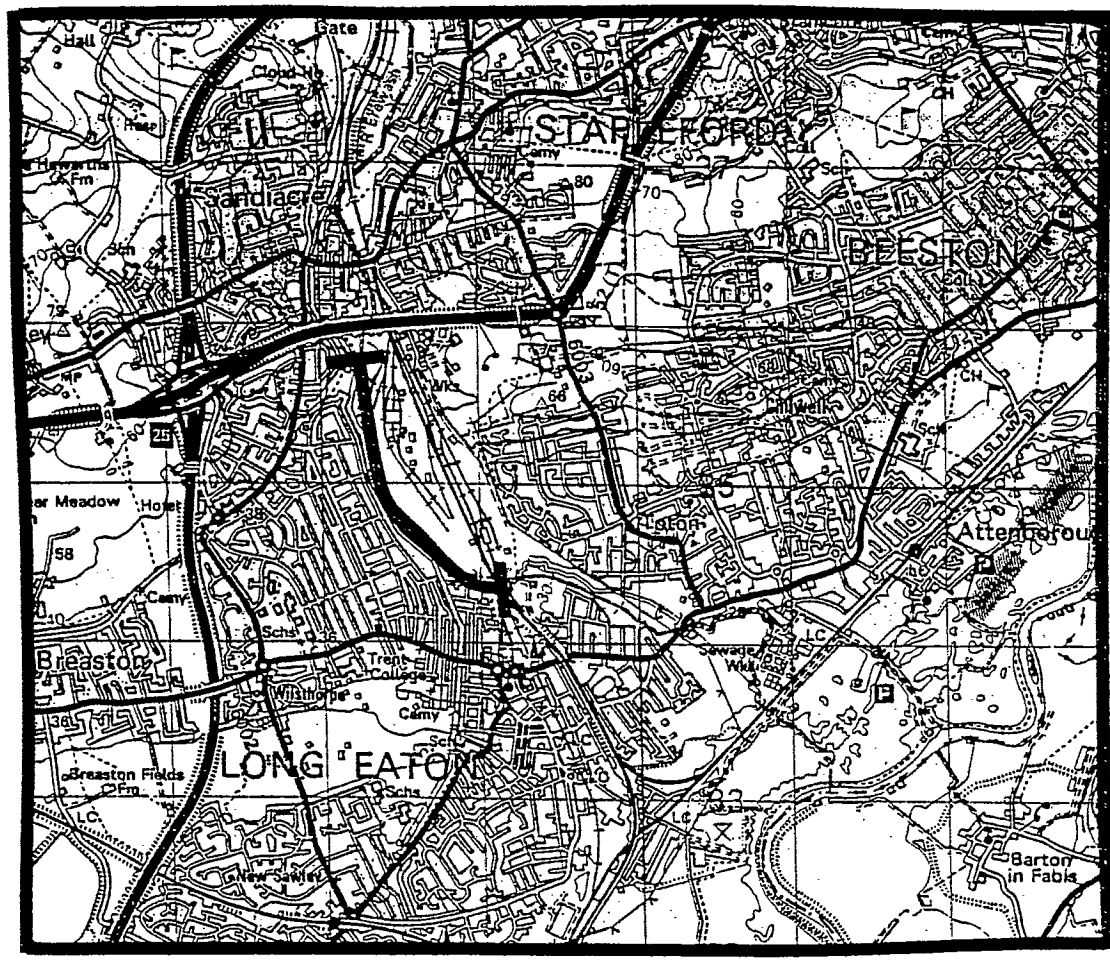
Erewash Borough Council and Nottinghamshire County Council made financial contribution to the scheme, which together with funding from the Agency's Flood Defence Dept. allowed the works to be undertaken as described. The recreational facilities associated with the scheme comprises approximately £10,000 of a £27,000 total for works associated with the scheme.

7. Proposed improvements to the scheme

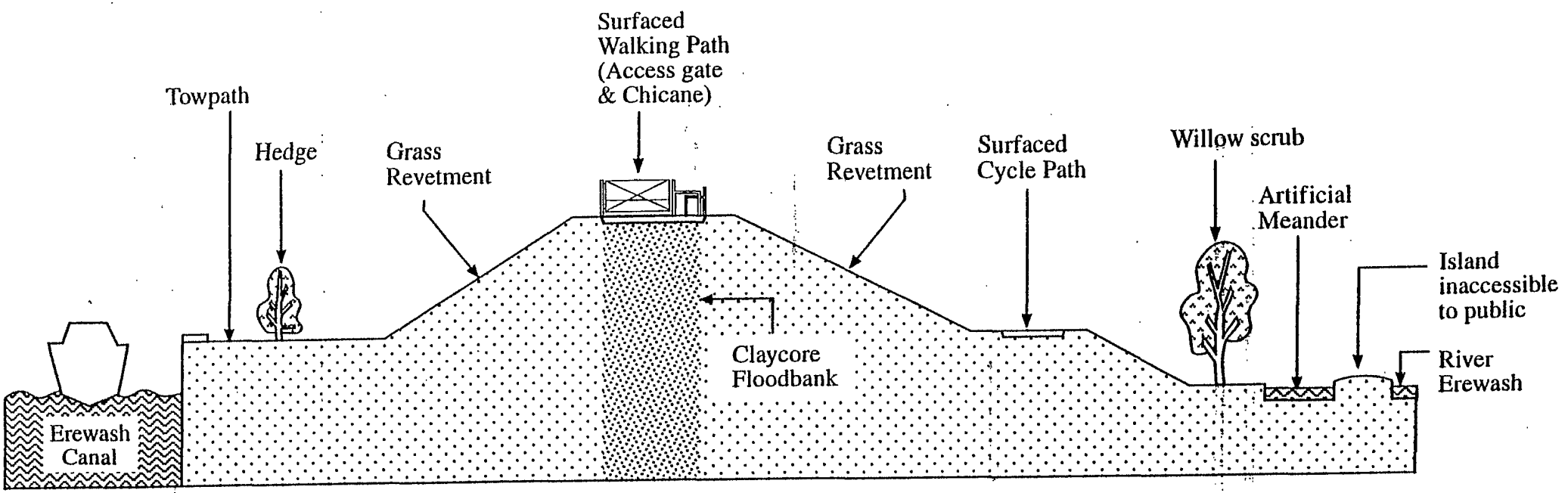
Installation of cycle ramps to allow riders to follow desire lines without compromising the integrity of the floodbank structure are to be installed.

Plate 15 : New surfaced footpath on berm of Type 3 floodbank, Tome Washlands

Plate 16 : Surfaced path of bank crest, with access control structure to prevent use by motorcycles, Tome Washlands



Map 7: Location map showing Tome Washlands near Nottingham (Scale = 1:50,000)



Cross section of floodbank at Tome Washlands, River Erewash

CASE STUDY 8

Project Name:	**Gainsborough quayside re-development,**
Location:	**Lincolnshire**
Grid Reference:	**SK 815894**
Length of study area:	**400m (total phased length = 1.2 km)**
Nature of floodbanks	
Material:	**Concrete and steel**
Type:	**1 (Tidal)**
Ownership:	**Private**

Key points:

- **renewal of original tidal flood defence structure was found to be necessary**
- **options for direct replacement were rejected partially because subsequent maintenance would require expensive and difficult access by boat**
- **phased construction of walkway along flood defences provides facilities for both recreation and maintenance**
- **recreational provision; stone-brick paved promenade, benches, lighting, litter bins, interpretation board and gardens**
- **preliminary evidence suggests urban regeneration resulting indirectly from scheme**

1. Background

Gainsborough lies on the right bank of the River Trent in the District of West Lindsey, Lincolnshire. Although approximately 42km above the confluence with the River Humber, Gainsborough is situated in a reach where the meeting of tide and flow has considerable impact. The low lying town has suffered many floods, eventually resulting in construction of the previous flood defence structures which were built in the early 1960's. Old warehouse walls were encased in concrete and gaps between buildings were sealed. The town is a historic river-port that had, for centuries been supported by a thriving wharfage which stretched flush along the east bank of the River Trent. However, Gainsborough has now been in decline since the mid 1800's and most markedly since the 1970's. The riverside area has suffered in particular. A study commissioned by the Agency to examine the status of existing flood defence structures found that the remaining life expectancy ranged from 3 to 25 years. Various options were assessed, and it was decided to replace the structure in a phased manner. The defences have been extended approximately 5m into the river in order to provide access for maintenance vehicles along its surface. The Agency entered into partnership with local bodies in order that this access might be also utilised for recreational purposes. To date, Phase I and II of a five phase plan have been completed.

2. Details of scheme

Repair of flood defences on the right hand bank of the River Trent in Gainsborough were judged unviable, and a scheme to replace them was conceived. With the aid of a local consortium, plans were drawn up to provide recreational facilities for the public. Five phases of work were formulated by the Agency between Whitton Gardens (downstream) to Trent Bridge (upstream) to account for the different levels of urgency with which the floodbanks required replacement. The existing flood defences to be replaced by Phase I were given a life expectancy of between 3 and 5 years, and comprises structures at Whitton Gardens and St. Pauls Malt (180m approximately and 15m in length respectively). Replacement defences and associated works were completed in August 1996. Phase II, (replacing prior structures with a life expectancy of between 5 and 10 years) is situated between the former Malt House (upstream) and Gleadell's Wharf (downstream) (approximately 200m in length), and was completed in December 1997. Work on Phase III is scheduled to commence in August 1998 and will stretch for 180m.

3. Recreational facilities

Provision for recreation includes benches, street lights, and an interpretation board. A common design has and will be used throughout the scheme. The stone brick walkway laid throughout the defences was chosen to match existing cobbles present in Gainsborough town center. Phase I largely consists of an area in front of Whitton Gardens. Re-landscaping of these gardens was undertaken as part of the works, which now provide an attractive riverside frontage. Benches and brickwork seating have been incorporated into the design. An interpretation board in a car park adjacent to the gardens provides information on the scheme and facilities. Other street furniture includes street lighting and litter bins.

4. Details of sea defences

Ownership of the flood defences is unclear. Areas of bank fall into private riparian ownership, and ownership by West Lindsey District Council. Riparian rights are maintained by these bodies.

4.1 Inward face

Where possible, the outward face sheet pile is tied back into adjacent ground. However, this has limited potential (since ties will not easily be installed) and in other areas an independent structure has been created by driving two parallel rows of sheet pile, 5m apart, running along the front of the existing defences. The sheet piles are connected together with stainless steel ties and the space between filled with concrete. The gap between this inside fence and the existing defences was also filled with concrete.

