

Erme Estuary Management Plan

Estuaries are special places, containing many important habitats. Historically, however, this importance has been ignored and large areas of estuaries have been irreversibly damaged. Many of the South West's estuaries are a recreational resource for a wide diversity of active watersports and quieter walking and wildlife watching activities, and some are important both for their commercial and recreational fishing activities. Clearly there are many pressures on our estuaries, not all of which are compatible and it is frequently the estuarine environment that suffers as a result. To ensure that these uses can continue to exist in the future without harming the actual resource that they depend on, there needs to be a co-ordinated approach to management. Estuary management is a process that brings together all those concerned with the current and future uses of the estuary to secure common aims and deliver agreed actions.

As part of its Campaign for a Living Coast, English Nature, launched the Estuaries Initiative to raise awareness about estuaries and encourage their active conservation management through non-statutory Estuary Management Plans.

Most of the South West's estuaries now have Estuary Management Plans being actively implemented, including the Salcombe-Kingsbridge, Dart, Yealm and Avon estuaries in the South Hams. The Erme Plan therefore completes the coverage of all estuaries within the District.

The Erme Estuary Management Plan addresses issues that affect the tidal waters of the Erme estuary, from the mouth [taken as an imaginary line between Battsborough Point and Fernycombe Point] to the tidal limit upstream [taken as the weir just below Sequer's Bridge], and along the extreme high water mark. Consideration is given to activities both on the estuary and in the surrounding catchment areas draining to the estuary and along the surrounding coast.

The Estuary Management Plan intends to dovetail with the Local Environment Agency Plan and the South Devon Area of Outstanding Natural Beauty management plan, both of which target the wider geographical area. The Estuary Management Plan production also supports AONB management plan Action notes. A24 & A57; and LEAP Action no. 14b and will actively consider those issues affecting the environment of the Erme estuary in further detail.

The management plan is intended as a working tool - only as current as the day it was printed. By necessity, the working management plan will evolve with the living estuary, developing conservation management practices and improving scientific knowledge.

Most of the Erme estuary is within the private ownership of Flete Estate, and nothing within this management plan should suggest any right of access without prior permission. This management plan and the associated Erme Estuary Management Advisory Group (EEMAG) have been formulated to maintain and enhance the conservation of the estuary in partnership with Flete Estate.

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Executive Summary

Aim of Estuary Management Plan

'To conserve the estuarine environment through encouraging the sustainable use of the estuary by managing human activity in a manner that minimises the environmental impact of those activities and safeguards the estuary's heritage resources and potential to meet the desires of future generations.' (adapted from the World Commission of Environment and Development 1987)

The key principles of this aim are:

- 1) The conservation of the estuarine environment is the responsibility of all those who use it;
- 2) Everything practical must be done to prevent the loss and degradation of the estuary's natural resources.

Objectives of Estuary Management Plan (not in any order of priority)

1. To conserve and enhance the natural environment of the estuary and its surroundings.
2. To accommodate the permitted recreational use of the estuary at a scale that is appropriate and sustainable to the estuary's environment.
3. To safeguard the interests of the local economy and encourage initiatives that contribute to the prosperity of the local community and are compatible with the overall aim.
4. To encourage co-ordinated action by those using the estuary, the various authorities, regulators, the local community, landowners and local interest groups.
5. To involve all those with an interest in the estuary and the surrounding countryside in the conservation management of its environment by their inclusion within the Erme Estuary Management Advisory Group (EEMAG) and its programme of conservation – monitoring, interpretation and enhancement.
6. To increase the community's awareness about the Erme estuary, its ecology and needs and about the Estuary Management Plan itself, its aims and objectives and the responsibilities of the community towards the continued conservation of the Erme estuary ecosystem.
7. To seek to improve the water quality to a level which supports both a healthy estuarine ecosystem and the local community's recreational, aesthetic and commercial needs.
8. To encourage the conservation of native fish, shellfish and bait stocks and to minimise the environmental impact of their exploitation.
9. To minimise the environmental impact of soil runoff and associated problems, and to limit the rate of siltation in the estuary to that of its natural equilibrium.
10. To encourage the preservation of local geological and geomorphological features, and ensure that flood defence or coastal protection projects within the estuary are consistent with the conservation spirit of the management plan.
11. To encourage the sustainable management of the surrounding countryside, - conserving and enhancing native habitats and wildlife, the estuary, and the commercial viability of local agricultural and forestry interests.
12. To encourage the consideration of the management plan and the conservation of the estuary as a priority within planning decisions that may directly or indirectly affect the estuary.

13. To seek to maintain access to and around the estuary at a level that is consistent to the needs of the Flete Estate, local community and the spirit of the Estuary Management Plan.
14. To identify, protect and actively conserve those archaeological and historical features that help to form the special qualities of the Erme estuary.
15. To encourage the highest standards of scientific research and monitoring surveys, with minimal environmental impact, that are of value to the conservation management, understanding of the estuary and/or its ecological processes.
16. To seek to manage the Erme estuary in a way that is sustainable to the estuarine environment and actively involves the local community, recreational users and commercial interests of the estuary.

Abbreviations used in the management plan

	MarLIN	Marine Life Information Network	
	MBA	Marine Biological Association	
ADAS	Agricultural Development and Advisory Service	MCO	Marine Conservation Officer
		MCS	Marine Conservation Society
AONB	Area of Outstanding Natural Beauty	NFU	National Farmers Union
BAP	Bio-diversity Action Plan	PC	Parish Councils
BASC	British Association for Shooting and Conservation	RDS	Rural Development Service
BMIF	British Marine Industries Federation	RIGS	Regionally Important Geological Sites
BTCV	British Trust of Conservation Volunteers	RSPB	Royal Society for the Protection of Birds
BTO	British Trust for Ornithology	RYA	Royal Yachting Association
CA	Countryside Agency	SHDC	South Hams District Council
CCS	Coast and Countryside Service	SHDC	South Hams District Council
CLA	Country Landowners Association	SWCP	South West Coastal Path
CSS	Countryside Stewardship Scheme	SWMAG	South West Marine Archaeology Group
DCCA	Devon County Archaeology Service	SWW	South West Water
DBRC	Devon Biodiversity Records Centre	TBI	to be investigated
DCC	Devon County Council	TIC	Tourist Information Centre
DEFRA	Department for the Environment, Food and Rural Affairs.	UoP	University of Plymouth
DSFC	Devon Sea Fisheries Committee	WeBS	Wetland Birds Survey
DWT	Devon Wildlife Trust	WGS	Woodland Grant Scheme
		Priority	
EEMAG	Erme Estuary Management Advisory Group	H	High – Action required as soon as possible, within the first two years of the present management plan period.
EA	Environment Agency	M	Medium – Action required as soon as possible, within the present management plan period.
EN	English Nature	L	Low – Action that be attended if the opportunity occurs within the present management plan period.
EU	European Union	O	Ongoing – A high/medium priority that requires long-term attention for the present management plan period.
FC	Forestry Commission		
Flete	Flete Estate		
FWAG	Farming and Wildlife Advisory Group		
LEAP	Local Environment Agency Plan		
LO	Landowners		

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Introduction and background

The Erme estuary contains a diverse natural environment and distinctive landscape, built and cultural heritage, which is highly valued by those who live, work and visit the area. The Erme estuary is a complex, dynamic environment that needs to be viewed holistically. Flete Estate is, unusually, a single organisation that is in a position to co-ordinate estuary-based activities and be responsible for the overall care and management of the estuary and its surrounding area.

Links with other plans

The Erme Estuary Management Plan is a non-statutory document and there are no legal powers to ensure that all the recommendations of the Plan are implemented or adhered to. However, a number of the recommendations relate to the statutory duties of organisations involved in the Plan's development. The Plan should act as a mechanism for informing and co-ordinating these duties, encouraging a holistic approach to the management of the estuary-based activities and resources.

There are several other plans relevant to the study area - all apply the principles of sustainable development and use in their particular areas of interest. The Erme Estuary Management Plan has regard to, and informs, the following plans and initiatives;

Devon Structure Plan (statutory) – strategic development plan produced by Devon County Council, Plymouth City Council, Torbay Council and the Dartmoor National Park Authority. The plan recognises the importance of the landscape and its character (policy C2), Areas of Outstanding Natural Beauty (policy C4) and the undeveloped coast (policy C7.) Each of these policies is seen to be fundamental to the future of the estuary.

South Hams Local Plan (statutory) - local development plan produced by South Hams District landscape for the area of the South Hams, excluding Dartmoor National Park, which regulates the use and development of land. The current Local Plan supports the development of a management plan for the Erme estuary. It is felt that Local Plan policies are closely related to the Estuary Management Plan, particularly in relation to policies for the landscape, transport, access, heritage and nature conservation. The first Local Plan Review is currently under way.

The South Devon AONB Plan (statutory) was produced by a Joint Advisory Committee comprising of representatives from local authorities, government agencies, amenity and land user interests, in consultation with the local community between 1995-97. It aims to put the right measures in place to secure the protection, care and conservation of this nationally important landscape. The Plan recommended the preparation and implementation of Estuary Management Plans that integrate management proposals on the water and surrounding land. The Plan's Action Programme 1997-2002 is under review at the time of writing. The Countryside & Rights of Way Act 2000 has strengthened the status of AONB Plans so that it is now a statutory duty on all local authorities and upon public bodies, to produce and adopt such plans and their recommendations.

Avon and Erme Local Environment Agency Plan (non-statutory) - assists the Environment Agency in achieving its objectives for the whole of the River Erme (and the River Avon, Salcombe-Kingsbridge Estuary and Slapton Ley) catchment area. It includes policies and actions that relate to the estuary, including a commitment to support an Erme Estuary Management Plan. Particularly relevant policy areas include the impact of effluent discharges and of farming on rivers and wetlands; biodiversity planning; seeking information on the historic value of the catchment; reducing the potential impact of antifouling from boats; and protecting landscape quality. The Local Environment Agency Plan (LEAP) is reviewed on an annual basis. The Estuary Management Plan includes policies and actions from the LEAP where proposed management actions coincide.

Avon, Dart and Erme CAMS (non-statutory) - Catchment Abstraction Management Strategies will describe a

plan for achieving sustainable management of water resources within a catchment. The CAMS document for the River Erme (as part of the Avon, Dart and Erme CAMS) will be published by the Environment Agency in March 2006 and will be reviewed and republished every 6 years. The management of water resources will be based on balancing the needs of the water abstractors, fisheries, recreation and navigation as well as the need to protect water quality. The development of the strategy will be guided by consultation with the local community and interested parties and will be predominantly concerned with the freshwater reaches of the river system. The CAMS document will describe both the strategy and detail technical information on the allocation of water resources within the catchment. There are no licences to abstract water within the estuary itself.

Lyme Bay and South Devon Shoreline Management Plan (non-statutory) - defines a strategy for future sustainable coastal defence of the Lyme Bay sediment cell which includes the adjacent coastline and mouth of the Avon estuary. Work proposed as part of the ongoing shoreline management review process will help to inform management decisions about flood defence and coast protection for the Erme estuary. Likewise, any data from local research for the Erme Estuary Management Plan, such as monitoring for sea level change, will be shared with the Lyme Bay and South Devon Coastline Group.

Devon Biodiversity Action Plan (non-statutory) – an audit of Devon’s biological and geological diversity that represents Devon’s response to the UK Biodiversity Action Plan. Prepared by the Devon Biodiversity Partnership, it comprises an audit of Devon’s wildlife and earth heritage and a series of individual action plans for key habitats, geological features and species, including one for estuaries.