4.2 Crest

The crest is situated approximately 8m above the river bed and consists of an 5m wide pedestrian walkway and vehicular access for Agency maintenance. This access promenade is capped with high quality block paving and brickwork. A parapet wall with brick cladding and steel railings provides both the top of the flood defence and safety for pedestrians. Raised blocks prevent cycling along the wall and anti-vandal paint has been employed throughout. The crest incorporates a drainage system with interceptor drains and holding tank. Water may be pumped (using a small submersible pump) over the parapet wall when normal drainage is not possible because of high water levels.

4.3 Outward face

The outward face is composed of steel sheet pile, which has been faced with green oak cladding and fenders to protect against damage by navigational craft.

4.4 Maintenance requirements

Maintenance requirements of the flood defence structure itself are anticipated to be minimal over the early life of the structure, although regular inspections of the outward face will be undertaken. Any maintenance and repair work can now be undertaken from the top surface of the flood defence, either using specialised vehicles, suspended platforms or scaffolding, avoiding the need for costly access by boat.

Basic maintenance of the drainage system on the promenade will be required, together with street lighting. Bins are regularly emptied, and the gardens are managed.

4.5 Maintenance responsibilities

West Lindsey District Council are responsible for the emptying of bins / street cleaning, the maintenance of street lighting and the management of gardens.

The Agency is responsible for the maintenance of the flood defence structure itself, and of the submersible drainage pump.

5. Recreation issues

5.1 Recreation / flood defence

No significant impacts have been encountered or are anticipated between recreational use and the flood defence structure. Indeed, the only negative comments have resulted from delays prior to official opening to the public. Issues of public safety have resulted in measures to prevent cyclists from riding along the parapet wall.

5.2 Recreation / riparian owner

No negative issues have been encountered between recreation and riparian owners. Indeed, property values are reported to have already increased as a result of the development, and future regeneration of the area is predicted.

5.3 Recreation/conservation

No issues between recreation and nature conservation have been encountered as a result of the scheme. Dogs Island and Beckingham Marshes are two areas opposite the flood defences which are worthy of note. The areas, (forming an extension of the River Idle Washlands system) are acknowledged as being of value for wintering and passage wildfowl, providing feeding and roosting habitat for a range of birds including Berwick's, whooper and mute swan, widgeon, teal, pochard and snipe.

6. Funding and management of recreational facilities

Funding of the Scheme by the Agency has been augmented by support from the 'Gainsborough Regeneration Partnership', which includes West Lindsey District Council and Lincolnshire County Council. The Partnership attained funds via a Department of the Environment SRB grant. The grant was awarded to cover:

- the additional costs of upgrading the maintenance access which was to be built by the Agency and create a recreational promenade for the public;
- construction of gaps in the promenade where flood defence work was not immediately required (and would therefore not be immediately constructed by the Agency) ; and
- regeneration of sites behind the defence works.

The total of the scheme is estimated to be between £16 and £18.5 million, of which Phase II has cost £4.6 million. SRB funds are contributing approximately £600,000 for upgrading the maintenance access to a promenade and £1.6 million to bring works forward and allow continuity of access. Total SRB funds are £3,575.000 and are being made available over six years. The remainder constitutes the flood defence works themselves, which were subsidised by 35% by MAFF.

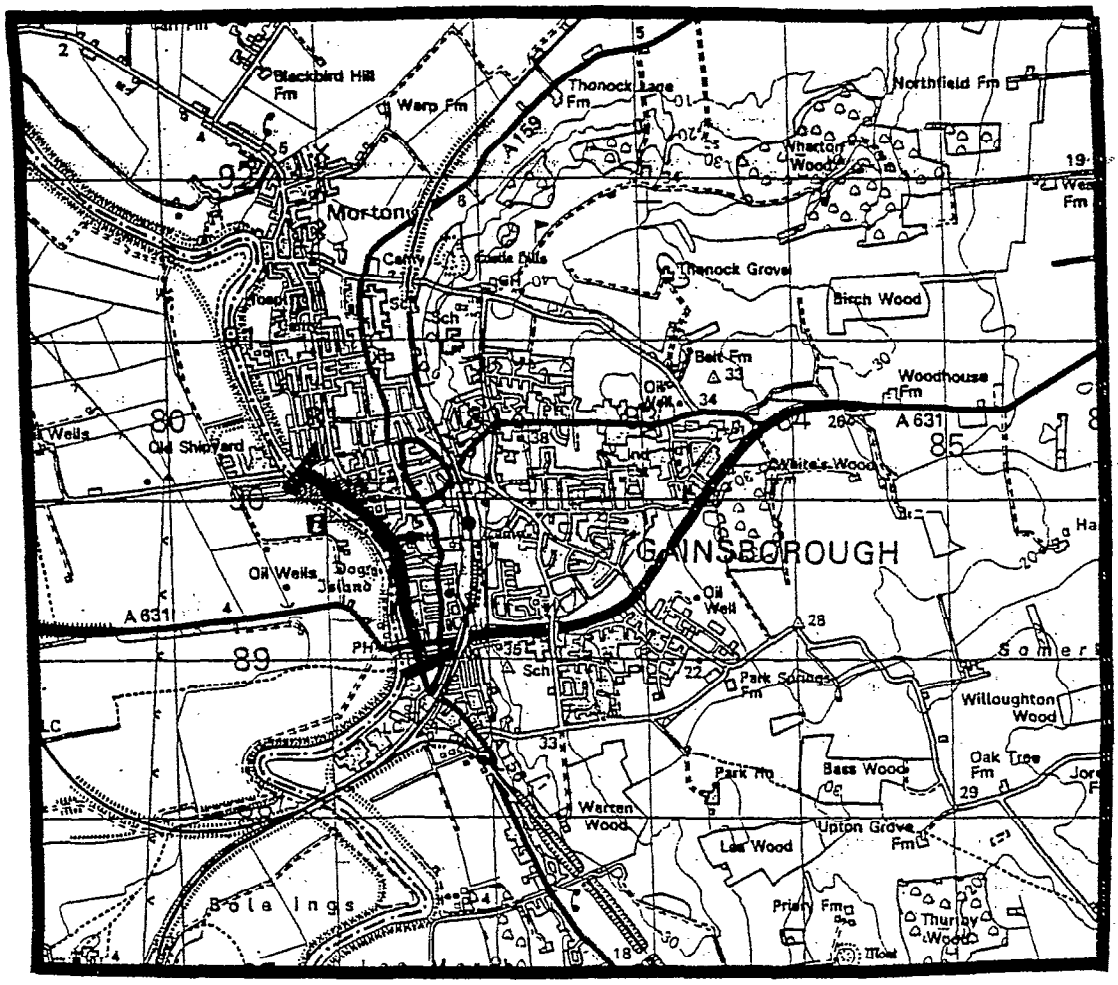
7. Proposed improvements to the scheme

Completion of phases III, IV and V will result in an overall improvement to the amenity value of those phases already completed. It is also hoped that a footbridge over the River Trent will allow access to a footpath on the left hand floodbank, and create a circular walk. Associated with this plan are proposals to develop agricultural land on the opposite bank.

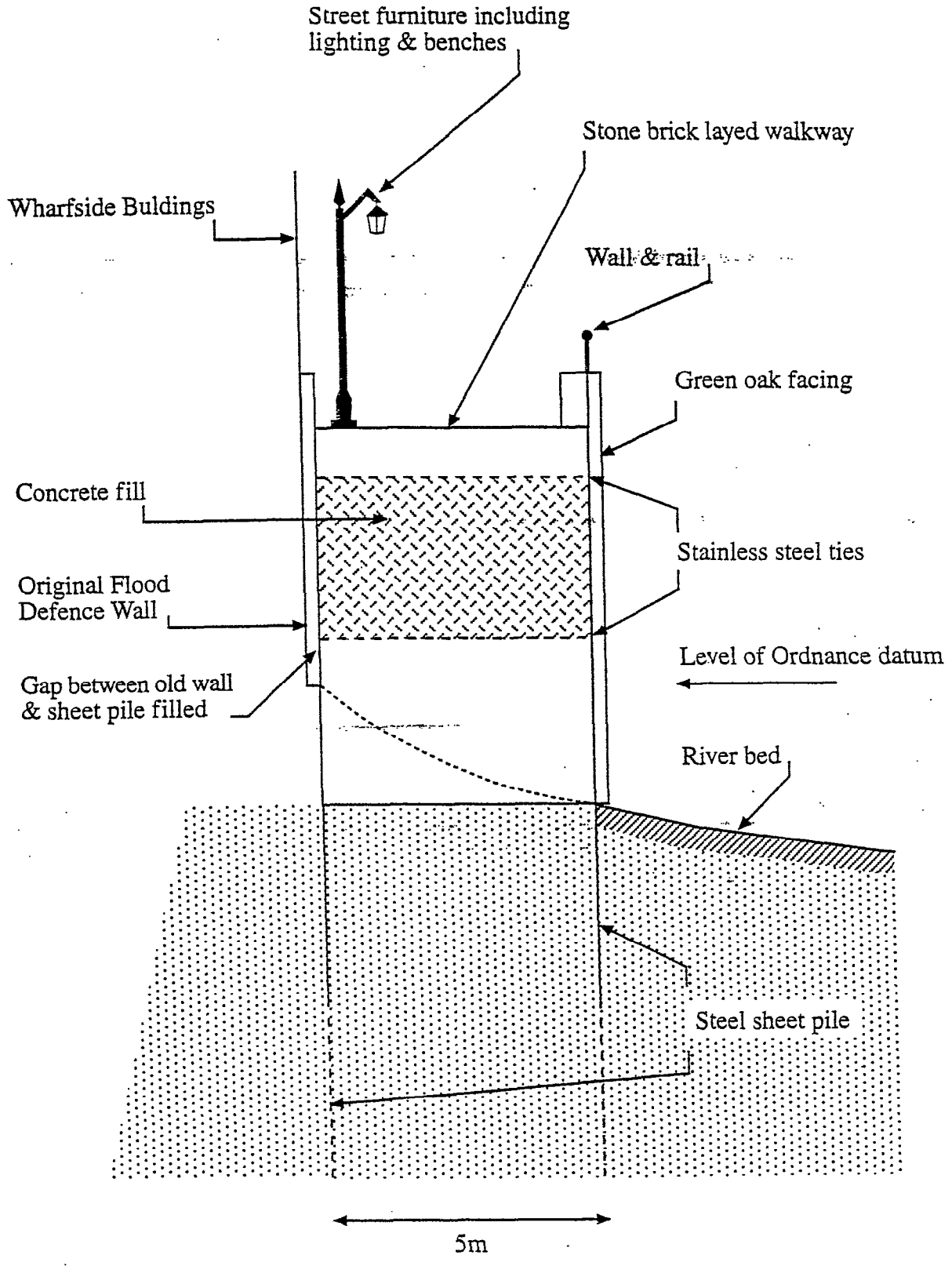
Provision has been included for installation of closed circuit television cameras along the promenade if this is required at a later date.

Plate 17 : 'Whitton Gardens' created as an amenity area on Type 1 flood defences, Gainsborough

Plate 18 : Newly built sea wall, Gainsborough



Map 8: **Location map showing flood defences at Gainsborough (Scale 1:50,000)**



Double sheet pile flood defence on River Trent, Gainsborough

CASE STUDY 9

Project Name:	**Trans-Pennine trail**
Location:	**River Dearne, South Yorkshire**
Agency region & area:	**North east**
Grid Reference:	**SE430025**
Length of study area:	**2km**
Nature of floodbanks	
Material:	**Earth**
Type:	**3 (Riverine)**
Ownership:	**Split between Agency and Doncaster Metropolitan Borough Council**

Key points:

- **riverine flood bank, forming a component of the Trans Pennine Trail**
- **attempts made to induce character of previous railway associations in some areas**
- **recreational uses; walking, cycling, horse riding, with angling and bird watching on adjacent areas of land**
- **route for horseriders has been separated from other recreational use wherever possible to avoid intimidation**
- **recreational provision; surfaced paths, outdoor furniture, waymarker posts**

1. Background

The Trans Pennine Trail (TPT) is a long distance cycle-path / walk-way which, when complete will stretch from Liverpool to Hull. Pressure from previous recreational use of the flood defence (including walking, people exercising dogs and cycling) precipitated a decision to improve and develop access of this principle section of the TPT adjacent to the River Dearne.

The TPT is a multi-user long distance leisure route, running coast to coast. It is intended to form the western end of the European Long Distance Path 'E8' to Istanbul. In general, the TPT follows disused railways, riverside paths and canal tow paths, together with established rights of way.

2. Details of scheme

Comprising a key section of the TPT, the flood defences of the River Dearne near Mexborough consists of both purpose built floodbank and a reinforced disused railway embankment, originally built for both flood defence and rail transport

requirements. The main trail, designed for use by walkers, cyclists and disabled people runs for the majority of the section along the crest of the flood defence structure. A short section (at the extreme east of the trail), the track runs along the off-side of the flood bank before rising up to the disused railway line (where the rail embankment begins to form the flood defence structure). For much of the route, (which follows a disused single-track railway of between 2 and 3 metre width corridor), is tree lined, with views of the river and surrounding countryside provided via localised clearings on either side. Benches are provided to allow views to be fully enjoyed. Railings are provided for public safety where drops from the crest (e.g. over drainage culverts) are considered dangerous. Railings, together with other furniture have been designed to simulate the livery and design of a stereotypical historic rail company. A stile providing access to and from an adjacent footpath has been constructed in a similar manner, with old railway sleepers providing the steps over railings.

Where possible, the TPT provides a route for both horse riders and people with disabilities in addition to walkers and cyclists. Whilst it was originally intended for all users to utilise the same trail, a decision was made to separate horse riders whenever possible to avoid intimidation of other parties. The trail now provides a bridle route for horse riders that largely follows the grassy berm on the inside of the floodbank.

Concerns regarding the safety of riders when passing through grazing tenancies resulted in the termination of annual grazing agreements which were previously in place.

Users are encouraged to follow routes by means of marker posts. By this method, horse riders are directed to use pasture on the near-side berm of the bank at the east end of the trail. This provides access to unofficial gallops adjacent to the disused railway embankment and allows attractive riding without danger to other recreational users. Railings imitating the design of those used throughout Doncaster Race Course have been installed to further encourage riders to follow the designated route.

The disused railway diverges from the river near to the centre of the section and the main trail then follows a purpose built floodbank. Horse riders are brought up onto the crest of the floodbank for a short (*c.* 15m) length before being diverted onto a designated track on the farside of the floodbank. Again simulated race course railings are used to reinforce the desired line of use.

3. Recreational facilities

Provision for recreation consists of benches which have had views opened up through vegetation, a surfaced track, railings, styles and posts indicating routes for riding, cycling or walking. The furniture is in the character of a historic railway and some railings imitate those found at Doncaster Race Course.

A landscape architect within Doncaster Metropolitan Borough Council was responsible for designing features of the trail, in association with a manual which sets common standards for the TPT itself. However, it was decided that recreational

facilities should associate with local characteristics in preference to the standard TPT guidelines.

4. Details of flood defences

The disused railway is the responsibility of Doncaster Metropolitan Borough Council, whilst the Agency has ownership rights over the structure as a flood defence. The purpose built floodbank and all riverside land is solely the property of the Agency.

Doncaster Metropolitan Borough Council have ownership rights of adjacent land. The floodbank is largely clay core construction, although significant quantities of mining waste has also been incorporated.

4.1 Inward face

The inward face of the section of disused railway embankment which comprises the flood defence structure is densely vegetated with a mixture of scrub, bushes and trees. In these sections, some additional reinforcement of the inward face has been undertaken.

The inward face of the purpose built floodbank is grass covered only. Prior to the development of recreational use, this area together with the berm pasture was let for grazing. This provided revenue to the Agency whilst also ensuring that grass, together with the berm pasture, did not grow to excessive levels. Since the grazing tenancy has been allowed to lapse, the Agency now mows the grass twice each season.

4.2 Crest

The crest or top of the floodbank supports the main length of the trail. Along the disused railway embankment, the trail has been surfaced with a dark ash-based mixture to simulate the surface expected from an disused railway and this contributes to the historic impression.

The surface of the main trail in other areas of the section, including the purpose built floodbank and horse route at the base of the outward face, consists of a lighter coloured rock, which has been crushed and rolled. The crest also incorporates a spillway which allows floodwater to escape onto an adjacent flood meadow. Ramps onto and off the spillway allow for use of the track by disabled people.

4.3 Outward face

This is similar to the inward face, and is again covered with dense vegetation near the disused railway embankment and comprises of a grassed revetment on other areas.

4.4 Maintenance requirements

Mowing of the grassed revetments and riverside berm are undertaken twice each

season by the Agency. This is a new requirement, brought about by the cessation of grazing tenancies on land now used by the public. No maintenance of track, railings or furniture has yet been required and it is anticipated that such maintenance will be relatively low. Some management of vegetation along the disused railway embankment is also required on an regular basis.

4.5 Maintenance responsibilities

Doncaster Metropolitan Borough Council are responsible for upkeep of the furniture, track and vegetation management along the disused railway embankment. The Agency is responsible for mowing of grassed revetments, berms and the track along the purpose built floodbank.

5. Recreation issues

5.1 Recreation / flood defence

Problems have been encountered with motorcyclists riding along the crest of the floodbank. This potentially results in damage to the floodbank structure, whilst also causing problems for legitimate users and local residents. The problem has been solved in part by local involvement and informal consultation between local people and motorcyclists, and partly by the installation of access discrimination at each end of the disused railway (e.g. kissing gate). Agency Flood Defence engineers also expressed concern at the potential use of the floodbank crest by horse riders. Since it was anticipated that this would result in excessive rates of erosion and damage to the integral structure of the floodbank. This has been solved by directing horse riders along alternative routes whenever possible.

5.2 Recreation / riparian owner

No riparian ownership issues have arisen as part of the scheme. Local residents have, in general, expressed positive feelings about the scheme. An Agency tenant who had an agreement to graze animals along the section highlighted concerns over the safety of novice horse riders using land occupied by other animals. In addition, problems ensuring that access gates remained shut also compromised the suitability of grazing rights in this area. Eventually, the agreement was terminated at the end of the annual lease and grazing now occurs in adjacent lengths only.

5.3 Recreation/conservation

No conflicts have been reported between nature conservation and recreation. Deneby Inggs Nature Reserve and Site of Special Scientific Interest lies adjacent to the site and appears to remains unaffected. Impacts to the wildlife value of the disused railway appear slight.

6. Funding and management of recreational facilities

The project was a collaboration between Doncaster Metropolitan Borough Council and the Agency. Central Government provided the majority of funding to Doncaster Metropolitan Borough Council in the form of a City Challenge Grant.

Approximately £55,000 was provided in this manner and the Agency has contributed only through loss of income through grazing rights and in the cost of subsequent maintenance (essentially consisting of grass mowing). In combination this represents a financial sot to the Agency of approximately £1,600 per annum.

7. Proposed improvements to the scheme

The scheme as described above constitutes phase I of an considerably larger project to allow the full TPT to be walked.

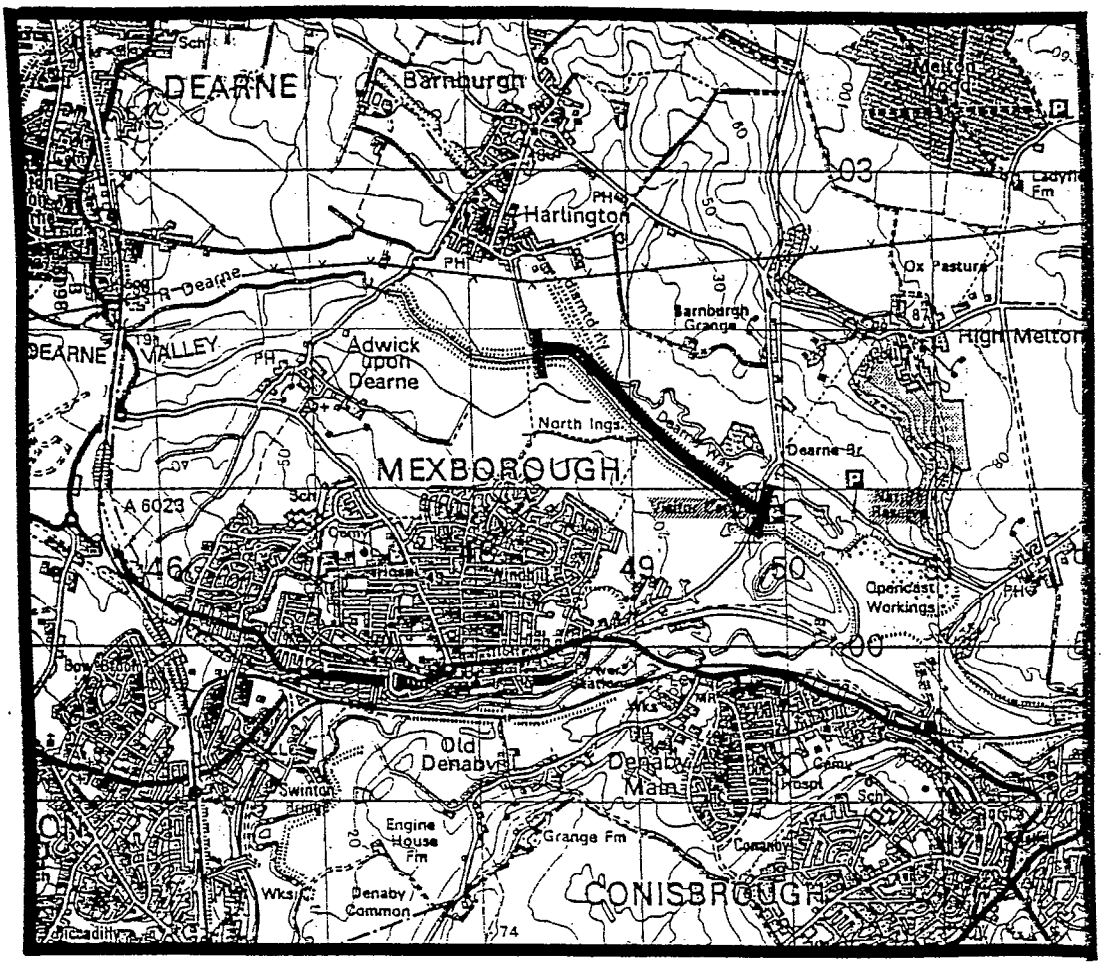
The extension of the scheme to pass through the grounds of the 'Earth Centre', a millennium commission funded attraction focusing on sustainability, has already been proposed. This will require the construction of a bridge over a road, but is anticipated to further extend the TPT within a few years.