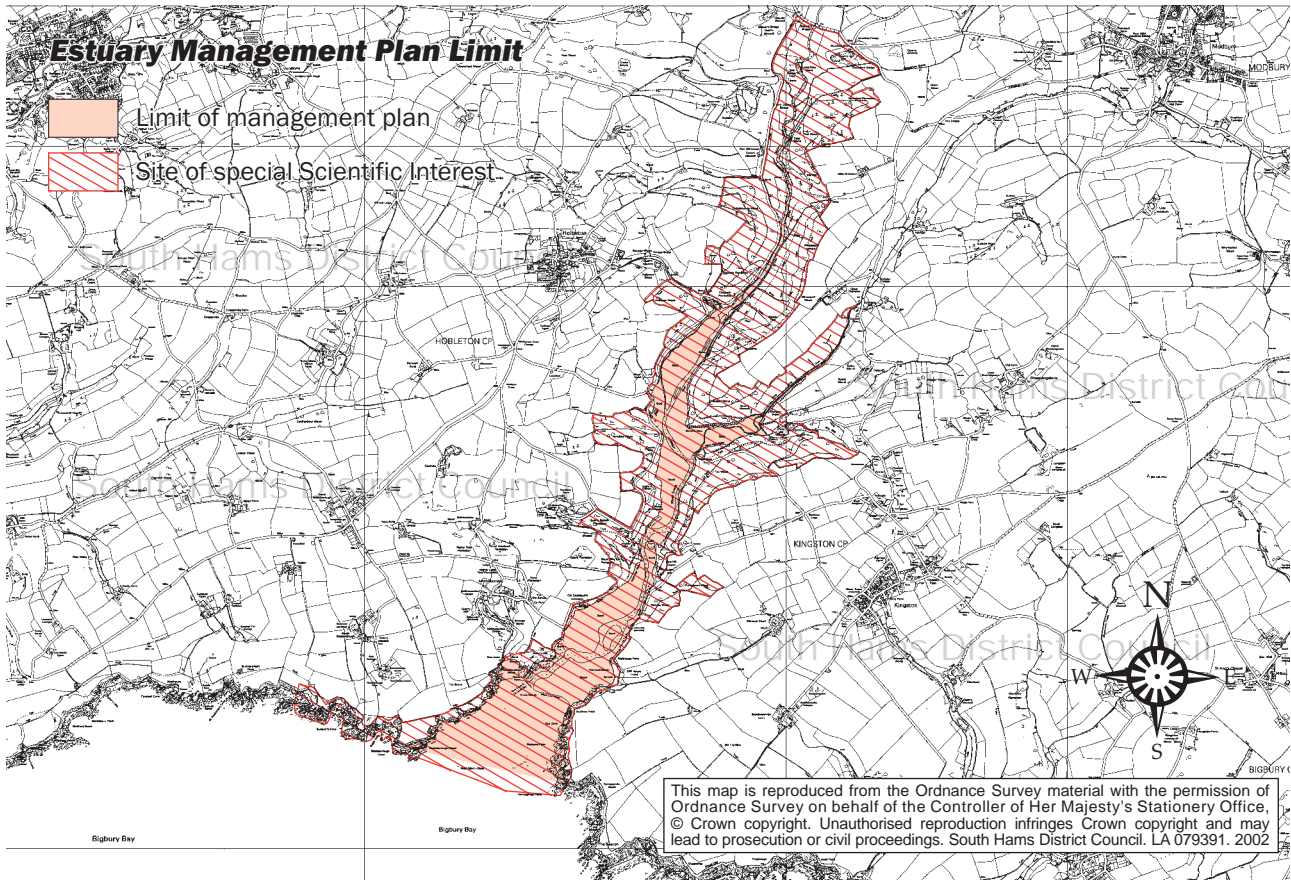
Other Plans - due regard is also given to a number of other initiatives which local authorities are involved in. “Devon on the move,” the County Council’s current Local Transport Plan, was submitted in July 2001. This provides a bidding framework to central government to meet the County’s travel needs for the next five years; Devon County Council has prepared a Coastal Oil Pollution [Response] Plan. The Devon County Council Economic Development Plan and work of the Regional Development Agency will continue to provide a background to the Estuary Management Plan.

The Erme Estuary Management Plan does not attempt to override existing statutory and non-statutory responsibilities but will compliment them and, through co-ordinated management, use existing powers and influences to secure the sustainable use of the estuary’s resources. Erme Estuary Management Advisory Group (EEMAG) provides a vehicle for co-operation, change where it is needed, and the motivation to realise appropriate solutions to existing and future problems and opportunities.

The Erme Estuary Management Plan has been produced as a proposed action by both the Area of Outstanding Natural Beauty management plan and the Local Environment Agency Plan, and encouraged by English Nature’s Estuaries Initiative. The production of the plan has been co-ordinated by South Hams District Council’s Marine Conservation Officer, with much voluntary help from Gillian Grieves, a post graduate student from the University of Plymouth. The funding for the MCO post during this time has been from SHDC, Salcombe Harbour Authority, MAFF and European 5B funding. The MCO during this time reported to a steering group consisting of the SHDC - Maritime Officer, SHDC - Coast & Countryside Service Manager, English Nature - Devon Maritime Conservation Officer and Environment Agency - LEAP Team Leader.

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Overview of the estuary



Location	
Position	SX 62 48 50° 18' N 03° 57' W
Administration area	Devon South Hams
Conservation agency/area	English Nature Devon
Physical features	
Physiographic type	Ria (drowned river valley)
Length of coast	16 km
Area of inlet	Total 100 ha; intertidal 60 ha
Area of catchment	34 125 ha
Length of inlet	6 km
Length of river within catchment	67.1 km
Bathymetry	Very shallow; maximum depth not recorded
Average annual rainfall	965 mm
Wave exposure range	Exposed to extremely sheltered
Tidal stream range	7-8 knots (off Pamflete Beach)
Mean tidal range	4.7 m (spring); 2.2 m (neap)
Salinity range	Fully marine to upper estuarine
Approximate population	901 (Parish Council census figures of 1991)

The River Erme lies on the south coast of Devon and runs through a narrow wooded valley from a weir south of Sequer's Bridge to the sea where it empties into Bigbury Bay. It is very secluded and almost completely unspoilt. The inlet has been substantially infilled by silt and at low water the river channel is very shallow and broad. The sediments remain sandy for some distance away from the entrance where there are areas of exposed bedrock. The shores of the estuary are often steep and rugged. Saltmarsh is present in the upper reaches, grading into woodland and wet meadows. Freshwater input is low. Atlantic salmon *Salmo salar* and sea trout *Salmo trutta* migrate to the inlet to spawn upriver.

The entire inlet is a Site of Special Scientific Interest. It also lies within the South Devon Area of Outstanding Natural Beauty, the South Devon Heritage Coast and is a Coastal Preservation Area (defined by Devon County Council). Small numbers of waterfowl feed and roost within the inlet, which is also frequented by otters *Lutra lutra*. Rare and notable flora and coastal invertebrate fauna are also present.

Marine Biology

There is a paucity of data on the marine biology of this estuary within which the substratum is essentially all sediment.

At Wonwell Beach an extensive beach consists of clean, mobile, rippled and waved sand. The infauna is impoverished although dense patches of the spionid worm *Scolelepis squamata* and a few lugworms *Arenicola marina* are present. Upstream at Wonwell Beach the infauna are typical of mobile sediments including the amphipod *Bathyporeia pilosa* and isopod *Eurydice pulchra*. The lower shore banks and the river channel bed consist of shingle and cobbles on sand. The salinity is very reduced and communities are poor. The algae *Fucus ceranoides*, *Porphyra* sp., *Enteromorpha* sp. and other green algae are present on the shingle and cobbles. Exposed bedrock is present on the upper-middle and upper shore with sand-scoured furoid algae communities.

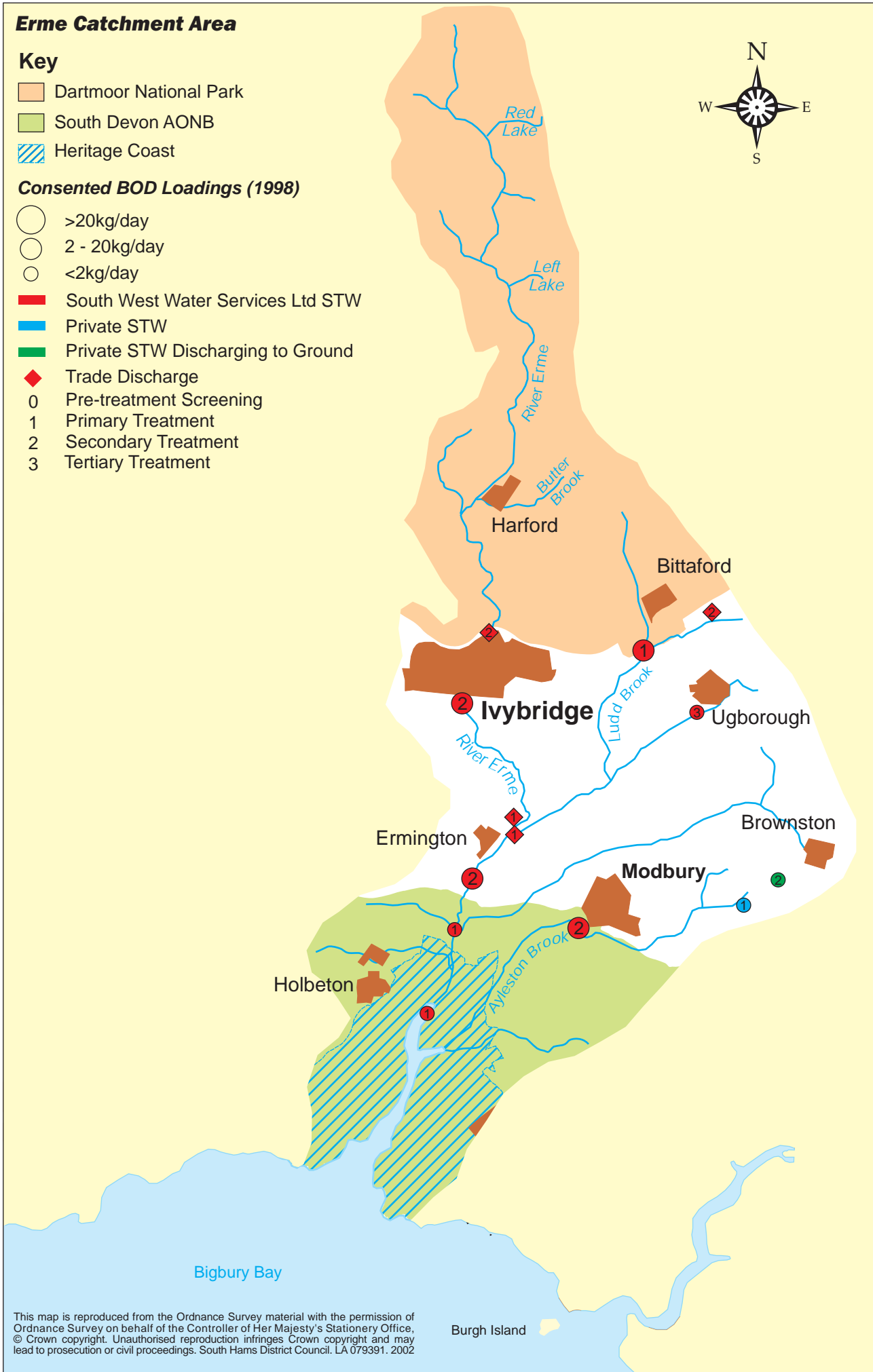
Opposite Tor Wood the lower-middle shore is of fine sand with some mud. Ragworm *Hediste diversicolor* are abundant and oligochaetes are also present in large numbers.

Human influences

The entire estuary and mouth out to an imaginary line between Battisborough Point and Fernycombe Point and most of the adjacent land is believed to be owned by the Flete Estate, which has maintained its essentially natural character. Some sand extraction takes place upstream of Mothecombe.

There was a fish farm on the inlet.

Leisure activities are limited. Sailing, power boating, diving (sports and marine archaeology - permission and licence required from DCMS when diving within 250 metres of designated wreck sites) and windsurfing occur in the lower reaches as far upstream as Wonwell. Walking is restricted to the four public footpaths around the estuary, the Heritage Coast Path, and those running from Ermington to Sequer's Bridge on the west of the river, from Sequer's Bridge to Fawns to the east of the river, and from Kingston to Wrinkle Wood on the east of the estuary. Riding is permitted along two bridleways, running from Holbeton to Efford House and from Hole Farm to Hollowcombe Cross, both on the west of the estuary. Beach recreation also takes place in the area.



Management Framework



Objective

To involve all those with an interest in the estuary and the countryside in the conservation of its environment by their inclusion EEMAG and its programme of conservation - monitoring, interpretation and enhancement.

The Estuary Management Plan process provides a basis for investigating the existing status of the estuary's environment and developing a framework for longer term planning. It is anticipated that most estuaries will be under increasing pressure from recreational and commercial use which, if not carefully managed, could over-spill into the Erme estuary and lead to the degradation of the natural resources upon which many people rely. It could also lead to increasing conflict between different user groups and unsafe practices due to competition for space, and potential disagreement over the appropriate use of certain areas. There is a need, therefore, to establish and promote sustainable use and set guidelines for users to avoid conflict, protect the most valued aspects of the estuary and to conserve the estuary for its own right.

The conservation management of the Erme estuary depends upon the co-operative workings of the Flete Estate and a wide range of agencies, organisations and individuals. Some, through Flete Estate, seek to preserve particular interests and concerns, others have statutory obligations. The Estuary Management Plan endeavours to co-ordinate the workings of all interested parties towards the common goal, that of the conservation of the estuary through its active management and sustainable use.

It is important that all relevant parties are given a chance to air their particular concerns, ensuring a collective discussion of the proposed actions for

implementation. The evolving management plan and setting up of the EEMAG is very much part of this process, encouraging local active management of the plan whilst bringing in expertise from the wider community. EEMAG should include representatives of the local estuarine community, and landowners and farmers from the wider water catchment area.

EEMAG should be a body where common policies and action points might be agreed. Action Points may then be co-ordinated, ensuring duplication of effort and waste of resources is avoided. The management plan itself will endeavour to dovetail with the current Local Environment Agency Plan and the Area of Outstanding Natural Beauty Management Plan.

Issues and concerns;

- plan must be practical and prescriptive
- encouraging local community and schools involvement in the management plan where possible?

Codes-of-conduct - this plan makes several references to codes-of-conduct, both existing and suggested. Any new code-of-conduct is unlikely to have any backing in law but is likely to be mainly educational, interpreting the consequences of going against the advised code and the suggested code itself. Any such suggested code is likely to be prepared in full consultation with EEMAG and will be pragmatic.

No.	Action	Implementation	Responsibility	Priority
E1	The role of EEMAG to be encouraged and supported.	Relevant interested parties to be encouraged to elect representative(s) and be invited to join. Define terms of reference and relationship with Flete Estate and members of EEMAG.	Flete, EEMAG	H
E2	Aims and objectives to form the basis for the management of the estuary.	Draft of aims and objectives to be discussed and adapted.	EEMAG	H
E3	Ensure EMP dovetails with LEAP, AONB & Local Plan.	Ensure that drafts are consistent with the objectives of these other management plans. Encourage LEAP, AONB and Local Plan to evolve, taking on EMP objectives where appropriate.	EA, CCS, SHDC	H
E4	Ensure that the spirit of the estuary management plan is adopted throughout the water catchment area.	Ensure that conservation implications of EMP are adopted by those advising and managing the countryside within the water catchment area.	EN, EA, DWT, CCS, RDS, ADAS, FWAG, NFU, RSPB	H

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Objective

To conserve and enhance the natural environment of the estuary and its surroundings.