Willow kidding worked as a wicker structure into the banks of the River Dearne have been installed at several places along the floodbank. It is hoped these will provide suitable angling points which will help to prevent erosion as fishing increases with improvements to water quantity.

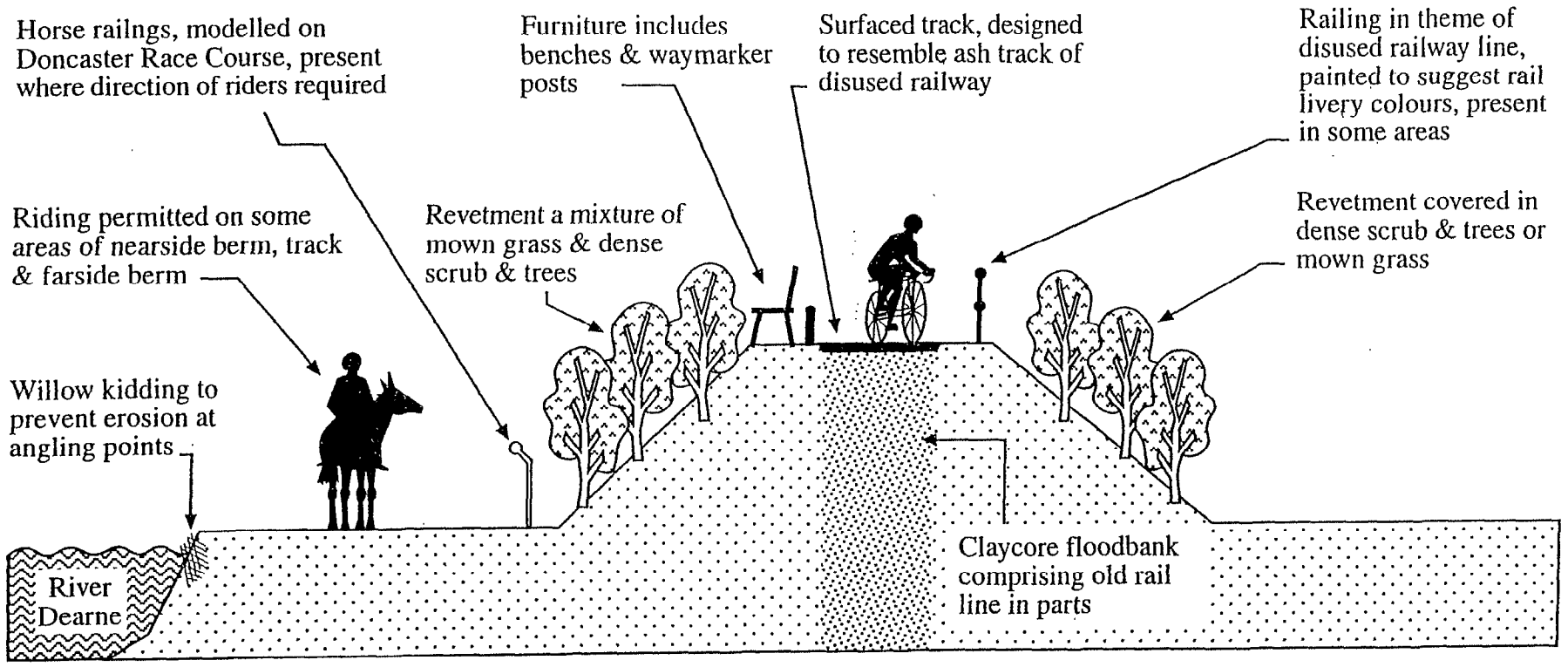
Other improvements to the aesthetic and nature conservation value of the River have and will be made, including the creation of meanders and pools. This indirectly increases the amenity value of the scheme.

Plate 19 : Separate footpaths for cyclists/walkers and riders on the River Dearne flood banks

Plate 20 : Way marking to guide recreational users to correct path on River Dearne flood banks



Map 9: Location map showing the River Dearne flood defences and Trans Pennine trail (scale = 1:50,000)



Cross Section through floodbank at River Dearne section of the Trans-Pennine Trail

CASE STUDY 10

Project name:	**Great Ouse Path**
Location:	**River Ouse flood banks, Kings Lynn**
Agency region & area:	**Anglian**
Grid Reference	**TF 5615 3188**
Length of study area:	**1.4km (750m on flood banks)**
Nature of flood banks:	
Material:	**Earth**
Type:	**Tidal (Type 3)**
Ownership:	**Environment Agency (Flood defence)**

Key points

- **cycle track constructed on flood bank to form part of the National Cycle Network and priority route to work**
- **conversion to official cycle track has allowed legal enforcement of non-authorised use without the need for barriers**
- **funding by the council for maintenance of the footpath was a condition of the land drainage consent**

1. Background

Norfolk offers excellent cycling opportunities, largely as a result of its flat topography and also because of its network of rural lanes. Norfolk County Council is keen to market the county as a cycling centre and has used recreation as a means of attracting tourists from the UK and the rest of Europe. In collaboration with SUSTRANS: Paths for People charity, the council is now developing a number of cycle tracks within the county to form part of Route 1 of the National Cycle Network, which will eventually extend from Inverness to Dover.

In addition to this national initiative, there has been significant pressure on the Council from local people to provide safe routes to school and work. The Great Ouse path provides a link from residential suburbs to the south of Kings Lynn to the town centre, and as such is identified at a strategic level in the Borough Plan as a priority route to work.

2. Details of the scheme

The Great Ouse path runs along the crest of the tidal flood banks which line the River Great Ouse. It follows the line of an existing permissive footpath which extends south of Kings Lynn towards Wisbech. The scheme to upgrade the footpath to a cycle way has been undertaken in two phases.

3. Recreational facilities

The Great Ouse path is a designated cycle track and as such must provide for authorised use by pedestrians and cyclists. The section of path which follows the flood banks is 3m in width and is constructed of black tarmac, underlain by a Type 1 sub-base (a cross section of the path is given in the accompanying figure). It incorporates two sets of double wheelchair access ramps which were designed following specifications from the Disabled Access Group. The ramp has a maximum gradient of 1:20 and a total rise of 3.4m.

4. Tidal defences

The Agency has ownership rights over all the defences in this area of Anglian region. The path is constructed on Type 3 flood banks, which have a wide river-side berm.

4.1 Maintenance requirements

Maintenance of flood defences is managed strategically throughout the region and all flood defences in the Kings Lynn area of Anglian region have recently been upgraded to provide protection against a 100 year flood event. The banks are designed and constructed to reduce the risk of settlement, with intense compaction. The resulting stability of the underlying banks reduces the risk of settlement and cracking of the paths surface.

4.2 Bank crest

In some Agency regions flood defence engineers have encountered problems with the edges of tarmac cycle ways becoming eroded by heavy maintenance vehicles. The flood banks on which the Great Ouse path is located are particularly wide, allowing vehicles to travel along the bank with the wheels on one side on the sealed path and those on the other on the bank.

4.3 Inward and outward faces

The inward and outward faces of the flood bank are grassed, with no underlying reinforcement such as interlocking blocks or geotextile. In the development stages of the Great Ouse path the Borough Council proposed a planting scheme for the bank faces which involved small trees and shrubs. The proposal was turned down by the

Agency on the grounds that it posed a flood defence hazard. However, a second proposal to establish ground plants on the bank faces was accepted. Species such as primroses (*Primula* sp.) and cow-slips (*Primula veris*) have been incorporated into the grass sward and provide an attractive and natural feature.

The maintenance requirements of the upgraded banks consist of mowing and occasional repairs. Mowing is normally undertaken twice during the growing season between April and October, although for conservation purposes this has recently been reduced to one cut, to allow flowering plants within the grass sward to set seed.

4.4 Maintenance responsibilities

The land drainage consent granted to the County Council by the Agency includes a condition that any damage to the path caused by routine maintenance must be paid for by the local authority.

5. Recreational issues

5.1 Recreation / Recreation

Prior to development of the path as a cycle track the council had received a number of complaints of motor cyclists using the footpath. As part of the scheme the right of way was converted from a footpath to an official cycle way under the Cycle Track Act 1984. Formalising the status of the path has allowed the police to legally enforce the ban on motor-cycle use on the track. This was considered to be a more effective means of preventing unauthorised use than barriers which were found to impede access by wheel chairs and push chairs.

On many urban cycle routes cyclists and pedestrians are segregated for safety reasons by a white line along the centre of the path. Norfolk County Council have avoided this approach on the grounds that it represents an unsightly, and decidedly 'urban' feature in an otherwise fairly natural riverside environment, and that in most cases pedestrians use both sides of the white line. As no collisions between pedestrians and cyclists have been reported since the opening of the path this policy has proved to be successful, and may be due to the long sight lines and open nature of the flood banks.

5.2 Recreation / flood defence

The Agency's flood defence had some initial reservations about the development of the footpath., in relation to its effect on the structural integrity of the flood bank, and possible disruption of maintenance activities. Since the opening of the path, no problems have arisen in relation to flood defence requirements.

During the first year after the path was laid some difficulty was encountered in establishing a grass sward next to the path, with the result that loose soil tended to

wash onto the path after rain. Repeated seeding in subsequent years has overcome the problem and no evidence of soil erosion was noted during the site visit.

5.3 Recreation / riparian owners

Agreement with the Agency, who are the principal land owners, was reached at an early stage in the development. However, an objection to the scheme was raised by one riparian owner during the consultation phase of the project. The Crown Commission, who owned an area of land adjacent to the path, asserted that the cycle way would reduce the development potential of that particular area and applied for compensation. The claim was, however, not pursued.

In the original proposal the banks of the Narr Valley drain provided the connection between the pedestrian/cyclist crossing on the main Wisbech Road with the Great Ouse flood banks. The Internal Drainage Board refused permission to route the path along the banks of the drain on the grounds that the proximity of the banks to the edge of the drain and its overall depth may pose a safety hazard. The path now follows a less scenic and more circuitous route through back streets to the main road.

5.4 Recreation / conservation

There are no sites of nature conservation interest on or in close proximity to the flood banks on the route of the Great Ouse path.

6. Funding and management of the Great Ouse path

The statutory duty for funding cycle tracks generally lies with the County Council Transportation Department. However, in this case the Kings Lynn and West Borough Council provided £35,000 of the total £80, 000 cost of the project. The status of the path as a 'route to work' in the Borough plan confers priority status in terms of financial provision at a Borough and County level.

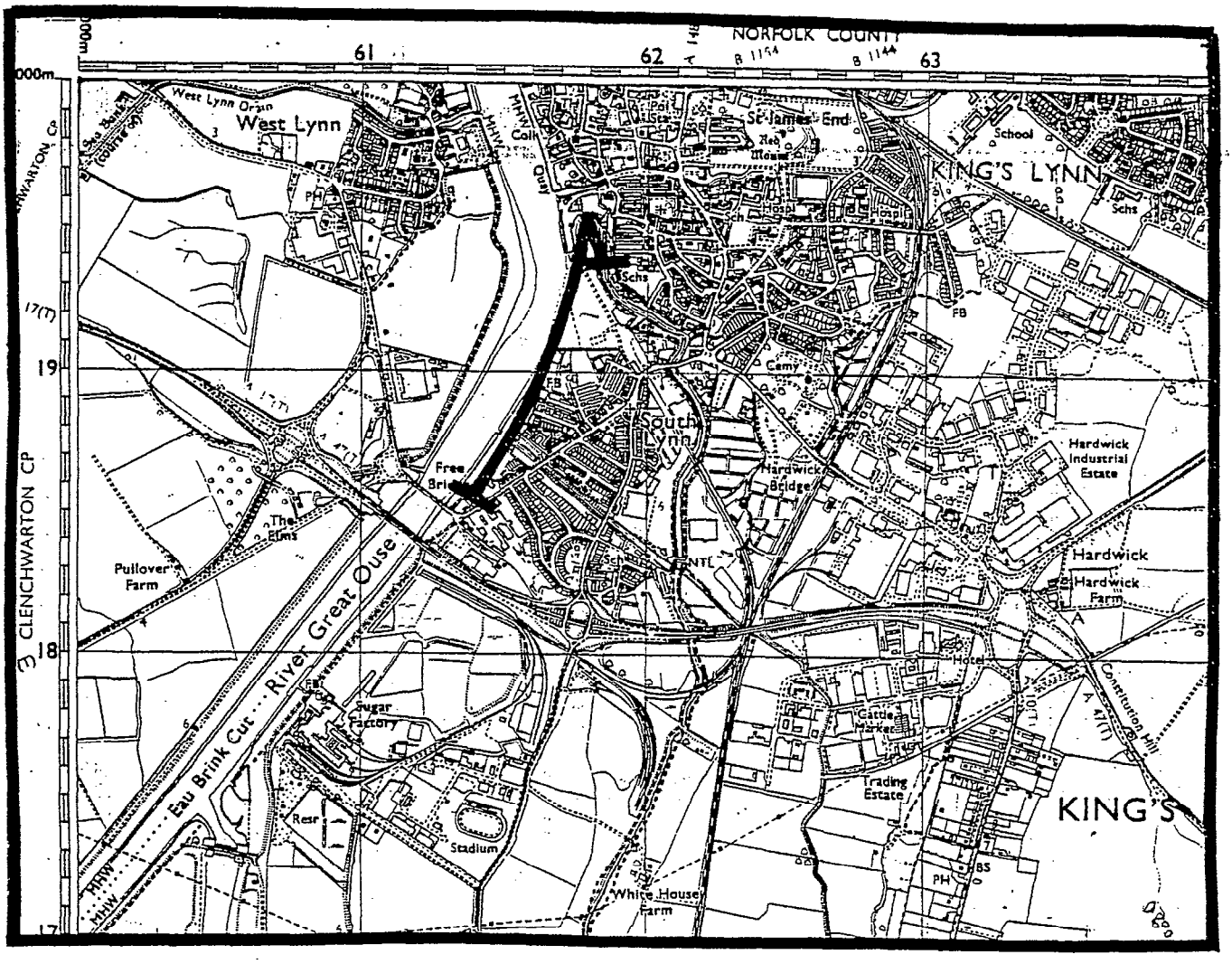
As stated in section 4.4 the County Council have a legal obligation under the terms of the land drainage consent to maintain , or provide funds to maintain the foot path.

7. Proposed improvements to the scheme

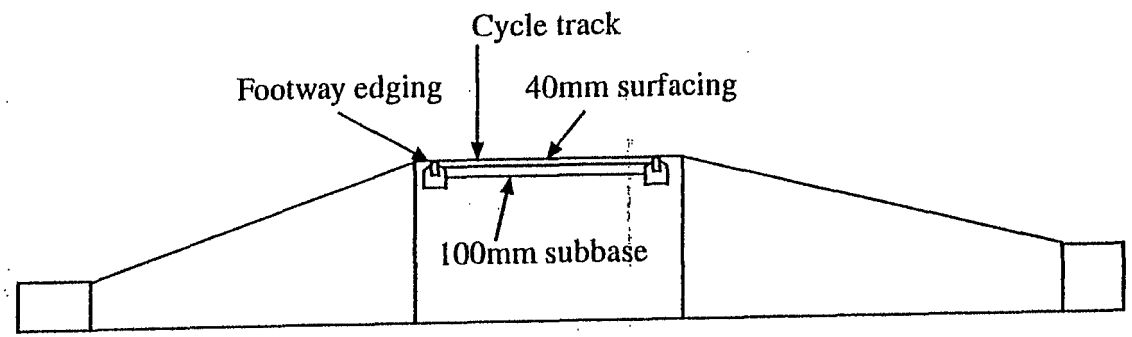
At present the sealed path stops short of the main A47 bridge which crosses the Great Ouse. A future phase of the Great Ouse path, currently under development, will route the cycle way over the 'Free Bridge' and south towards Wisbech on flood banks on the western side of the river.

Plate 21 : Great Ouse path on tidal flood banks adjacent to River Great Ouse. The disabled access ramp is shown on the right of the picture

Plate 22 : View south from Kings Lynn showing end of Great Ouse path and original permissive path



Map 10: Location map showing the Great Ouse path Kings Lynn
(scale = 1:25,000)



Scale: 1:100

Cross section through Great Ouse floodbank showing cycleway

CASE STUDY 11

Project name:	**Welches Dam,**
Location:	**Great Ouse Washes, East Anglia**
Agency region:	**Anglian (Central)**
Grid Reference:	**TL 470859**
Length of study area:	**1km**
Nature of flood banks	
Material:	**Earth**
Type:	**Type 4 (Riverine)**
Ownership:	**Environment Agency (Flood defence)**

Key points:

- **Bird hides located on the crest of the flood bank**
- **Public right of way diverted from the crest of the flood bank to the toe of the outward face to prevent disturbance of birds by walkers, cyclists etc.**
- **Wheelchair access provided to several specially adapted hides**
- **Boardwalks prevent damage to wetland areas at the toe of the inward face**

1. Background

The Ouse Washes was jointly acquired by the RSPB, the Wildfowl and Wetlands Trust and the Cambridgeshire Wildlife Trust in 1964 in a move to protect an increasing colony of black tailed godwits. The reserve area, which totals approximately 3850 acres is divided between the three organisations, with the RSPB owning the largest proportion.

The Ouse Washes reserve is now one of the largest areas of regularly flooded freshwater grazing marsh remaining in Britain. It is an internationally important wintering site for migratory birds, especially Berwick's and Whooper swans, ducks such as wigeon as well as many species of breeding waders (Lambert, 1994). As such the Washes attract large numbers of birdwatchers ranging from casual observers to committed ornithologists. The Ouse Washes is designated as a Special Protection Area (SPA) under Article 7 of the EC Directive on Wild Birds (74/409), and is notified as a SSSI under the Wildlife and Countryside Act 1981.

2. Details of the scheme: recreational use

2.1 Bird watching

Eleven bird hides have been constructed for public use on the flood bank which

separates the Old Bedford counter drain from the Ouse Washes. Two of the hides were purpose built to incorporate disabled access. A visitors centre and car park for the Ouse Washes is located on the flood defences on the north western side of the Counter drain. The visitors centre and hides attract approximately 8000 visitors per year, with the largest proportion of visits recorded in February (Lambert, 1994).

2.2 Wildfowling

Several BASC wildfowling clubs are permitted to shoot in the area. Shooting is only permitted on a set number of days per week, and for a set number of guns. All club members are expected to follow a set Code of Practice.

2.3 Walking

A public footpath extends along the length of the Counter Drain/ Old Bedford bank. For much of its length the path follows the top of the bank, although in the proximity of the hides it has been diverted along the outer edge of the bank. The footpaths in this area are not heavily used, largely because few of them form circular routes.

2.4 Angling

Angling rights on the Old Bedford drain between Welches dam and Purls Bridge (see fig.) are owned by the RSPB and angling is prohibited here throughout the year. Outwith this area the rights to the fishery are owned by the Agency and leased to a total of twelve angling clubs. Angling is largely restricted by the availability of access points and is generally confined to within 1km of main access points. Eel fishing is also practiced under commercial licence on the Old Bedford/Counter Drain and the Hundred Foot River.

2.5 Ice skating

This traditional fen activity occurs largely in the area to the north of the Ouse Washes, when correct weather conditions prevail.

3. Recreational facilities

3.1 Bird hides

The original hides provided on Welches Dam were of a standard design used by the RSPB. Following upgrading works on the flood bank during 1993/94, which involved the removal of the hides some specific adaptations have been made, such as increasing the size of the window slits to provide improved visibility, raising the height of the seats to accommodate children, and insulating the hides.