Nature Conservation

The Erme estuary is a typical ria (flooded river valley), formed through rising sea levels after the last ice age. It has been suggested, that due to limited road access, the Erme estuary and surrounding landscape has remained relatively unchanged for decades. The entire inlet is a Site of Special Scientific Interest. Small numbers of waterfowl feed and roost within the inlet, which is also frequented by otters. Rare and notable flora and coastal invertebrate fauna are also present (see BAP species list, Appendix E). The estuary supports some very rich and extensive saltmarsh habitats and is particularly well wooded for Devon, especially alongside the water's edge. The least well known habitats are probably those within the estuary itself but they are believed to be typical of the region, with extremely highly productive communities tending to be dominated by very large populations of very few species. These 'low diversity, high biomass' habitats are a characteristic feature of estuaries, particularly at the macroscopic (visible to the naked eye) level. Apart from ornithological and foraminiferan surveys, there have been few biological surveys of the estuary and it is part of the management plan to survey the estuary more fully

The marine habitats outside the estuary are less well known but are of huge environmental importance and are designated as a Sensitive Marine Area, by English Nature. While this management plan aims to discourage any adverse impact on the estuary from upstream or the coast, the plan must take a holistic approach to ensure that no proposed action itself can lead to any adverse impact outside the estuary. Countryside managers and management advisors should be encouraged to consider the impact of their advice on the estuarine environment downstream.

The Erme River valley, although not directly a part of this management plan, is well known for its terrestrial and riparian habitats and supported wildlife.

The natural habitat for most of the estuary catchment area is broadleaf woodland and is consequently the 'preferred' habitat to support the richest majority of native British wildlife. The Erme river corridor supports a relatively rich mosaic of semi-natural

broadleaf woodland for Devon, thus supporting an equally rich diversity of wildlife. Devon as a whole is very poorly wooded and it is imperative to conserve and enhance the existing woodland, as a reservoir of species that, through the sensitive management of local wildlife corridors, may be encouraged to seed poorer habitats. The various conservation bodies and organisations presently operating within the water catchment area should continue to ensure that a diverse mosaic of habitats is encouraged - so that no one species, phyla or habitat is prioritised at the expense of others.

Modern day conservation is highly political and there has been some need to prioritise conservation efforts. Biodiversity Plans, or BAPs, go some way towards this by identifying key habitats and species, and producing individual conservation action plans for them - HAPs [habitat action plans] and SAPs [species action plans]. Many of the SAP species were chosen as useful indicators of the 'health' of specific habitats. BAPs have been prepared at national, regional and county levels. Many of the active conservation organisations within Devon have advisors encouraging sustainable land management for their specific, or locally relevant, BAP species - through government funded grant schemes, such as the Countryside Stewardship Scheme. Landowners and farmers are invited to sign up to the Countryside Stewardship Scheme for a ten year agreement period. There is a need to identify those BAP species and habitats relevant to the Erme estuary and dovetail the Management Plan to them. There is also a need for a holistic approach, ensuring that the BAPs, or interactions between them, have no adverse impact on the estuary, for example, ensuring that all such schemes discourage soil runoff as a high priority.

The three main conservation aims of the management plan are;

1. the conservation of the saltmarshes and grazing marshes;
2. the continued monitoring and conservation of local fauna and flora - the monitoring of local 'indicator' species populations will also act as a 'health

check' for local habitat and species populations. – (N.B. there has been some local concern about perceived dropping bird populations and we must be careful to retain scientific credibility with our proposed actions, ensuring a high confidence of cause and effect.)

- the conservation and enhancement of local habitats, in particular Orcheton Mill reedbeds and Saltercrease sand/shingle upper littoral fringe community (also known as Saltcrease) - 'particularly rich in insects and strandline flora such as sea couch, marram-grass, sea radish, sea rocket etc., and part of the mosaic of habitats on the Erme, adding a variety little represented on the estuary' - (Waterhouse, 2001 pers comm).

Concerns and issues;

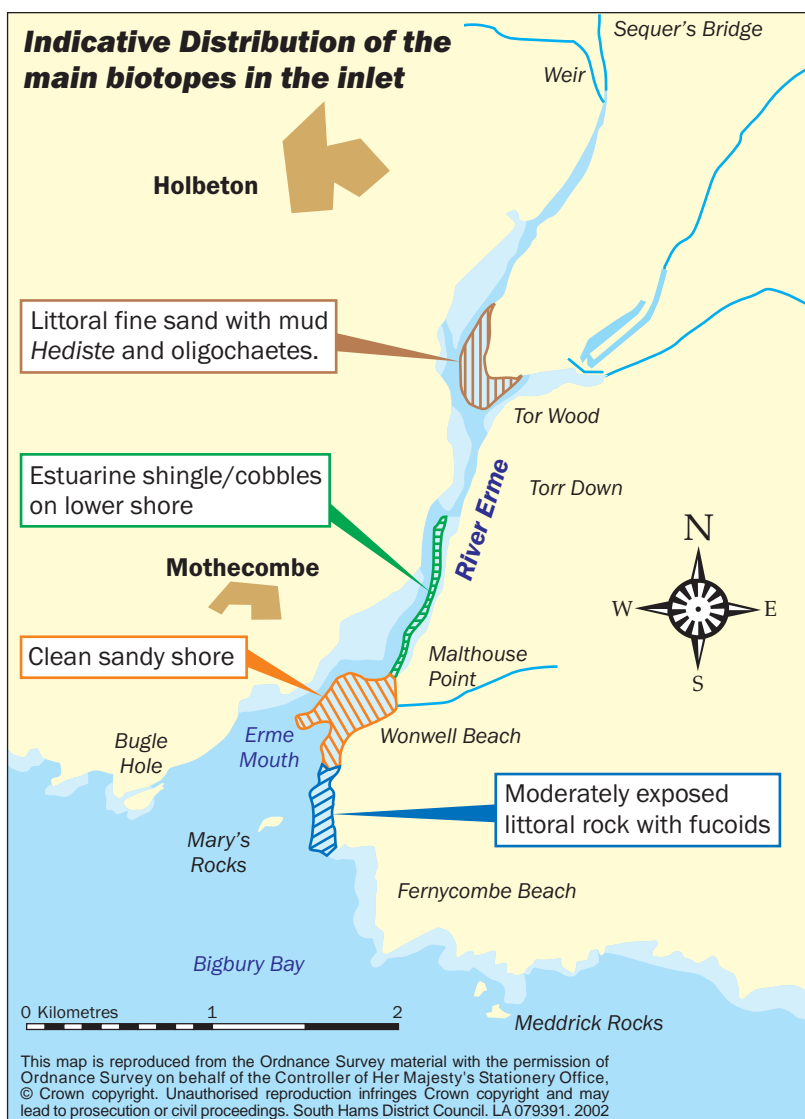
- the maintenance of the estuary's unspoilt nature and lack of development of disturbance from a nature conservation perspective;
- lack of knowledge concerning lower estuary/marine habitats and species and consequent environmental importance;
- potential invasion of habitats by non-native species and subsequent control (Knotweed reported in woods)
- conservation of saltmarshes, thought to be regionally important - need to survey and monitor accurately for change - raise awareness about saltmarshes and their ecological importance - some quadrats/ transects reported to have been carried out by University of Plymouth
- mixed reports of falling bird populations but reported evidence appears to contradict this - need to continue wildlife surveys and counts;
- BAP spp./habitats present; - need to monitor extent of change or quality - English Nature has a 6 yearly rolling programme of SSSI site condition assessments. Units in unfavourable condition will require action to achieve favourable condition, or be approaching favourable condition, by the year 2010. Units highlighted during the current round as unfavourable and requiring action are Wheat Park & Stickle Park, Yarninknowle Wood, Wrinkle &

Furzedown Wood, Sequer's Bridge Parkland, Great Orcheton Meadow and Orcheton Wood.

- saltmarsh/grazing marsh -
- kingfishers
- otters
- offshore marine habitats/ biotopes – survey by DEFRA?
- Zostera* spp.?
- sublittoral soft sediment
- intertidal soft sediment
- ancient/semi-ancient woodland
- riparian/freshwater habitats
- some local perception that management for cirl buntings is having a negative impact on yellow hammer numbers.

Reported (unconfirmed);

- increasing numbers - basking shark, dolphin, sand eel and lugworm



- increasing numbers - peregrine falcons, curlew, skylarks, buzzards, little egrets, ravens, swallows/house martins, barn owl - +ve management where appropriate - scots pine for herons
- decreasing numbers - kestrel, lapwing, teal - but not thought to be a local cause
- wetland birds count carried out by Harry & June Huggins

No.	Action	Implementation	Responsibility	Priority
E5	Ensure the conservation of special sites, species and habitats?	Consider specific management needs for <u>all</u> special species or habitats - especially those native species for which the Erme Estuary supports a significant proportion; specifically water meadows, oak-hazel woodland, reed bed swamp, reed bed and maritime grassland [supports AONB Action no. A27] N.B. priority should be given to globally rare species and not those present in low numbers at their limit of distribution.	MCO, EEMAG, EN, EA, DWT	M
E6	Removal of material from the estuary without prior consent to be discouraged. [non-commercial bait collection accepted d4?]	Discussions on permissible collecting activities, locations and times. Encourage greater environmental impact awareness and a voluntary code-of-conduct for rockpooling, beach-combing, aquarium collecting, etc.	MCO, EEMAG, Flete, DWT	M
E7	Encourage the control of problem or invasive non-native species around the estuary. [supports AONB Action no. A10]	Problem or invasive non-native species and inventory parameters to be established. Consider current effective control methods and investigate special restrictions. Identify appropriate person/organisation to carry out control. Raise awareness about the law and dangers of introducing non-native species to the estuary.	MCO, EN, EA Flete, DWT,DBRC	M
E8	An inventory of saltmarsh areas to be undertaken. (to include Saltercrease)	Inventory parameters to be established. Appropriate participants identified. Co-ordination of information collecting and collation.	MCO, EN, DWT, DBRC	M
E9	Conservation action plan for saltmarsh to be supported/established. [supports LEAP Action no. 12c]	Consider controlled use of and access to saltmarsh. Raise awareness about the conservation value of the saltmarsh habitat. Monitor saltmarsh 'health.' (to include the upper littoral fringe habitat known as Saltercrease)	MCO, EN, Flete, EEMAG, DWT, CCS, EA	M
E10	Ensure no net loss of saltmarsh area within the estuary.	Consider encouraging new saltmarsh through 'managed retreat' where appropriate. [BAP target to increase area of saltmarsh nationally by 10%]	MCO, EN, Flete, EEMAG, DWT, CCS, EA	M
E11	Conservation action plan for grazing marsh to be supported/established.	EN & EA to liaise with Flete Estate to develop conservation management of the grazing marshes. Monitor grazing marsh 'health.'	EN, EA, Flete	M
E12	Support the continued surveillance of fauna and flora populations on the estuary, e.g. BTO Wetland birds surveys.	Support the continued surveillance of flora and fauna where appropriate and encourage further community involvement where desired. Monitor population change and investigate cause, consider active conservation management where appropriate. Co-ordination of information collecting and collation.	MCO, EEMAG, DWT,DBRC, EN, EA, WeBS - (BTO), appropriate conservation organisation	M
E13	Programme to be prepared to encourage management of the most important wildlife sites.	Identify priority through discussion with conservation organisations and agree on who is to lead promoting conservation action within each. Engage the co-operation of the appropriate landowner/farmer and, where appropriate, assist in preparation of site management plans or grant applications.	DWT, EN, BTO, RSPB, EEMAG, MCO, DBRC	M
E14	Opportunities for habitat creation and enhancement to be identified.	Opportunities to be identified through discussions with conservation organisations - to be consistent with soil conservation actions. Discussions to be held with landowners/farmers. In particular scrub clearance to include maritime grassland, climax maritime community, possible areas for managed retreat, etc.	MCO, EEMAG, EN, DWT, BTO, RSPB, EA	M
E15	Encourage the sustainable management of fringing land.	Discussions to be held with landowners. Encourage the adoption, where relevant, of the Countryside Stewardship Scheme, WGS or similar agro-environmental schemes with farmers and landowners.	MCO, EEMAG, DWT, EN, CCS	M
E16	Aim to dovetail EMP and BAP actions.	Seek to dovetail and cross-reference EMP and BAP actions.	MCO, DWT, DBRC	O
E17	Seek survey of unconfirmed wildlife sites.	Seek survey of unconfirmed wildlife sites, see Appendix D, and re-survey of other sites. N.B. Land owners permission must be sought before such surveys are instigated.	MCO, CCS, DWT, DBRC	M

Recreation

5

Objective

To accommodate the permitted recreational use of the estuary at a scale that is sustainable to the estuary environment.

The Erme estuary, being for the most part within private ownership, with very limited public access, is relatively quiet in terms of its recreational use, which is, probably the main reason that the estuary is so unspoiled. Most recreational activities are controlled through a permit system, allowing Flete Estate to require the adoption of relevant codes-of-conduct and responsible behaviour. Such 'permitted' activities include walking, bird-watching, horse riding and angling.

Divers wishing to dive within 250 metres of the designated wrecks are required to seek permission and gain a licence from DCMS before diving in that area.

There is a national right of navigation over all tidal waters but there is some concern about the unrestricted behaviour of some less responsible craft, including high speed craft and large vessels, creating excessive wash. Some form of local byelaw may go some way to encouraging responsible behaviour by restricting the speed, for example, of such craft. Wind surfers are known to launch from Wonwell beach, with activity restricted to 1-2 hours either side of high water due to the shallow nature of the estuary.

Concerns and issues;

- codes-of-conduct for relevant recreational groups - environmental & health & safety - maybe a district/regional issue e.g. divers and jet-skis.
- sensitive areas to be identified as 'no landing' areas? - saltmarshes
- investigate the environmental impact of horse riding over the saltmarshes?
- seek to encourage the 'close control' of dogs during nesting season and prolonged periods of adverse winter weather conditions.
- promotion of the coastal footpath and its management by Coast and Countryside Service
- promotion of the Erme - Plym trail and South Devon Coastal Path - discouraging 'off-track' rambling
- concern about number of water skiers and jet-skis - wish to adopt speed limit byelaw - would be patrolled by local water bailiff
- growth in number of yachts anchoring - there is a limit of 25 moorings within the estuary managed by Flete Estate, 9 of which are used regularly - there is no boat maintenance allowed within the estuary.

No.	Action	Implementation	Responsibility	Priority
E18	Increase in recreational activity during sensitive periods to be discouraged.	Discussions with recreational groups and Flete Estate to be held on need and methods of managing activity levels.	Flete, EEMAG, SHDC	M
E19	Evidence of conflicts between activities to be monitored with zoning considered for some areas.	Discuss potential conflicts with Flete Estate and appropriate local groups and develop a management action accordingly if desired.	Flete, EEMAG, EA	O
E20	Codes-of-conduct for users of the estuary to be considered.	Consultations with Flete and appropriate local groups. Review any relevant codes-of-conduct for environmental, archaeological and H&S issues.	MCO, Flete, EEMAG	M
E21	Promotion of designated footpaths to be consistent with the spirit of the EMP.	Any active promotion of the Erme-Plym Trail and South Devon Coastal Path should be consistent with the spirit of the Erme EMP. Discourage off-path rambling.	CCS, Flete	O
E22	Investigate need to restrict speed of water-craft.	Discuss possibility of local byelaw to restrict speed and wash of water borne craft entering from sea. Flete to investigate implementation of such a byelaw.	Flete, SHDC	M
E23	Sensitive areas to be identified as 'no landing' areas.	Discuss the need for such 'no landing' areas, e.g. the areas of saltmarsh. <small>[supports AONB Action no. A115]</small>	Flete, EEMAG, MCO, EN,	M
E24	Moorings to be restricted to existing areas.	Ensure that moorings area does not increase to the detriment of the landscape and environment of the estuary.	Flete, EEMAG	O
E25	Investigate need to encourage the management of anchoring and navigation of yachts.	Discuss the legal options of Flete Estate to manage through encouragement the anchoring and navigation of yachts where and when having a significant environmental impact. <small>[There is a public right of navigation and anchorage (for the purposes of navigation) over tidal waters].</small>	Flete, SHA, EEMAG	M
E26	Disturbances to overwintering birds to be monitored for significant impact.	Establish voluntary monitoring programme. Establish and encourage extreme winter weather code-of-conduct to minimise disturbance of feeding waders (wading birds).	MCO, WeBS (BTO), EEMAG	M

6

Community Awareness

Objective

To increase the community's awareness about the Erme estuary, its ecology and needs and about the Estuary Management Plan itself, its aims and objectives and the responsibilities of the community towards the continued conservation of the Erme estuary ecosystem.

Estuaries have until the recent English Nature Estuaries Initiative been poorly understood and under-valued, with many hectares being lost through barrages and land reclamation. As we research more into estuarine ecology we gradually realise the true worth of estuaries - as egg laying or nursery 'grounds' for commercially important fish; internationally important feeding 'hyper-markets' for birds and fish; and highly productive ecosystems of potentially global importance. It is imperative to the future of estuaries and to the conservation management of the Erme estuary that this importance is more widely acknowledged by the local and wider community.

It is an objective of the management plan to raise the general awareness of the local community, through locally promoted events such as guided walks, illustrated talks, and particularly through working with local schools and colleges. Flete Estate has a particular interest in encouraging

the educational use of the estuary by special needs groups. Visiting educational and recreational groups should be encouraged to follow a responsible code-of-conduct, to minimise the environmental impact of their visit.

Issues;

- encourage working with local farmers, schools, colleges and Universities
- encourage a code-of-conduct for visiting educational and recreational groups
- walks/talks/events for local community groups ?
- local opportunities for on-site interpretation initiatives ?
- need to balance encouraged educational use of the estuary with its unspoiled and quiet character.

No.	Action	Implementation	Responsibility	Priority
E27	Encourage awareness of the estuary by local schools and youth groups (e.g. DWT's Wildlife Watch, the scouts, guides and associated groups).	Encourage awareness and sustainable use of the estuarine environment by schools within the water catchment area. Prepare a code-of-conduct for use of the estuary by visiting schools, colleges and Universities. Discourage unnecessary access to sensitive sites. Promote use of the estuary to special needs schools/units.	MCO, CCS, DWT, EN, Flete	O
E28	Encourage awareness of the estuary by the local community.	Encourage awareness and sustainable use of the estuarine environment by the local community within the water catchment area. Offer guided walks, illustrated talks, etc. to local community groups.	MCO, CCS, DWT, Flete	O
E29	Include the estuary within the guided walks and events programmes through prior arrangement.	Include a number of awareness raising guided walks and events targeted at the local community within the Coast and Countryside Service events programmes? <small>[supports AONB Action no. A133]</small>	Flete, MCO, CCS	M

Water Quality

7

Objective

To seek to improve the water quality to a level which supports both a healthy estuarine ecosystem and the local community's recreational, aesthetic and commercial needs.

Generally, the water quality of any estuary is a potentially 'limiting factor' to the relative health of the estuarine and adjacent habitats. Within the Erme estuary, water quality is mainly a result of the quality of waters flowing into the estuary from the water catchment area, via the River Erme and to some extent seawater from the open coast.

The water quality of the River Erme draining into the estuary has been assessed against expected water quality using the River Ecosystem Classification. The River Erme at Fawns Bridge to the tidal limit has a River Quality Objective (RQO) of River Ecosystem (RE) Class 2. This is a target for water quality and has to be achievable and sustainable. The RE class reflects the chemical quality needed from different types of river ecosystem, including the types of fishery they can support. RE2 represents water of good quality suitable for all fish species. An assessment of water quality based on data collected between 1998 and 2000 revealed that the stretch was compliant with its RQO and marginally failed to meet its long-term RQO of RE1, which is a long-term target used for planning purposes.

The Environment Agency has specific duties in relation to bathing waters. The quality of bathing waters in England and Wales is monitored against standards set in the Bathing Water Regulations (SI 1991/1597), which give effect to the EC Bathing Water Directive (76/160/EEC). The assessment of compliance against the standards of the EC Directives are complex. Each water sample is analysed for total coliform bacteria, and for faecal coliform bacteria, the latter being indicative of the presence of traces of human sewage. The imperative standards, which should not be exceeded, are 10,000 coliforms per 100 millimetres (ml) of water and 2,000 faecal coliforms per 100ml of water. In order for a bathing water to comply with the EC Bathing Water Directive, 95% of the samples (i.e. at least 19 out of the 20 taken) must meet these standards, plus other criteria. The designated bathing water at Mothecombe met the mandatory (imperative) standards of the Bathing Waters Directive in 2000,

but failed to meet the guideline standards of the Bathing Waters Directive in 2001. South West Water are installing secondary treatment at the Holbeton STW to comply with the Urban Waste Water Directive. These improvements should be completed by the end of December 2001.

Bathing waters are monitored over the summer months when swimmers etc. are likely to be present, there is no statutory requirement to monitor the waters outside this season. During heavy rainfall events, normally winter, the mouth of the estuary smells strongly of sewage and Sewage Related Debris (SRD) are visible, therefore the water quality in the area must be questionable and windsurfers and surfers should take extra care during these times.

There is a degree of public concern about the water quality within the estuary, mainly centred upon microbiological 'pollution' from sewage treatment works. The 'scum' frequently seen floating up the estuary on an incoming tide is seen as an indicator of the perceived pollution problem; however this scum is frequently that of a natural estuarine phenomena, the so called 'diatom scum' - diatoms and other biologically sourced material floated by the incoming tide. However, there is a need to raise the local community's awareness of the actual water quality, the work carried out by the relevant services and the practical limitations of their work.

Water quality should be seen as a wider community team effort, from an awareness about what should and should not be flushed into the domestic waste water system; the responsibilities of those farming and managing the surrounding farmland and countryside; the home use of pesticides, herbicides and fertilisers, as well as that used on commercial farms; litter and rubbish casually discarded around the estuary; the workings of South West Water and the Environment Agency; to oil leaking from internal combustion engines of cars as well as boats. To supplement this, the identification of point and diffuse pollution sources is encouraged.

Soil runoff can directly affect the estuary water quality by increasing the suspended sediment within surface water run-off

leading to increased water turbidity. Increasing water turbidity reduces light penetration and consequently, reduces the rate of microbial breakdown by ultra-violet light. Increased surface run-off may also reduce the time taken for contaminated water to reach the estuary. The *E. coli* bacteria survives for approximately 7 days in water and a decrease in water retention times could increase *E. coli* survival time within the estuary, and increase the possibility of animal poisoning or contamination.

Nutrient enrichment of the estuary and surrounding wetland habitats, from anthropomorphic sources is considered to be likely but no data is known of and it is not known if the levels of enrichment are significant. The Environment Agency at present are not planning to survey or monitor nutrient levels within the Erme estuary. A summer build up of *Enteromorpha spp.* has been suggested as an indicator of elevated nutrient levels. Estuarine mudflats, are however, very high nutrient habitats naturally and with no baseline records of past growth known and with *Enteromorpha* build ups also being enhanced by rough and windy weather, it is suggested that this is not a reliable indicator. The precautionary principal is suggested but such a principal is not a good stance to demand public expenditure from, e.g. the tertiary treatment of sewage effluent (where tertiary treatment is defined as nutrient stripping). Many of the principals within this plan, however, will go some way towards reducing anthropomorphic nutrient levels, e.g. soil conservation. Nutrient enrichment and eutrophication concerns, especially within estuaries, are suggested as coming to the fore nationally and EEMAG should endeavour to keep abreast of developments.

Further issues of soil runoff are discussed in Chapter 9: Soil Runoff.

Oil pollution is a potentially large problem in itself, both from the seemingly catastrophic consequences of a major oil spill and the frequently unnoticed, but in the long term equally damaging, environmental impact of numerous small spillages - so called chronic low level oil pollution. A tier classification has been developed for the categorisation of oil spills. Tier 1 - includes small, operational spills that can be dealt with immediately using local resources. Tier 2 - covers medium sized spills, which may require outside assistance through regional response. Tier 3 - includes the largest spills, where the clean-up is beyond the capability of local and

regional resources and will require national assistance. The tier system was designed to relate the size of spill to the resources available for the clean-up and are, therefore, relative to the size of the port. For example the volume of a Tier 1 spill in the Erme estuary would be much smaller than a Tier 1 in the Salcombe-Kingsbridge estuary. Larger ports are able to insure against the smaller spillages by having the necessary materials and staff on hand to cope; just as the Erme estuary would find it difficult to justify such an expense, it also does not have the number of boats or staff of these larger ports. In the Erme estuary the main sources of these low level inputs are likely to be from private properties, traffic and roads, and agricultural activities within the water catchment area. Legislation is difficult to enforce with such potentially small oil spillages but everything should be done to minimise the impact whenever possible and the priority should be to continue to raise the awareness of the risks with those most likely to be the cause. There is an Erme estuary emergency response plan for larger oil spills from sea, with oil boom securing points in place. Advice for the safe storage of oil at home and work, and details of used oil banks and contact numbers is offered in the Oil Care Code, which is available from the Environment Agency.

Marine litter is an ongoing problem both aesthetically and as a potentially lethal hazard for wildlife. Much of the litter we find on our beaches comes from boats at sea, litter deliberately or thoughtlessly thrown overboard, broken and discarded fishing nets, ropes etc. Many of the short lengths of string and rope found on the shore have come from the underneath of 'bottom trawl nets' where they are tied on as sacrificial skids to protect the net itself as it is dragged along the seabed. The Marine Conservation Society is the lead organisation in tackling this problem and it is proposed that beach clean-up events are organised as part of the Marine Conservation Society's 'Adopt-a-beach' campaign.

A potential threat to the water quality of the Erme estuary is presented by a concentration of lead, cadmium, copper, and nickel within the sediment, remnants of historic industrial mining in the catchment. If the sediment layers are remobilized, the water is at risk from contamination, threatening the diversity of the estuary's organisms. The issues surrounding the threat and actuality of a heavy metal toxic event within the estuary are discussed in Chapter 16 Climate and Sea-Level Change under indirect effects.

Concerns and issues;

- wish to ensure full environmental impact survey of any fish farm/fishery proposals - water diversion and fish feed/biocide pollution
- oil pollution 'Tier 1 & 2' - Erme estuary is not a port but may be a conservation priority? - main oil pollution potential from 'upriver' roads and agricultural sources.
- oil pollution 'Tier 3' - Environment Agency, oil boom points within the estuary
- investigate the need for sensitivity mapping updating etc.
- investigate problem areas and suggest areas for regular clean ups in association with Marine Conservation Society's 'Adopt-a-beach' campaign
- assist with national and regional litter and rubbish abatement measures.