3.2 Footpaths

The footpath in the Welches dam area has been surfaced with gravel. To the north of the Welches Dam pumping station a series of gates stiles and steps guide walkers away from the top of the flood bank onto a surfaced track at the base of the flood bank. Wooden steps lead from the track up to each of the bird hides. To the south of the pumping station the footpath also follows the base of the flood bank and is stock fenced for some of its length. Purpose-built board walks have been provided to guide walkers through a series of marshy areas. The path has a high quality surface to

allow wheelchair access, and incorporates ramps leading to several of the hides.

4. Details of flood defences

The flood defences are owned and maintained by the Agency throughout the length of the study area.

5. Recreation issues

5.1 Recreation/maintenance

Unofficial access on to the flood banks for 4x4 vehicles has been granted in the past by the Agency to allow wildfowlers to gain access to the washes on which shooting is permitted. The demand for this type of use is greater in the winter months when the banks are more prone to erosion. Some irresponsible use has resulted in the deterioration of the track which runs along the crest of the bank to the point where access for essential maintenance is impaired or prevented.

A number of options are being considered to resolve the problem including: restricting access in winter providing an additional track at the base of the flood bank.

5.2 Recreation / recreation

The Ouse Washes management strategy: Recreation and Access Topic Paper provides a detailed account of the recreational issues associated with the area. A brief summary of the key issues is outlined below.

5.2.1 Bird watching / walking, horse riding

Walkers and horse riders using the official rights of way on top of the flood bank are visible against the sky line ('skylining'). During the winter months this often results in disturbance to wintering birds. Skylining has been avoided in the Welches Dam area by routing the footpath from the crest of the floodbank on to the toe of the landward face. In other areas the crest of the bank is screened with willows, planted at the foot of the flood bank. Throughout the reserve area, where alternative routes exist at the base of the flood bank, walkers using the top of the flood bank are usually intercepted by wardens and politely requested to use the lower paths.

5.2.2 Bird watching / wildfowling

The two adverse effects of wildfowling on bird populations are disturbance and poisoning through the ingestion of lead shot. A number of refuges for birds have been identified on the Washes, where shooting is prohibited, and these areas are regularly found to support higher numbers of birds than surrounding areas during the shooting the season. There is considerable support from both BASC and the RSPB for the development of lead-free shot which will help to reduce bird mortality from lead poisoning.

5.2.3 Bird watching / fishing

Significant disturbance to wintering birds was caused in the past by pike fishing on the Old Bedford river close to Welches Dam. However, disturbance caused by angling has been largely overcome through zoning, as follows:

- The RSPB prohibit angling in the Welches dam area (i.e. the core area of the reserve) at any time of the year (see section 2.4).
- Fishing outwith this core area of the reserve is limited to a period between 16 June and the end of October.

6. Funding and management of recreational facilities

The three organisations which form the partnership that runs the reserve contribute financially to its day to day management. Rent is paid to the Agency estates section for the land on which the hides are built, to compensate for loss of grazing. The amount paid has increased considerably since the reserve was established from £1 per hide to a total of £3000 for the entire reserve.

Plate 23 : Bird hides on River Delph flood banks at Welches Dam, Ouse Washes, Cambridgeshire

Plate 24 : Access control structures and waymarking used to divert walkers from the crest of the floodbank onto the landward toe

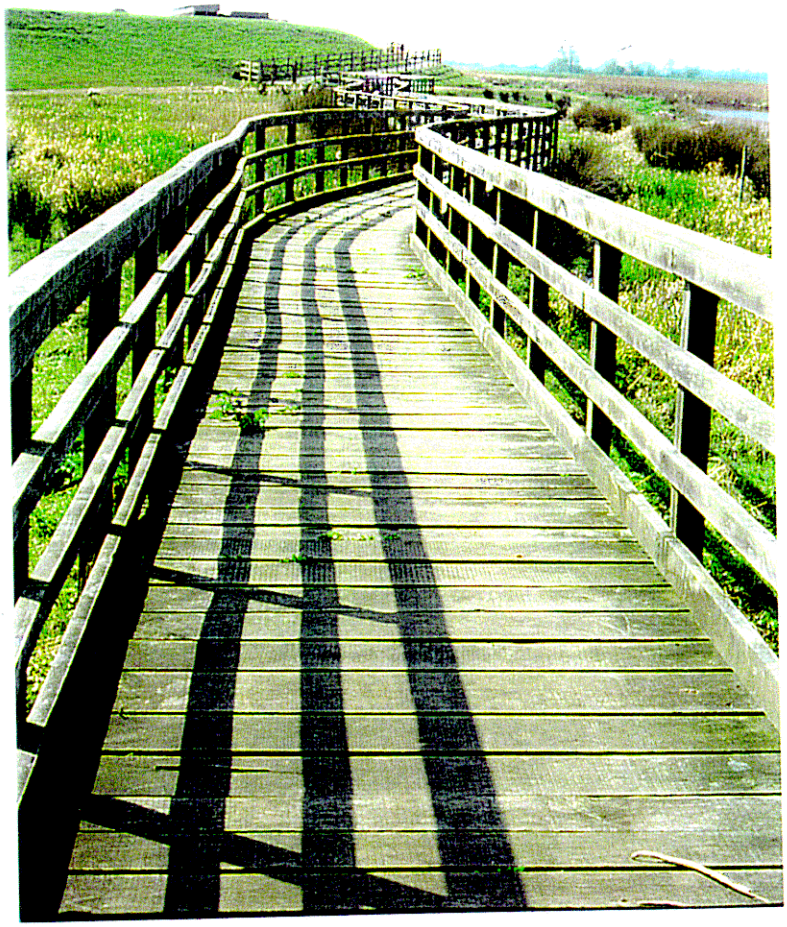
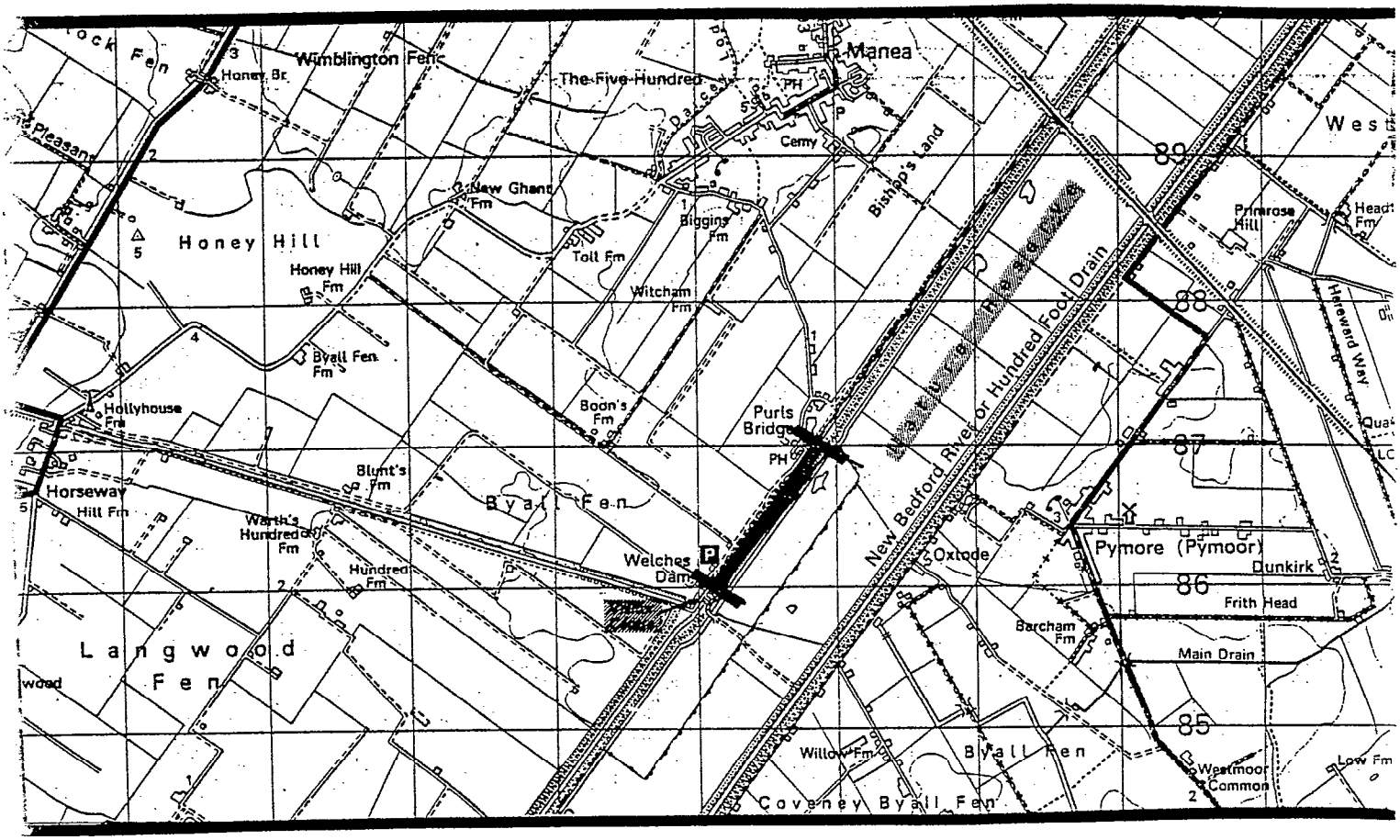
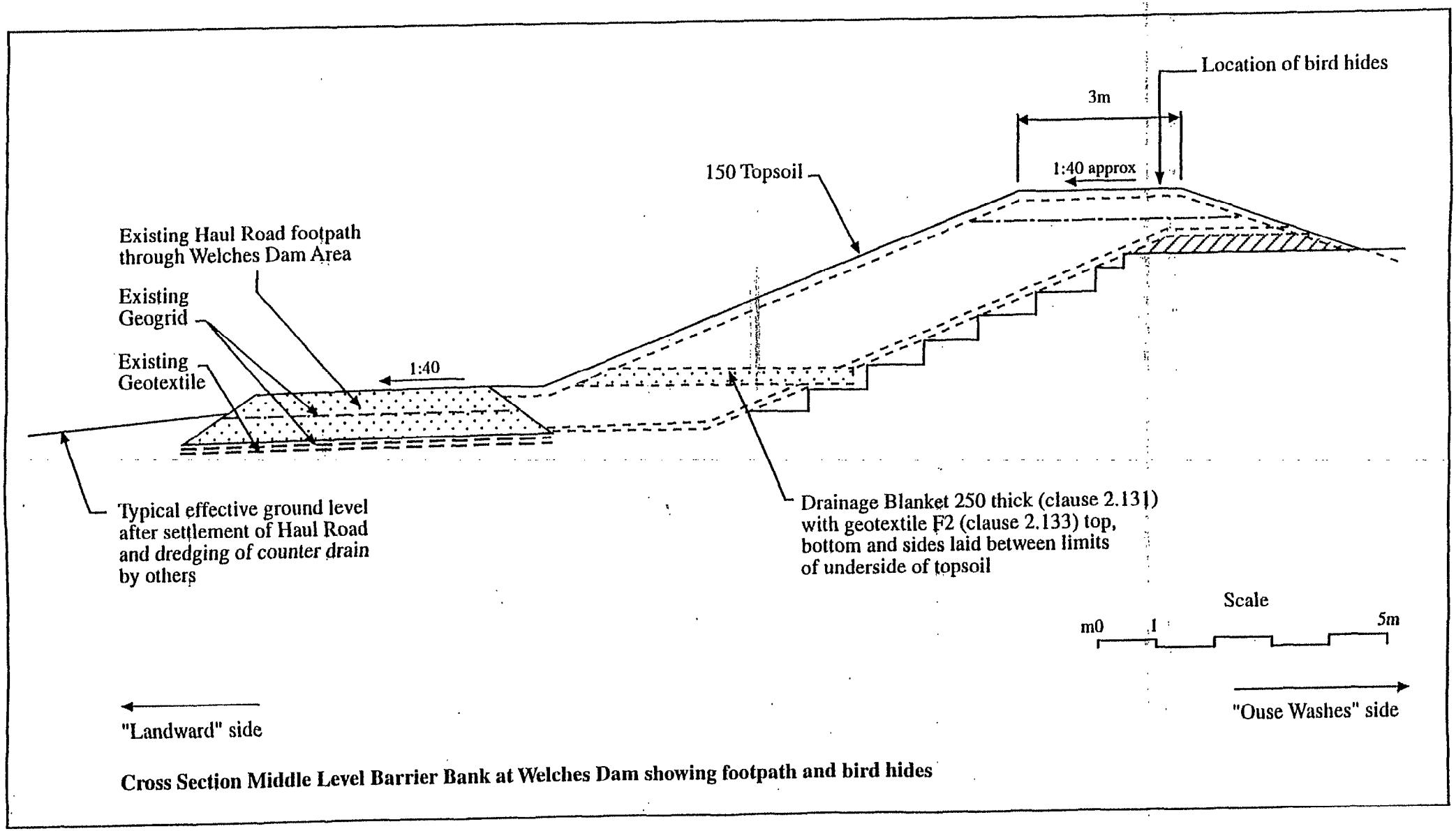