During the production of this report, DEFRA have produced a public consultation paper - 'Implementing the Nitrates Directive,' seeking to ensure that farmers follow 'Action Programmes' to reduce nitrate pollution either;

Option 1 - throughout the whole of the country, including the Erme estuary; or

Option 2 - within specific Nitrate Vulnerable Zones (NVZs), excluding the Erme estuary.

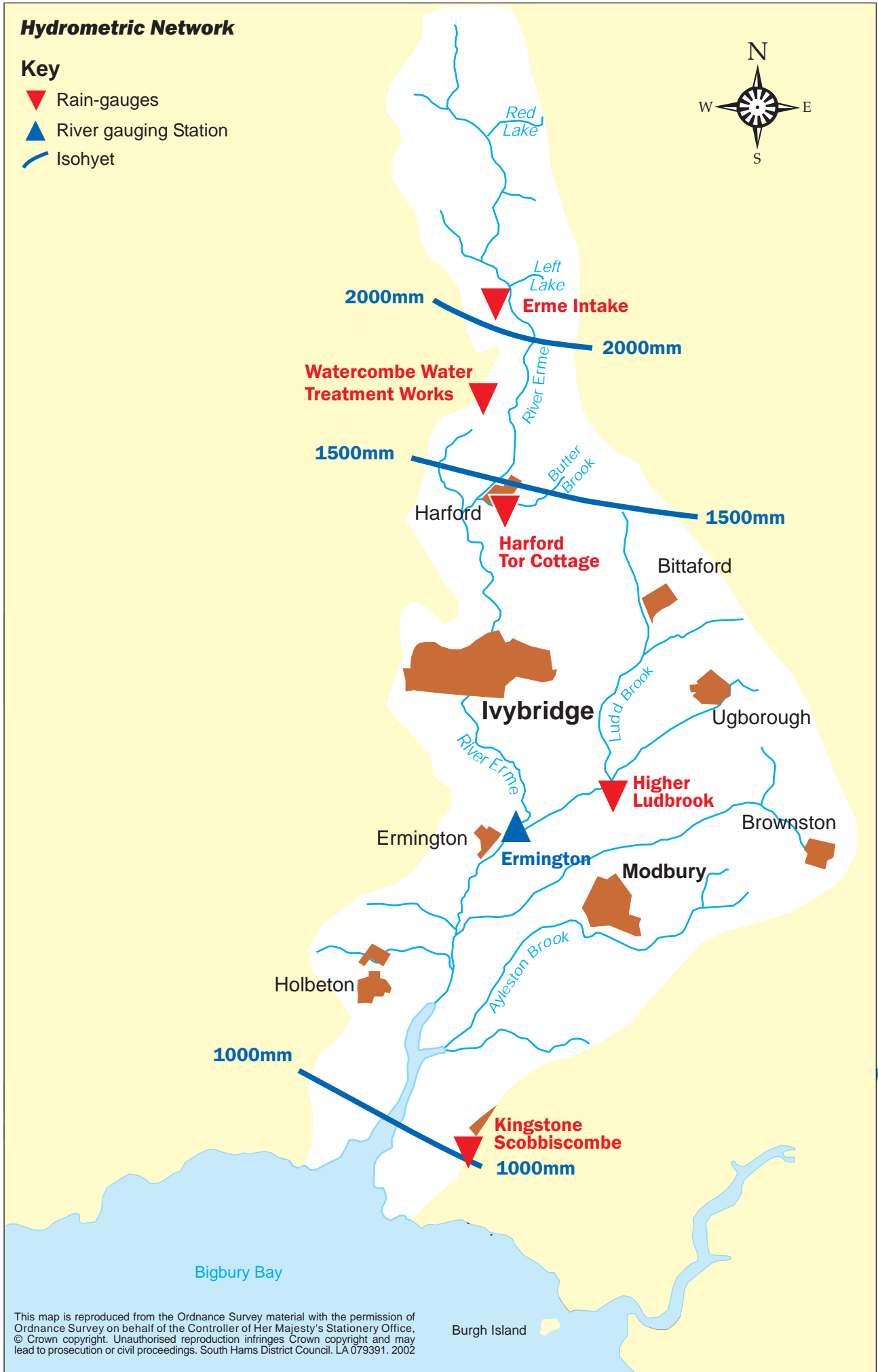
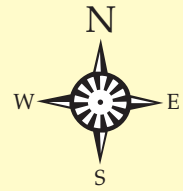
The quantity of fertiliser and timing of manure applications by farmers to their land will be limited by the Action Programme Measures. The Environment Agency will be responsible for ensuring these regulations are met. The objective of this EMP will remain to encourage efforts to minimise the environmental impact of all diffuse pollutants through the encouragement of soil conservation and sustainable land management practices.

No.	Action	Implementation	Responsibility	Priority
E30	Conserve the quality of the water at a level to support a healthy estuary ecosystem, the local community's recreational, aesthetic and commercial needs	Keep abreast of water quality developments with SWW & EA, strive for highest natural standards. Investigate scale of problem of diffuse pollution, mainly from farms within catchment? Action Plan. Raise local community awareness about the workings of SWW & EA, and local water quality perceptions.	EA, SWW, MCO, EEMAG, NFU	H
E31	Raise public awareness about 'diatom scum'	Actively encourage local community awareness about 'natural diatom scum' and the difference to sewage related scum. Promote EA leaflet and emergency number.	EA, SWW	M
E32	Investigate options for improving or removing private discharges.	Discussions to be held with SWW and EA. EA to encourage landowners. <small>[supports LEAP Action no. 1f in terms of limiting the introduction of new discharges by restricting the development of new STWs within the estuary]</small>	EA, SWW, EEMAG, Flete	M
E33	Explore possibilities of quantifying nutrient enrichment of the estuary.	Explore possibilities of quantifying nutrient enrichment of the estuary and its level of significance. Prepare programme to minimise future nutrient inputs.	EA	M
E34	Boat maintenance <u>within</u> the estuary to remain discouraged.	Permissible activities to be established and code-of-practise produced and encouraged. Alternative sites etc. to be established. Encourage awareness of the full impact of oil pollution with boat owners and the local community through use of codes of conduct.	MCO, Flete, SHDC	M
E35	Adopt the oil pollution procedures to be followed in the event of oil spillages in the estuary.	Regular review of procedures by organisations and people mentioned in the plan.	Flete, EA, SHDC, MCO, DCC	O
E36	Encourage regular shore line litter clean-ups.	Identify lee shore litter problem areas. Encourage regular litter clean-ups in association with MCS 'adopt-a-beach' campaign.	MCO, Flete, EEMAG, SHDC	O

Hydrometric Network

Key

- ▼ Rain-gauges
- ▲ River gauging Station
- Isohyet



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Fisheries



The Erme estuary is a Several Fishery that is effectively owned and managed by Flete Estate, with some relatively small scale organised boat angling for sea bass. The water bailiff of Flete Estate also monitors and manages bait and shellfish collection. There is some concern about the lack of management powers to control incoming fishing boats from sea and some unconfirmed reports of large scale net fishing.

The estuary used to support a mussel bed but the bed was washed away during storms in the late 1980's, although beds are likely to re-form naturally in the future. There is presently no crab tiling ('trapping' of soft or peeler crabs) thought to take place within the estuary.

Concerns and issues;

- sea bass - estate allows boat fishing for bass, anglers pay water bailiff - thought to be a sustainable use, prudent to check numbers
- some concern about commercial fishermen coming in from sea - controlled to some extent by water bailiff.
- bait collection is managed by local water bailiff - no commercial collection allowed
- prepare an agreed environmental code-of-conduct for personal bait collection
- mussels gone from estuary since storm in late 1980's
- no other shellfish collection other than for personal consumption, cockles etc.

Objective

To encourage the conservation of native fish, shellfish and bait stocks and to minimise the environmental impact of their exploitation.

No.	Action	Implementation	Responsibility	Priority
E37	Ensure sea bass angling remains sustainable within the estuary.	Seek discussions on sustainability of sea bass population between Flete and DEFRA	DEFRA, DSFC, EA, Flete	M
E38	Investigate desirability of a mariculture area within the estuary.	Discuss with Flete. Encourage discussions with DSFC et al if appropriate.[supports AONB Action no. A180]	Flete, DSFC, MCO, SHDC	M
E39	Prepare code-of-conduct for non-commercial bait collection.	Identify environmental and H&S problems and prepare code-of-conduct for bait collection. Identify and target education of individuals.	Angling clubs, Flete	M
E40	Investigate need for management powers for various fisheries.	Discuss legal options of Flete Estate to manage the access of commercial fishing.	Flete, DSFC	M

Soil runoff

Whilst the gradual siltation of all estuaries is part of the natural process of 'geomorphological succession,' there is a perceived local concern about how the rate of siltation has accelerated more recently, posing a potential threat of smothering the Erme saltmarshes. Siltation rates may be affected by natural and anthropomorphic changes in the soil structure, vegetation cover and the topography of the catchment, weather and by an ingress of sand/silt from the coast.

Land management and agricultural practices have increasingly changed over time and the perceived increase in siltation, is probably a result of an increase in soil runoff in response to this.

Historically, within farming, there have been government grants to grub out hedges, bring land into arable management and encourage land-use intensification helped by the invention of the steam driven traction engine, tracked vehicles and more latterly the rising popularity of the 4-wheel drive tractor, allowing all but the steepest slopes to be ploughed in all weathers. More recently the cattle crisis lead to a collapse in pastoral farming and again many fields have been ploughed up to replace lost income and there has been a growth in arable crops and soil workings - contributing to soil runoff. This alteration of land management and conditions in upland terraces may have weakened and compacted the soil structure causing it to



Objective

To minimise the environmental impact of soil runoff and associated problems, and to limit the rate of siltation of the estuary to its natural equilibrium.

be washed away with surface runoff, settling as silt in the estuary. The accelerated runoff may cause destabilisation and erosion of the upper shore and consequent deposition onto the lower shore within the estuary. To examine whether this is the case within the Erme estuary, a hydrological survey is recommended. River bank erosion and building works may also lead to a silt loading but some survey work would again be needed to identify the actual source within the Erme catchment.

Wherever soil runoff is a problem, there tends to be a strong correlation with the associated runoff of soil nutrients, fertilisers, herbicides and pesticides. Even from organically farmed fields, runoff may contain high levels of microbiological contaminants such as *E. coli*. There is a certain amount of practical work that may be carried out to limit such runoff, as laid out within the various MAFF (now DEFRA) and Environment Agency soil management code-of-best-practise publications. Contour ploughing is frequently seen as a preferred option but on steeper slopes it may actually lead to deep erosion channels where the water collects and breaches through the plough ruts. Buffer zones are also not necessarily the best option on steeper land as their useful life is very short. In these cases it is frequently prudent to discourage any form of ploughing, encouraging permanent grassland grazing or broad-leaved woodland crops.

The climax community for this area is broadleaf woodland and would, in balance, be the preferred habitat for most local and native wildlife. Large stands of conifer trees, however, can have a rather negative environmental impact on the local soil structure. The breakdown of their pine needles release tannic acids, increasing the acidity of the underlying soil structure and thereby causing nutrient and mineral leaching of the soil - further adding to the nutrient enrichment of the estuary. Successive conifer plantations exacerbate this problem and may also lead to an impoverished local flora and fauna.

There is presently much concern about the environmental impact and costs of soil runoff in the Southwest but still relatively little active management to alleviate the problem. Whilst sympathising with present and past pressures on land managers and farmers, more active soil conservation measures need to be encouraged. Soil is the raw material of farmers, and much time, effort and money is spent in enhancing the quality of that soil, consequently there is a huge financial loss. The loss of one millimetre of soil from one hectare equates to 10m³ of soil loss. Active soil conservation must come to be seen as a cost saving necessity and not as a 'green' whim.

Also refer to Chapter 4: Nature Conservation; Chapter 7: Water Quality; and Chapter 11: Landscape, Agriculture and Land Management.

Concerns and issues;

- need to investigate the rate and causes of siltation and associated problems, **who to champion and implement change?** - costs?
- 'estuary has become more muddy' - believed to be agricultural runoff - need to investigate
- desire to encourage sustainable farming methods, arable farming, buffer zones, conservation of woodland (encourages bats) - associated agro-chemical runoff - particular concern of maize crops - suggested that maize is under-sown with grass for winter grazing
- bank erosion along Erme riverside - cattle/fishermen - need to investigate
- associated agro-chemical runoff - see above; discourage conifer plantations in favour of broadleaf due to acidic runoff and nutrient leaching - check local impact.
- dredging & disposal? Not cost effective for the estuary - no use of barges on estuary anymore

No.	Action	Implementation	Responsibility	Priority
E41	Sources of sediment and sediment movements within the estuary to be investigated.	Discussion of siltation and survey requirements - commission survey if felt to be financially justifiable. Identify mitigation proposals and champion to implement proposals.	Flete, EEMAG, EN, DWT, DEFRA, EA,	H
E42	Encourage a more proactive response to the problem of soil runoff.	Lobby appropriate organisations and bodies to highlight soil runoff and associated problems as a priority issue requiring proactive management.	MCO, EEMAG, EN, EA, DWT	H
E43	Encourage soil conservation within the estuary water catchment area. [supports LEAP Action no. 21]	Discussions to be held with EA, DEFRA, ADAS, etc. and champion organisation found. Encourage land use mapping survey to identify and prioritise likely/known soil runoff hotspots and potential soil conservation buffer zones. Plan of action to be discussed and adopted. Discuss raising as a regional/national issue.	EA, DEFRA, ADAS, MCO, EN, DWT, NFU	H
E44	Encourage maize growers to follow soil conservation principal.	Encourage all those growing maize to adopt the most current soil conservation code-of-practice.	LO, DEFRA, ADAS, FRCA, EA	H
E45	Discourage large stands of non-native conifers, due to soil leaching problems.	Encourage the planting of native broadleaf trees in preference to conifers especially along the waters edge. Encourage small groupings of Scots pine for herons.	LO, DEFRA, EN, EA, FC	M

Geology and coastal protection

10

Objective

To encourage the preservation of local geological and geomorphological features, and ensure that flood defence or coastal protection projects within the estuary are consistent with the conservation spirit of the management plan.

The estuary is dominated by exposures of slates belonging to the Dartmouth Group of Lower Devonian age (around 390 million years old). These deposits were laid down as muds in coastal mudflats and lagoons, bordering a vast desert continent to the north. Fossil remains are generally very rare, although isolated plates and spines of primitive armoured fish have been found elsewhere in the district

A number of small dolerite dykes are distributed around the estuary, indicating limited igneous activity in the later Devonian or early Carboniferous. A period of intense tectonic activity and mountain building, the Variscan Orogeny, around 300 to 290 million years ago folded and faulted the Devonian sediments, transforming the original clays and shales into slates.

The morphology of the estuary is due to Quaternary processes including sea-level changes and periglacial activity during the "Ice Ages" and warmer interglacial periods, especially over the last 150,000 years or so. River terraces and traces of raised beaches appear to be present, and the estuary itself is also a ria, "drowned" when sea levels rose at the end of the last ice age. The surrounding cliffs are generally much lower than those around the Avon estuary, reflecting the slightly softer nature of the slates of the Dartmouth Group, when compared to the Meadfoot Group around the Avon, although elements of a

characteristic "slope-over-wall" morphology are still present.

The Erme estuary contains four main Devon County Geological Sites within the estuary water catchment area;

St Anchorite's Rock

SX54NE1 *Cliff top tor and quarry*

Tor Rock

SX64NW1 *Natural tor outcrop*

Pipers Cross Quarry

SX64NW2 *Small quarry*

Waterloo Quarry

SX65SW1 *Small/medium quarry*

Further details of these sites are appended to this plan (see Appendix B). The sites are recognised by the Devon RIGS Group (Regionally Important Geological/Geomorphological Sites) as valuable features on a county-wide basis; and sites are to be promoted for educational and research use, as well as being conserved. The Devon RIGS group promote a code-of-conduct for Geological Field Work, which should be followed by visiting individuals or groups.

Flood defences and coastal protection developments are expensive and tend only to be considered when absolutely necessary and of high priority. However, such projects should involve an environmental impact assessment and seek to reduce any negative impact to a

Simplified Geology Map

Key

Strata

Banded siliceous & slaty rock

Carboniferous

Slates

Middle Devonian

Staddon Grits/
Meadfoot Group

Lower Devonian

Dartmouth Slate

Lower Devonian

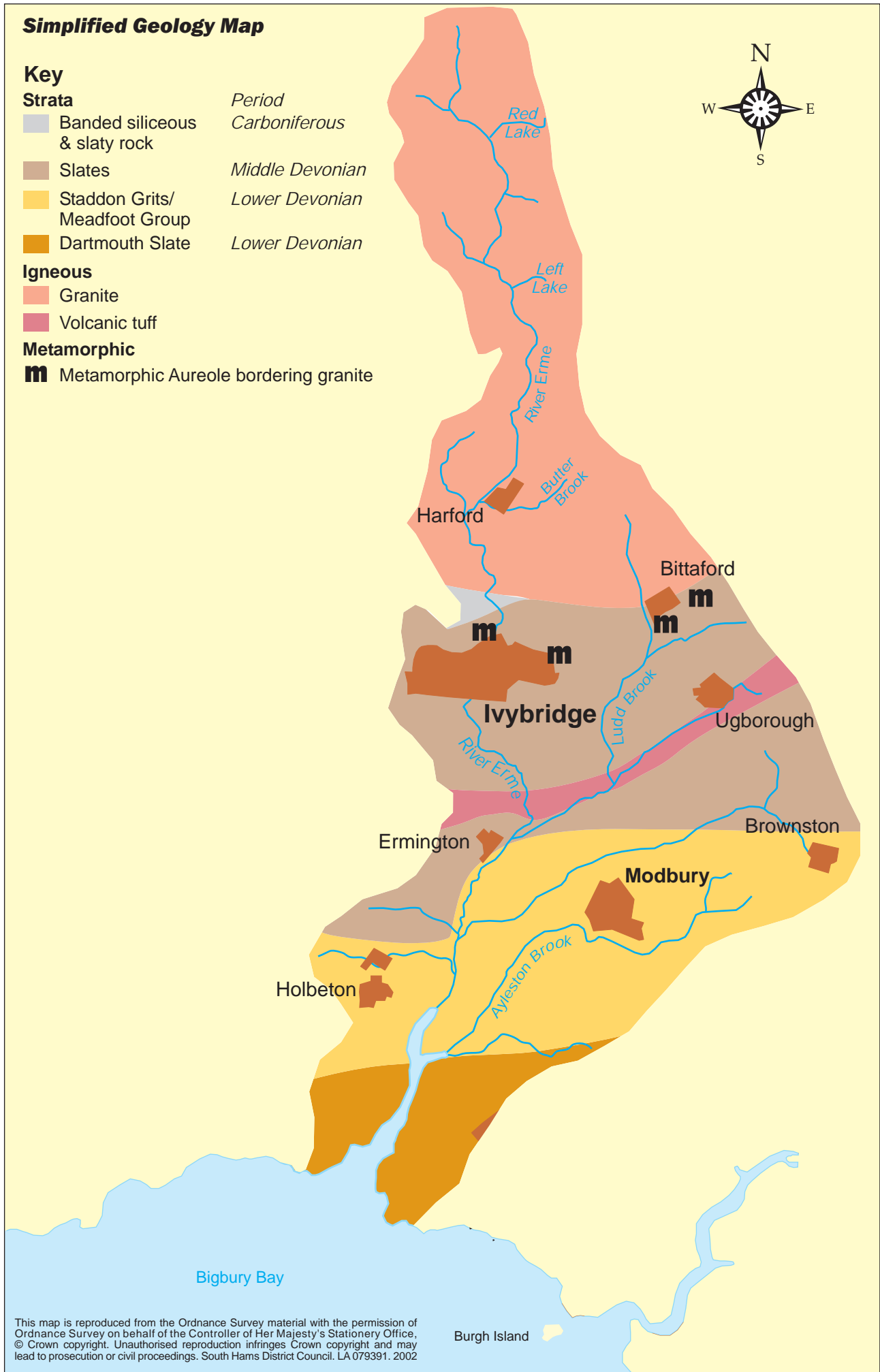
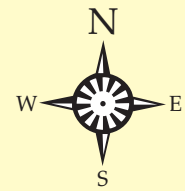
Igneous

Granite

Volcanic tuff

Metamorphic

m Metamorphic Aureole bordering granite



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realistic minimum. Within the estuary, in general terms, the Environment Agency has powers to implement flood defence (i.e. inundation prevention) schemes and the local authorities have powers to implement coast protection (i.e. erosion control) schemes. All flood defence and coast protection schemes will be in

accordance with the recommendations of the Estuary Management Plan and will have technical and economic as well as environmental appraisals.

Concerns;

none reported

No.	Action	Implementation	Responsibility	Priority
E46	Existing coastal protection works around the estuary to be examined in light of potential impacts on the estuary environment.	Effects of sea level rise to be discussed. Managed retreat and soft engineering principals to be adopted whenever appropriate. Implications to saltmarsh erosion or possible saltmarsh creation to be discussed.	DEFRA, EA, DCC, SHDC, EN, Flete	M
E47	Safeguard the geological and palaeontological features of the estuary.	Establish and promote a code-of-conduct for responsible geological field work and specimen collection. Promote the code-of-conduct with landowners. Seek protection of rich sites through designation.	EEMAG, RIGS group, EN	M
E48	Ensure that geological and geomorphological features or processes are not damaged or obscured by any development.	Ensure that the appropriate geological advisory body is consulted about any development that may have a potential impact on geological features or processes. Geological advisory bodies to ensure that all potentially damaging developments and sensitive sites are reported to the planning authority.	RIGS group, EN, CCS, SHDC, DCC, EEMAG	M
E49	Promote a greater awareness of the geological and geomorphological heritage of the estuary.	Seek to provide targeted interpretive materials and educational programmes where appropriate.	RIGS group, EN, CCS, EEMAG	M

Landscape, agriculture and land management



Objective

To encourage the sustainable management of the surrounding countryside, - conserving and enhancing and wildlife habitats, the estuary, and the commercial viability of local agricultural and forestry interests.

It is important to the success of the management plan that local landowners and farmers are invited to join EEMAG and are involved in the implementation of the management plan. Unfortunately, there is a frequently held perception that modern day farming and forestry practices are harmful to 'our' countryside - however it should be recognised that there are, and have been, huge pressures on farmers and foresters that did not or do not themselves encourage sustainability. Farmers need to react to market forces, frequently requiring an intensification of agricultural practice, for which shoppers are ultimately responsible; and aside from this, many gardeners frequently use more agro-chemicals per unit area than farmers. As organic and in-organic methods both require the application of fertiliser, it is the intensity of farming that is the potential issue. It is imperative that farmers and land managers are not alienated from the management plan.

Most of the Erme estuary's water catchment area is within the Dartmoor National Park and the South Devon Area of

Outstanding Natural Beauty, each with its own Environmental Management Plan. Obviously these plans rely on the co-operation of the relevant land owners and farmers and each encourage sustainable land management and soil conservation. These plans if implemented by farmers should support the policies and targets outlined in the Environment Agency's Avon & Erme Local Environment Agency Plan.

To prevent habitat de-fragmentation it is suggested that key habitats are identified and recognised for their local importance in a strategy, for example ancient broadleaf woodlands, designed to encourage the enhancement and conservation of these habitats - preferably linked by 'wildlife corridors' through the local countryside mosaic.

The main conservation aims of this management plan are the conservation and enhancement of the estuary's landscape character and the encouragement of sustainable land management operations. The plan also emphasises that actions do not in any way

imply right of access over privately owned land and that the landowners' permission and co-operation must be sought before any actions are implemented.

Reference should also be made to Chapter 4: Nature conservation; Chapter 7: Water quality; and Chapter 9: Soil Runoff.

Concerns and issues;

- much of the farmland within the estate is within organic produce management - positive or negative to estuary environment?
 - land management intensification
 - encouraging sustainable-use land management - agro-environmental grant schemes - who to champion advice?
 - Local Environment Agency Plan/Area of Outstanding Natural Beauty/
- Dartmoor National Park management plans active within water catchment area.
 - Devon Wildlife Trust/English Nature/Coast and Countryside Service/Royal Society for the Protection of Birds/Farming and Wildlife Advisory Group/Devon Rivers Trust interests within Erme catchment area - need to ensure that advice given to farmers/landowners is consistent with estuary conservation downstream.
 - need to identify key local distinctive landscape features and target their conservation - field boundaries, woodlands etc. - build on district - wide landscape assessment?
 - desire to encourage sustainable woodland management - advertise South Hams Woodlands project - other possible pro-active actions?

No.	Action	Implementation	Responsibility	Priority
E50	Landowners and farming community to be involved in implementing the management plan.	Consultations to include landowners and farmers. Landowners and farmers to be encouraged to join the Conservation Management Group.	Flete, MCO, EEMAG, NFU	H
E51	Encourage the continued conservation and sustainable management of woodlands around the estuary.	Encourage the planting of new broadleaf woodlands whenever appropriate - especially where this would link [wildlife corridors] or increase the size of existing woodlands. [supports AONB Action no. A34]	SHDC, EN, DWT, BTO, RSPB, EEMAG, Flete, EA	M
E52	Raise the awareness of the importance of hedgerows as wildlife corridors and their potential role in soil conservation	Survey the condition of the hedgerows around the estuary and encourage their conservation and sustainable management. Encourage the re-planting of lost hedgerows whenever appropriate - especially where this would link to one or more areas of wildlife habitat or their potential role in soil conservation.	SHDC, EN, DWT, BTO, RSPB, EEMAG	M
E53	Runoff risk assessment to be encouraged during any advisory farm visit.	Runoff risk assessment to be encouraged during any advisory farm or land management visit, e.g. Countryside Stewardship Scheme advisory visits.	MCO, CCS, DWT, RSPB, EN, ADAS, DEFRA	H
E54	Identify key landscape character features and their conservation. [supports AONB Action no. A3]	Identify the key landscape character features. Agree the conservation objectives for those features. Encourage their adoption with other relevant plans within the catchment area.	CCS, SHDC, EEMAG, EA, DWT, Flete	M

The built environment

12

Whilst it is not the function of the Estuary Management Plan to make planning judgements, where such decisions are likely to affect the environment of the estuary it is important that due weight is given to the estuary conservation objectives. The built environment can have dramatic impacts upon the natural environment and the minimisation of this impact is gradually becoming more of a priority within the planning decision making system.

Responsibility for planning issues rests with South Hams District Council, Dartmoor National Park Authority, Devon County Council and, by way of recommendations, the Environment Agency, English Nature and the Countryside Agency where there is a statutory conservation or water quality interest.