Plate 25 : Wooden board walks at Welches Dam used to prevent trampling of wetland vegetation, and allow wheelchair access



Map 11: Location map showing Ouse Washes, Cambridgeshire (Scale = 1:50,000)



Cross Section Middle Level Barrier Bank at Welches Dam showing footpath and bird hides

CASE STUDY 12

Project Name:	**Wivenhoe Cycle Trail**
Location:	**Wivenhoe, Essex**
Agency region (area):	**Anglian (Kelvdon)**
Grid Reference:	**TM 023239 - 036215**
Length of study area:	**3km (approx.)**
Nature of floodbanks:	
Material:	**Earth**
Type:	**Coastal (Type 1) and (Type 4),**
Ownership:	**Railtrack and private owners**

Key Points

- **cycle track on sea defences**
- **armouring of the bank crest provided stabilisation of the flood bank**
- **Environment Agency assisted in overcoming objections from riparian owners**
- **Project funded jointly by a number of organisations including the Environment Agency**

1. Background

As in other areas of East Anglia Colchester Borough Council is keen to promote cycling as an alternative method of transport to the car for travel to work, and as a means of attracting tourists from the rest of the UK and Europe. The Wivenhoe Cycle Trail was completed in 1996 and forms part of Route 1 of the National Cycle Network which will eventually provide a continuous link between Dover and Inverness. The path also provides a safe and quick route between Colchester and Wivenhoe for local residents.

2. Details of scheme

The cycle trail follows the crest of the sea wall between Colchester and Wivenhoe. It replaces a permissive right of way which had fallen into disrepair. SUSTRANS was commissioned by Essex County Council to survey the path and provide guidance on the construction of a new cycle path. After a prolonged planning and consultation phase (see section 5.2) the path was completed in June 1996. Consultation with a wide range of organisations was undertaken including the Environment Agency (Conservation and Recreation and flood defence), English Nature and the local wildlife trust and a number of recreational user groups.

3. Recreational use and facilities

The path is used by walkers, cyclists and is accessible for disabled people. Recreational facilities provided include:

- A surfaced path . The path is of the standard design recommended by SUSTRANS for a 'rural' route . It is approximately 2m in width, surfaced with limestone dust over a base course of plannings or scalpings, underlain by a layer of geotextile.
- Outdoor furniture, such as picnic table and benches
- Driftwood sulptures designed and constructed by NACRO the National Association for Care and Resettlement of Ex-offenders

4. Sea Defences

The sea defences are privately owned on this stretch of coast

4.4 Maintenance requirements

The sea wall on this stretch of coast is considered low priority in terms of maintenance

5. Recreation Issues

5.1 Recreation / flood defence

No conflicts between the recreational use and flood defence requirements have been encountered

5.2 Recreation / riparian owners

During the consultation process for the development of the footpath the various riparian owners objected on the grounds that their agricultural interests should not be affected by the works. The Environment Agency aided negotiations in this respect and designed a number of drainage culverts.

5.2 Recreation / conservation

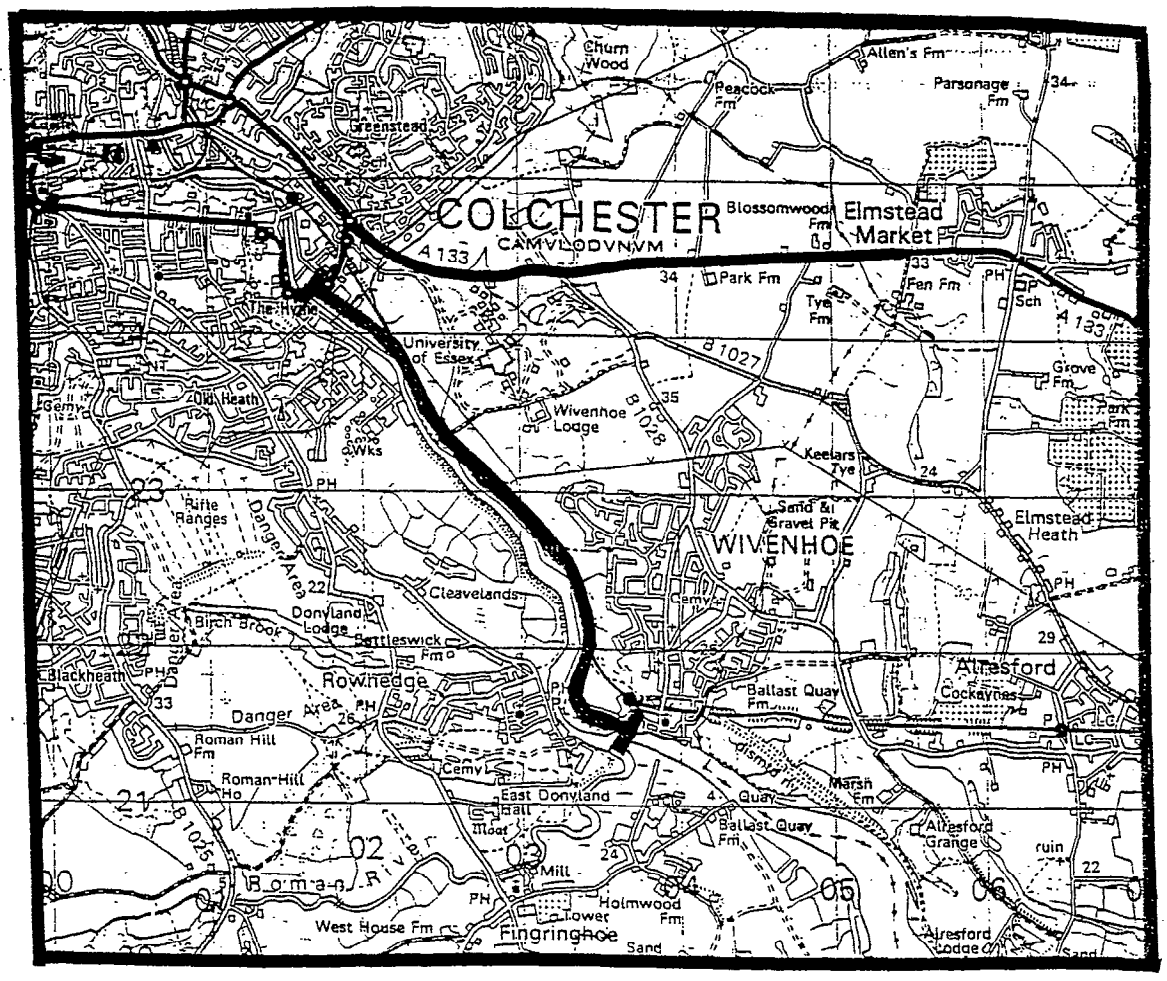
Although the path runs adjacent to an area of nature conservation interest for some of its length there have been no reported conflicts have been reported

6. Funding and management of recreational facilities

The total cost of the scheme was £100,000 which included design and construction. The project was funded jointly by:

- Essex County Council
- Colchester Borough Council (Highway and Engineering Services Division)
- The Environment Agency (flood defence)
- Wivenhoe Town Council
- University of Essex
- The Wivenhoe Society
- Colchester Cycling Campaign

Colchester Borough Council are responsible for maintaining the path. Maintenance costs are anticipated to be low as the path is free draining and will not be used by heavy vehicles. Maintenance requirements will be limited to leveling and pot hole filling.