Further urban development potentially threatens the water retention capacity of the upland terraces of the Erme catchment - a result of which could be increased runoff, the effects of which are discussed in Chapter 9: Soil Runoff, and Chapter 7: Water quality.

Concerns and issues

- encourage the local planning control officers involvement within the EMP consultation process
- seek to give the conservation of environmental and archaeological interests priority within planning decisions
- encourage relevant local organisations to trawl local planning applications for potential conflicts with the estuary management plan
- reported contaminated runoff from building sites in Ivybridge [environmental impact not felt to progress as far as the estuary - EA]
- local concern of increasing environmental impact of sewage effluent, storm water runoff, etc. from further developments in the catchment area - concern addressed by Local Environment Agency Plan

Objective

To encourage the consideration of the management plan and the conservation of the estuary as a priority within planning decisions that may directly or indirectly affect the estuary.

No.	Action	Implementation	Responsibility	Priority
E55	Seek to give the conservation of environmental and archaeological interests a level of priority within planning decisions.	Encourage the inclusion of the estuary management plan objectives within the local development plan. Encourage relevant local organisations to trawl local planning applications for potential conflicts with the spirit of the estuary management plan. Biodiversity Action Plan policy - to ensure that local development plans take full consideration of Estuary Management Plans	SHDC, DCC, CA, EN, EA, DWT	0
E56	Ensure no net loss of intertidal or subtidal area of the estuary. Devon estuaries BAP target	Ensure that any scheme removing an area of foreshore or seabed from the estuary creates a similar area of similar quality potential elsewhere.	SHDC, DCC, CA, EN, EA, DWT	0

13

Access to the estuary

Objective

To seek to maintain access to and around the estuary at a level that is consistent to the needs of the Flete Estate, local community and the spirit of the estuary management plan.

There is restricted and relatively poor access to and around the Erme estuary, allowing the estuary to have remained relatively undeveloped, unspoiled and natural. Opening up new access, even for relatively benign activities such as walking, can have quite dramatic effects on the local wildlife etc. and unless there are clear community or financial needs, new access down to the foreshore should be resisted.

Whenever possible, new access should be limited to routes well away from the foreshore or hidden by hedges, bunding or sunken paths. Well planned and considered access could however be beneficial to the spirit of the management plan.

Concerns and issues;

- access restricted to mainly local people through permit from Flete Estate

- access allowed to horse riders within the estuary - possible need for a voluntary code-of-conduct for horse riders, concerning severe winter weather disturbance of feeding waders and damage to saltmarshes.
- no dogs allowed on Mothercombe beach during May to September
- vehicular and pedestrian access to the shore only to be improved when no harm is demonstrated
- access to the footpath network away from the shore but with views of the estuary may be encouraged
- access for people with special needs to be considered where appropriate

No.	Action	Implementation	Responsibility	Priority
E57.	Access to the shore outside villages should only to be improved where minimal environmental impact is demonstrated.	Seek to confirm action within the local development plan. [supports AONB Action no. A109] Discourage further access where wildlife disturbance or environmental impact is likely to be significant.	SHDC, DCC, Flete, EEMAG	O
E58.	Only improvements to the footpath network away from the shore but with views of the estuary should be encouraged?	Consultations with Flete and local community If appropriate - identify key sensitive sites where any further shore side access would cause unnecessary wildlife disturbance or environmental impact. Raise awareness of sensitive sites and discourage any further access that might impact on these sites.	Flete	M
E59.	Access for people with special needs to be considered where appropriate.	Consider whenever appropriate. [supports AONB Action no. A87]	Flete, EEMAG	O

Historic environment

14

Objective

To identify, protect and actively conserve those archaeological and historical features that help to form the special qualities of the Erme estuary.

The historic environment is a human-made landscape of fields, woods, settlements, farms and lanes, and includes a number of individual sites, buildings and structures of archaeological and historic interest. The Erme Estuary has rich historic environment including maritime, intertidal and terrestrial sites, ranging in time from prehistory to the modern day. Estuaries are particularly important because their waters and waterlogged fringes can often contain very well preserved archaeological remains and evidence of past environments preserved in peat and silts. The historic environment is a finite and non-renewable resource containing irreplaceable evidence of the estuary's development and its use by past communities. This resource is of value both for its own sake and for the contribution that it can make towards education, recreation and the local economy.

Only a proportion of the archaeology of the estuary is documented and legally protected. Protected sites include Scheduled Ancient Monuments, such as Oldaport, Designated Wreck Sites in Bigbury Bay; Listed Buildings such as Flete and Mothecombe Houses, Registered Historic Parks & Gardens, such as Flete, and a number of village centre Conservation Areas. In terms of individual sites of archaeological or historic interest and the wider landscape, the majority of the historic environment has no statutory protection - although certain historic field boundaries are given protection by the 1997 Hedgerow Regulations. Therefore, protection of the historic environment of the Erme Estuary depends heavily on appropriate management and planning at a local level, involving awareness of its presence and importance and on careful management and stewardship by landowners, local authorities and all other individuals and organisations with an interest in the estuary.

The submergence of the river valleys that created the ria coastline also submerged important evidence of past environments, such as the remains of a prehistoric forest beneath Bigbury Bay, and may have sealed archaeological remains of former dryland sites beneath marine clays and silts. The settlement of the estuary hinterland in the later prehistoric and Romano-British period is attested by the presence of a number of

farmstead sites; such as at Scobbiscombe, Butland, and Fernycombe and by the Iron Age hillfort at Oldbury/Holbury and Roman finds at Oldaport. The discovery of 40 or so tin ingots of late prehistoric or late Romano-British or 'Dark Age' date, from a site in Bigbury Bay (now a Designated Wreck Site), is a significant find indicating long-distance trade and exploitation of the mineral resources of the hinterland. Post-Roman or 'Dark Age' activity has been recorded eroding from the beach at Meadowsfoot Beach. Evidence from this period is very rare in the southwest, and its discovery here, and at Bantham Ham on the Avon, indicate the importance of the South Devon estuaries in continuing trade contact with the Mediterranean world. The possible fortification of Oldaport, which may be of the Saxon period, may show the continuing importance of the Erme Estuary as an access and trading point for the region into early medieval times. There is a concentration of wrecks at the mouth of the estuary, in Bigbury Bay, particularly around Great Mary Rocks and West Mary Rocks. These sites represent various periods of seafaring, from possibly as early as the Iron Age, including two Designated Wrecks from the 16th - 18th Century. A number of maritime and industrial sites and buildings can be found along the estuary, including tide mills, lime kilns and Coastguard cottages. There is also a significant concentration of quarries along the valley sides. A number of these are designated as Regionally Important Geological Sites. In addition to industry, the estuary also contains significant 'landscapes of leisure'. On a small scale there are fishponds at Pamflete and a bathing pool at Meadowsfoot Beach. On a grander scale are the parkland and gardens around Flete House, which originated in the 16th and 17th centuries but are largely a 19th century creation. The continuing importance of the Erme Estuary as an access to the Devon hinterland is reflected in some of its most recent archaeology - the two Second World War pillboxes at Meadowsfoot and at the Coastguard cottages.

However, our knowledge and understanding of the historic environment of the Erme Estuary is incomplete. Whilst the County Sites & Monuments Register (SMR) records sites of archaeological and

historic interest in and around the estuary that are currently known, many historic features to be found around estuaries – lime kilns, fish traps, old quays, former ship building and repair sites, boat hulks and so on – have yet to be properly investigated. To date no Historic Audit of the estuary has been undertaken, nor have detailed surveys of the surrounding parishes. Future survey work and finds will undoubtedly add to our understanding. The Devon Historic Landscape Characterisation Project, currently in progress, will also aid in the interpretation of the hinterland of the estuary.

Concerns and issues;

■ **Lack of systematic survey of historic and archaeological features**

There is great potential to undertake further survey work in order to improve understanding of the Erme's archaeological and historic interest. Of particular importance would be: an Historic Audit of the whole estuary; investigation of intertidal coastal and estuarine areas where there is potential for well-preserved archaeological and environmental evidence; evaluation of the extent of the 'Dark Age' site at Meadowsfoot Beach; investigation of the multi-period occupation of Oldaport.

■ **Management of coastal erosion and new coastal defences**

The extent of the threat of erosion to coastal and intertidal sites, and what management would be appropriate to each circumstance, is little understood. Meadowsfoot Beach is an example of ongoing monitoring and emergency 'rescue' archaeology. The construction of defences to counter natural erosion can also constitute a threat to known archaeological sites and to areas of archaeological potential.

■ **Management of archaeological and historic structures and buildings**

Again the condition of these sites, and what management may therefore be required and appropriate, is little understood.

■ **Development pressures**

Development pressures, such as housing and infrastructure projects, have perhaps not been major issues in the Erme Estuary.

The guidance contained in PPG15 – standing buildings/conservation areas etc., PPG16 –archaeology and PPG20 – Coastal Planning, should be followed, in particular by being fully reflected in Structure and Local Plans. The key is awareness of the historic environment amongst developers and planners and, above all, early consultation. In brief, the most important archaeological remains and their settings should normally be protected from all development. In other cases the need for a given development must be weighed against the importance of the archaeology. Where a development goes ahead there may be need for detailed archaeological work – 'preservation by record'.

Changes in land management regimes

The conversion of former pastureland to arable or woodland (or to energy crops/ biomass) can cause considerable damage to archaeological sites, as can drainage/ improvement of low-lying pasture. The County Archaeological Service already provides input to the Woodland Grant Scheme and Countryside Stewardship, and will be happy to provide land managers with advice on appropriate management on appropriate management of individual sites on their holdings and whether or not proposed changes in land use have archaeological implications. Again, early consultation will be a key factor.

Concerns and issues;

- reported lack of systematic survey and recording of historic and archaeological features
- reported the deterioration in condition of some features of historic importance
- conservation (archaeological) of Mothecombe Beach
- discourage irresponsible metal detecting within estuary
- encourage archaeological survey of farmland/woodland before any significant changes in land management, such as new deep ploughing - especially within low lying areas of valley

No.	Action	Implementation	Responsibility	Priority
E60	Undertake Historic Audit of the Erme estuary.	Undertake Historic Audit of the Erme estuary and produce a detailed management plan for those significant historic features	DCCA*	H
E61	All developments on archaeological sites to contain appropriate conditions.	Consult Devon County Archaeological Service for development proposals on all substantial development proposals or known or suspected archaeological sites.	SHDC, DCCA	O
E62	Consult Devon County Archaeological Service on all developments below 10m OS map contour.	Consult Devon County Archaeological Service for development proposals below 10m OS map contour of sites adjacent to estuary. Investigate grants towards costs.	SHDC, DCCA	O
E63	Seek to manage use of metal detectors within terrestrial archaeological sites.	Consult with Devon County Archaeological Service over sensitive archaeological sites and seek to manage use of metal detectors within those areas. Advertise metal detection restrictions.	Flete, LO, DCCA	H
E64	Survey land for archaeological interest before changing land management.	Encourage the consultation of Devon County Archaeological Service before carrying out significant changes to land/farm management. Investigate grants towards costs.	DCCA, SHDC	M
E65	Survey mudflats for buried archaeological features.	Investigate possibility of surveying mudflats for buried archaeological features using non-intrusive methods with Devon County Archaeological Service.	DCCA*,	L
E66	Encourage the further conservation of the designated wreck sites.	Advertise the designated wreck sites on the relevant charts. Prepare code-of-conduct for divers and make available from local dive shops and air suppliers. Emphasise that diving must be permitted by the licensee of the licensing regulations.	Flete, DCMS, NAS, SWMAG	M
E67	Prepare conservation action plans for local archaeological sites.	Prepare conservation action plans for Mothercombe Beach dark ages midden, Oldaport and other sites as known or discovered.	DCCA*, Flete	H
E68	Encourage the conservation of important paleo-environmental sites.	Carry out a desk survey of known and likely paleo-environmental sites and seek to conserve them. Prepare code-of-conduct for archaeological surveys to minimise damage to sites.	DCCA*, PU	L

* - in partnership with other unidentified agencies and subject to funding.

Research and monitoring

15

Objective

To encourage the highest standards of scientific research and monitoring surveys, with minimal environmental impact, that are of value to the conservation management, understanding of the estuary and/or its ecological processes.

High quality survey and monitoring is vital to the continued management of the estuary, through;

- helping to raise the understanding of the estuary and its processes,
- helping to establish baseline fauna and flora lists of the various communities and habitats of the estuary for future comparison,
- identifying important species etc. for prioritised conservation programmes such as the Biodiversity Action Plans
- helping to monitor species populations and habitat community structures
- highlighting changes that may require active conservation if needed.

Scientific research can help the sustainable management of the estuary in many ways, through;

- increasing our understanding of the estuary and/or its communities (and/or species) enabling us to fine tune or even alter the management of the estuary,
- encouraging a greater understanding of the local environment by the local and wider community,
- potentially answering many of the questions and gaps in our knowledge of estuarine ecology.

To this end, it is important that research, particularly that which will directly benefit the management of the estuary, is encouraged. EEMAG may wish to publish a 'wish list' of desired research projects and encourage a licensing system of research permits. Dr Keith Hiscock of the Marine Biological Association has offered to referee estuarine/marine research project proposals - to ensure that the environmental impact of the research is kept

to a cost/benefit minimum. Those involved in research should also be encouraged to carry out a Health & Safety risk assessment and adhere to their own recommendations; adhere to any environmental code-of-conduct that they agree to; seek the permission of the appropriate landowner and to pass a copy of the resultant report to the Conservation Management Group.