Map 12: Location map showing the Wivenhoe cycle trail
(Scale = 1:50,000)

Appendix 2

Details of telephone discussions

ENVIRONMENT AGENCY STAFF

Name	Region (Area)	Details
Roger Valentine	Anglian	Contacted re. Possible case studies. Suggested Project Greensail – scheme to re-open access points through sea walls in Anglian region. Still in early stages
Mark Dixon	Anglian (Essex)	Contacted re. Case studies. Anglian region has 500km of coast and only 10 access points. Suggested coastal path at Kanvey Island where provision has been made for active and passive pursuits. Suggested that there is a greater requirement for facilities in urban areas
Roger Hamilton		Suggested that majority of flood bank projects in northern region
Helen Partridge	Southern	Discussion re. Possible case studies. Suggested contacting SUSTRANS
Amanda Elliot	North West	Discussion regarding the Douglas River Walk where interpretation had been provided on the flood bank. Problems with car parking on the Lancashire Way. Sent details for Pilling Lane End – site where conflicts have been encountered between different recreational users e.g. bird watching and dog walking
Don Vickers	Thames	Very few flood banks in Thames region. Some hard defences in Lower Thames: Thamesmead River Cray
Andy Baines	South west (N. Wessex)	Discussion regarding possible case studies: River Parrett trail; River Torn footpath/cycleway; canoe access points at Langport; proposed disabled access at Middlenee on the River Isle;'Pedal the Levels'
Stewart Moody	South West (N. Wessex)	Discussion regarding the River Parrett trail case study
Francis Farr Cox		Discussion regarding the canoe access at Langport. Not considered ideal as case study, as only a proposed project.
Jane Cecil	Southern	Discussion regarding the 'Coast to Countryside' project as potential case study. Currently carrying out a feasibility study for a cycleway on flood bank. Project has been delayed due to late application for lottery

		funding.
Andrew Crawford	Midlands (Upper Trent)	Discussion regarding Tame walkway as possible case study
Gill Mackley	Welsh	Discussion regarding possible case studies. No suitable examples in her area but suggested phoning Dermot Smith in north Wales
Alan Alison	Southern	Discussion regarding the Lymington to Keyhaven sea wall as possible case study
Roy Johnson		Discussion regarding Trans Pennine Way as possible case study.
Valerie Holt	Midlands (Lower Trent)	River Erewash case study
Tim Hall	Midlands Lower Trent	Gainsborough case study
Marianne LeRay	Midlands (Lower Trent)	Discussion regarding Severn Way as possible case study. Also footpath at Severn-Vyrnwy confluence. Plans to create a wetland area at the base of newly restored flood banks would have resulted in the loss of a footpath. The problem was overcome by building a temporary summer access point across the wetland.
Judith Crompton	South West (South Wessex)	Discussion regarding the River Frome moorings and footpath as a potential case study
Jason Chambers	Southern (Kent)	Enquiry regarding potential case study schemes in Kent. Saxon Shore Way was found to be the only example of recreational schemes specifically on flood banks.
Barry Canon	Anglian (Bedford)	Discussion regarding the Carddington canoe slalom as possible case study. Artificial concrete channel cut through flood bank with sluice to control water in the Ouse used by local canoe club. Considered to be good practice as combines flood defence function of sluice with organised recreational activity. However, it was rejected as it did not involve the flood bank.
Tim Barrett	Anglian (Kelvden)	General discussion regarding recreational use of flood banks. • Certain activities such as cycling and riding limited by land drainage by-laws. • Lack of public navigation rights has limited the development of the River Stour for recreation • In eastern region most flood defences are privately owned which often limits

		development for recreation. • Many of the sea defences in the region would be suitable for recreation as they are large concrete structures which would not be liable to damage. In two locations in the region experiments have been carried out using different types of footpath surfacing, incorporating an open asphalt/stone material to allow percolation and prevent flooding
Morris Portsmouth	Midlands (Lower Severn)	Discussion regarding Severn Beach sea defences as a potential case study
Mark Atkinson	Anglian	Discussion regarding Ouse Washes as potential case study

Local authorities

Name	Authority	Comment
Dave Thomas	Bexley Borough of Bexley	Discussion regarding the River Cray flood plain and flood banks which has been converted to an area for passive recreational pursuits.
Paul Tiplady	South Downs Countryside Project (Countryside Commission)	Discussion regarding research into the effects of trampling carried out by English Heritage and Countryside Commission at Stonehenge. So called 'honeypot' areas which are used heavily by visitors suffer serious erosion which is solved by sowing more robust grass species. Further information can be found in *Landscape Design* Oct. 1990 pp 46 - 48

Recreational Organisations

Name	Organisation	Comments
John Grimshaw	SUSTRANS	Putting sealed path on flood bank has two benefits in flood defence terms: i)A sealed surface on the flood bank serves to shed water and prevent flooding ii)'Armouring' the surface of the bank increases the structural integrity of degraded banks and prevents tunneling by flood water.
Barry O'Dell	British Water Ski Federation	Requirements for water skiing: • Slip-way with gradient 1:6 • Ideally changing rooms, although a static caravan is sufficient in some cases. Water skiing is often perceived as a

		'problem' sport and is often excluded automatically from recreation areas. BWSF have found that given appropriate management water skiing can co-exist with other activities. For example, in the National Water Skiing Centre in Scotland shares facilities with a countryside wardens office.
Carel Quaife	British Canoe Union (National Development Officer)	No facilities are required where only a small number of experienced canoeists use a site. Erosion can occur if a large number of canoes are launched from one location. Facilities in the form of spcialised launch points are required in these situation and if disabled participants are to be catered for. Also unobstructed parking and an access route to the launch point
	British Cruising Association	No official guidelines published on requirements for mooring etc.

Appendix 5

List of questionnaire recipients

REGION	FLOOD DEFENCE & WATER RESOURCES MANAGER	FISHERIES, ECOLOGY AND RECREATION MANAGER	ADDRESS
Bristol (Bridgewater)	Richard Horocks	Dr Roger Merry	Rivers House East Quay Bridgewater Somerset TA6 4YS
North East Region: HQ Leeds	David Pelleymounter	Steve Bailey Q returned but not completed 12/3/98. Responsibility delegated to area staff	(David P) Phoenix House Global Avenue Leeds, LS11 8PG (Steve B) Rivers House 21 Park Square South Leeds LS1 2QG
Northumbria area: Newcastle	Peter Kerr	Godfrey Williams	Environment Agency Northumbria Area Office Tyneside House Skinnerburn Road Newcastle Business Park Newcastle Upon Tyne NE4 7AR
Dales area: York	David Rooke	Kevin Blackmore	Environment Agency Coverdale House Aviator Court Amy Johnson Way Cliscon Moor York YO3 4UZ
Anglian Region: HQ Peterborough	Steve Wheatley	John Adams	Kingfisher House Goldhay Way Orton Goldhay Peterborough PE2 5ZR
Northern area: Lincoln	Andy Baxendale	Nick Bromidge (8/3/93)	Waterside House Waterside North Lincoln LN2 5HA
Northern Area Welland and Nene (catchments)		Irven Forbes (Reply received from Chris Randall) 19/2/98	
Central area: Huntingdon	Nigel Woonton	Mike Evans (Reply received from Mike Atkinson) 8/3/98	Bromholme Lane Brampton Huntingdon Cambs PE3 9JE
Eastern area: Ipswich	John Hesp	Charles Beardall	Cobham Road Ipswich IP3 9JE
Thames Region: HQ Reading	Peter Borrows	Roger Sweeting	Kings Meadow House

			Kings Meadow Road Reading RG1 8DQ
West area: Wallingford	John Dora 19/2/98	John Sutton	(John D) Isis House Howberry Park Wallingford OX10 8BD (John S) Lamborne House Address as above
North East area	Graham Cowell	Mark Pilcher	Apollo Court 2 Bishops Square Business Park St Albans's Road West Hatfield Hertfordshire AL10 9EX
Sunbury East area: Sunbury	David Van Beesten	David Webb (based in Guildford)	(David VB) Riverside Works Fordbridge Road Sunbury on Thames TW16 6AP (David W) Lady Mead Bypass Road Guildford Surrey GU1 1BZ
Southern Region: HQ Worthing	Ken Allison	Ian Johnson	Guildburne House Chatsworth Road Worthing West Sussex BN11 1LD
Hampshire area: Winchester	Tim Kermode 27/2/98	Lawrence Talks	Sarum Court Sarum Road Winchester SO22 5DP
East Sussex/West Sussex area: Worthing	Andrew Davies	Jane Cecil 20/2/98	Ridgeworth House 5 Liverpool Gardens Worthing West Sussex
Kent area: East Malling	Alison Garett	John Morgan	Orchard House Endeavour Park London Road Addington West Morling NE19 5SB
South West Region: HQ Exeter	Jim Constantine - 6/3/98	Mike Williams	Manley House Kestral Way Exeter EX2 7LQ
Cornwall area: Bodmin	Gordon Trapmore	Martin Williams	Sir John Moore House Victoria Square Bodmin Cornwall PL31 1EB

Devon area: Exeter		Steve Douglas	Details as HQ Exeter
North Wessex area: Bridgewater	Richard Simons	Dr Roger Merry	As HQ Bridgewater
South Wessex area: Blandford	Ian Hope	Judith Compton (Reply received from Conservation Section 'joint effort' - 5/3/98)	Rivers House Sunrise Business Park Higher Shaftsbury Road Blandford Dorset DT11 8ST
Midlands Region: Upper Severn area: Shrewsbury	Peter May (Reply received from Chris Ing 5/3/98)	John Woolland	Hafren House Welshpool Road Shelton Shrewsbury SY3 8BB
Lower Severn area: Tewkesbury	Paul Bailey	Alan Churchward 18/2/98	Riversmeet House Newtown Industrial Estate Northway Lane Tewkesbury GL20 8JG
Upper Trent area: Lichfield	John Buckingham (Reply received from D. A. Watson - 23/2/98)	Emma Baker	Sentinel House 9 Wellington Crescent Fradley Park Lichfield, Staffs WS13 8RR
Lower Trent area: Nottingham	Dr John Adams (Reply received from David Hoskins - 5/3/98)	Karen Miller (Reply received from Valerie Holt - 5/3/98)	Midlands Region Trentside Offices Scarrington Road Nottingham NG2 5FA
Welsh Region: Northern area: Bangor	Mike Davis	Brian Jones	Welsh Region Ffordd Penran Parc Menai Bangor LL57 4DE
South East area: Cardiff	Ron Clarke	John Gregory	Abacus House St Mellons Business Park St Mellons Cardiff CF3 0LT
South West area: Haverfordwest	Dr Peter Jones	Paul Varallo (Reply received from Mike Jenkins, Glan Tawe, 154 St. Helens Road, Swansea) 25/2/98	Llys Afon Hawthorne Rise Haverfordwest Pembrokeshire SA61 2BQ
North West Region: Central area: Preston	Derek Major (Reply received from W Rushton - 5/3/98 - different address)	Jonathan Shatwell (Reply received from Mark Alterton) 20/2/98	P.O.Box 519 South Preston PR5 8GD
South area: Sale	Phil Young	Bob Lee	Mirwell Carrington Lane Sale M33 5NL