There are several areas of the estuary, especially those underwater, where there is a lack of knowledge concerning habitat details, habitat extent or conservation priority. Some priority should be given to baseline survey these habitats, so that the conservation of the habitat or their species may be considered. It is also very important that the various saltmarshes are accurately mapped, allowing growth/erosion monitoring and conservation proposals to be considered. All survey results should be made freely available to the

relevant Devon Biological Recording Centre [bar administration costs], to allow informed decisions to be made at both local and national level.

Issues;

- notification system for survey/research work and register of research projects to be established - managed by MCO to encourage non-invasive research appropriate to the sensitivity of the area and of use to the active management of the estuary.
- Marine Biological Association to referee - Dr Keith Hiscock
- encourage biological survey and records link with Devon Biological Recording Centre and details of the survey undertaken to MarLIN.

No.	Action	Implementation	Responsibility	Priority
E69	Notification system for survey/research work and register of research projects to be established.	Code-of-conduct for permissible projects to be established. Consult MBA (or other appropriate academic body) as referee for academic research projects. Promote photographic monitoring. Records to be kept on research studies.	MCO, MBA, Flete, DBRC, UoP	M
E70	Encourage biological records/data to be lodged with Devon Biodiversity Records Centre.	Encourage biological survey and records link with Devon Biological Recording Centre. Inform MarLIN of surveys undertaken, together with details of data collected and data access.	MCO, DBRC	M
E71	Encourage survey/research work that would be of benefit to the conservation management of the estuary.	Advertise desirability of positive and sustainable scientific surveys, environmental impact assessments and research work to all potential Universities and University departments.	MCO, EN, MBA, Flete, DBRC, UoP	M

16

Climate and sea-level change

Objective

To encourage the commencement of a monitoring system of climate and sea-level changes and encourage the development of research into the effects of such changes on the estuary and the appropriate adaptation of the EMP.

Global sea level **is** rising, the volume of Arctic ice **is** thinning, many glaciers **are** retreating, in some parts of the world, rainfall **is** becoming heavier. Evidence suggests that these trends **are** a consequence of an increase in emissions of so called 'Greenhouse Gases'. In 1996 the Intergovernmental Panel on Climate Change (IPCC) concluded that *"the balance of evidence[now] suggests that there is a discernible human influence on the climate,"* and suggest that a 60-70% reduction of greenhouse gas emissions could stabilise the atmosphere and minimise the effects of climate change. Even with this reduction global temperatures may still increase by 0.7C° by 2100, however, current industrial practices have not yet met these recommended targets and emissions rates remain high. In light of this, climate change

and sea-level rise seem inevitable. Whilst there is confidence in the predictions of change, scientists and policy-makers still do not have a full assessment of the implications of climate change and cannot be certain about the nature and extent of associated impacts. **No-one can be sure about the actual effects of climate change on the ways that we live and work but this should not be a reason to avoid considering the issue.** The impacts of dramatic changes in climatic conditions can be direct or indirect, and may worsen in the longer term. Thus, climate change will threaten the continuation of the prosperity of the locality and will present increasing risks to people, property, economic activity and natural resources (Climate Challenge Conference 1999).

The difficulty with addressing the possible impacts of climate change within the EMP is that this management plan covers a five-year period, a time-scale within which the effects of climate change and sea-level rise will almost be unnoticeable. However, given the magnitude of changes predicted over the 50 to 100 year time frame and awareness of the issue in the earliest stages, continued research and monitoring might help the development of adaptive responses that can reduce the impacts of changing climates if and when they occur.

Scientifically, there is a high level of confidence in determining changing levels of greenhouse gases and sea-levels. However, there is less confidence in predicting increased storminess and intense precipitation, variables that are the most significant for estuarine communities. This level of uncertainty must be borne in mind when investigating the impact of climate change and sea-level rise on the Erme estuary, as the development of an inappropriate adaptive strategy could have significant managerial and cost implications.

Direct effects

Under the 'business-as-usual' scenario, where current practices continue with no attempt of managed adaptation, Climate Challenge 1999 predicted a number of direct changes that the coastal regions of the South-West can expect by 2050, including:

1. A sea-level rise of 0.2-0.8m, in contrast to a 0.2m increase at Newlyn, Cornwall since 1915.
2. An increase in annual temperatures of 0.8-2.3C° in contrast to the 0.3C° increase since 1900.
3. A higher frequency and magnitude of storm surges around the coast.
4. An increase in annual precipitation, especially during the winter, and storm surge frequencies will increase the number of coastal and estuarine flood incidents. This is expected to be magnified in areas already prone to floods, such as low lying land and steep sided valleys.

Higher sea levels during storm periods may cause higher storm waves that will increase coastal erosion, this is of particular concern at coastal headlands, as cliff erosion may have secondary impacts on the coastline and the estuary. Communities and transport infrastructure in coastal and estuarine regions are at direct risk from rising sea-level and changes in storminess,

with low-lying areas being at particular high risk of flooding at high spring tides. In the Erme estuary, property on the lower banks with boat houses and some access tracks may be at risk from damage.

Indirect effects

Wildlife has always been sensitive to climatic changes, however, change on this scale may be too rapid to allow successful adaptation or evolution. This is particularly important given the SSSI conservation designation to the Erme as there are extensive regions of mud-flat and salt-marsh, and the breeding, roosting and feeding sites of birds could be affected. Furthermore, increased water temperatures, that may arise from a northern shift of the Gulf stream, could encourage algal blooms, which will influence existing water quality and the composition of existing ecology, and a northern shift of migratory fish stocks, which will influence the fishing economy.

Research undertaken by the University of Plymouth has revealed concentrations of lead, cadmium, copper and nickel within the Erme sediments, due to a direct metal effluent output from historic mining contained within the upper reaches of the catchment. The metals are concentrated at two distinct horizons, 26cm and 36cm from the surface (Price unpublished 2000). There is a significant risk that the uppermost sediment layers within the estuary may become remobilized by natural processes and human activities, including through climate change, precipitation, the re-alignment of channels, and a persistent intensity of 'wading' and use of motorised craft. As the sediment is disturbed, the pollution horizons may be disrupted, re-suspending the heavy metal content into the estuarine water. As the incidence of suspended metal loads increases, there is an increased risk of biological contamination that is characterised by a reduction in faunal biodiversity. In turn, this can affect fisheries, shell-fish and water quality standards. Also, unlike biological material, metals fail to degrade and tend to bioaccumulate within the food chain. Lead and cadmium have the greatest tendency to bioaccumulate, and therefore, have become priority pollutants. However, both are of relatively low toxicity to marine flora and fauna. Copper has a greater level of toxicity to organisms, and in estuaries where the complete changeover of waters by tidal flushing takes time, the persistence of this metal can be long-term. At present, there is little indication to suggest a high level of heavy metal contamination outside of the sediment.

However, that is not to assume that it may not occur and, in light of predictions of future climate change, the possibility of heavy metal contamination may become significant in the future. Therefore, there is a recommendation to encourage further research by the University of Plymouth and maintain the precautionary principle until circumstances change.

Increased precipitation, flooding and storminess can potentially threaten the structural viability of soils and river banks. Soil runoff is suggested as one of the most significant problems for the estuary. The predictions for increased precipitation will not be equally spread across the year, where the winter will be characterised by flooding and the summer by droughts. During the winter, intense rainfall may cause rapid ground saturation and standing surface water, and any additional rainfall will be washed into the river and estuary carrying a proportion of surface soil with it. The increased river discharge and turbidity that results may cut into river banks as the channel is widened to capacitate the larger water volume. Both of these processes may have negative consequences for the water quality and siltation of the estuary (for more detail refer to Chapter 9: Soil Runoff and Chapter 7: Water Quality) Further long-term effects associated with increased runoff and erosion could include a raised influx of soil nutrients and fertilisers, herbicides, pesticides and microbiological contaminants such as *E. coli* into the estuary.

Therefore, considering the widespread ramifications of predicted changes on urban and natural environments, coastal and estuarine flooding are major issues for concern. However, while prediction forecasts contain many uncertainties and national adaptation strategies remain in their infancy, the recommended actions for the duration of this EMP focus on continuing research, monitoring and modelling of the possible effects and scenarios of climate and sea-level change. The aim at this

stage is to prioritise research to provide the most relevant information to local authorities and businesses.

The EMP does identify some actions that could be considered in the long-term, emphasising the requirement for more resources and the clarification of current responsibilities if the Erme estuary is to respond and adapt effectively to the changing climate with minimum disruption to urban communities, flora and fauna, agricultural practices, and fisheries over the next 50 to 100 years.

The permission should always be sought from the landowner and nothing within this plan may be taken to suggest that researching bodies can undertake fieldwork without consent.

The Erme estuary has become an ideal location to focus research into the impacts of climate change on flora and fauna communities due to its relatively undeveloped setting and close proximity to the University of Plymouth, which has geographical and geological departments have interests in climate change and sea-level rise. Despite the long-term scale of predicted changes, under the precautionary principle, prevention is considered to be better than cure and the commencement of a research programme will facilitate the identification of change before it becomes detrimental to the estuarine environment. In light of this, and anticipated continued research by schools and universities, the Erme estuary management plan contains a detailed set of actions for implementation for the duration of the plan which is hoped to become a 'model' for other local estuaries in terms of managing climate change, to which the outcomes of the Erme research can be transferred, where relevant.

Concerns and issues:

- need for further survey and research into the identification of the *real* impacts of climate change on the Erme estuary – investigate indicators
- raise public awareness to encourage diversification and response.
- encourage the investigation into levels of uncertainty regarding increased storminess and precipitation predictions.
- need to identify appropriate adaptive response for nature conservation – a combination of natural or facilitated migration, facilitated colonisation and/or artificial colonisation.

No.	Action	Implementation	Responsibility	Priority
E72	Develop a monitoring programme of the coastal zone.	Monitor changes in coastal erosion rates and research into long-term soft-engineering coastal defence options. Model rates of sediment movement, so as to indicate the need of action if beaches deteriorate. Analyse the risk of remobilising riparian/estuarine toxic sediments and their associated effects.	Flete, SHDC, UoP *	0
E73	Modelling the positive and negative impact of climate change on the tourist industry.	Model the positive impacts of changing climates – extensions to the tourist season, increases economic income from outdoor activities. Model the negative impacts of changing impacts – increased visitors create increased pressure on the natural environment and a demand for better access etc.	UoP *	0
E74	Research into impact on fisheries.	Model the impact of climate change on fish stocks, species diversification and migratory patterns.	DSFC, DEFRA, UoP *	0
E75	Research into climate change and 'best-practice' land-use management.	Identify the impact of sea-level rise on the visual landscape, including the loss of some urban areas and access routes. Model the socio-economic effects of change on local economies Examine the reduction of arable agriculture if soil quality diminishes, and the impact of a transition to pastoral. Identify sustainable crops that may be more suitable for the conditions predicted through climatic change in the region.	DEFRA, UoP *	0
E76	Encourage research of heavy metals concentration in the estuarine sediment as a monitoring tool.	Encourage, under consent of Flete Estate, continued research of sediment content by University of Plymouth. Identify options for reducing the impact of a contamination event if circumstance arises in the long-term: - possibility of managing human activity that presents a risk of sediment remobilization.	MCO, Flete, UoP *	0

Further actions are recommended for consideration so as to prepare for possible future scenarios.

No.	Action	Implementation	Responsibility	Priority
E77	Identify the real impacts of climate change	Identify the short- and long-term specific impacts of climate change on the estuary, specifically for flooding, water resources and hydrology, biodiversity, agriculture and soils, business and tourism and cultural heritage. Encourage further research from the University of Plymouth.	UoP *	0
E78	Relation of predicted changes into realisation of increased flood risk.	Identify long-term weaknesses of coastal defence provisions. Improve flood risk knowledge, awareness and identification. Use planning to deter development on upper terraces and identify the high costs of 'no-action' as opposed to adaptation.	UoP *	0
E79	Identification of adaptive strategies to protect nature conservation areas.	Identify appropriate adaptive responses based on the value of the habitat at risk. Improve the existing management and protection of designated sites, ensuring that the relevant authority addresses the impacts of climate change. Suggest that buffer zones are incorporated into designations to aid habitat adaptation.	DBRC, EA, EN, SHDC	0
E80	Incorporation of climate change issues into current land-use and sectoral planning systems.	Aid the development of 'climate sensitive' planning processes which integrate climate risks into future urban and natural land-use planning. Improve the methodology of risk assessments to identify all possible threats and opportunities associated with climate change.	EU and National Policy	0

* - in partnership with other unidentified agencies and subject to funding.

For a more detailed report on the issues and outcomes of Climate Challenge for the South West please refer to:

<http://www.climatic-challenge.org.uk>

17

The management programme

Objective

To seek to manage the Erme estuary in a way that is sustainable to the estuarine environment and actively involves the local community, recreational users and commercial interests of the estuary.

Management plans should be seen as active working documents, only as up-to-date as the day they were written and may evolve as we learn, discover and grow within our environment from day to day. The EMP will encourage best practice, adapting to change and evolving new practices based on the current best knowledge and/or if necessary the precautionary principal.

The Erme estuary management plan aims to conserve the environment of the estuary, in its widest sense, for its biological, historical and aesthetic interests, as well as for its local human community who enjoy those interests. In order to engage the community in the spirit of the management plan, it is important to encourage a feeling of 'ownership' of the estuary and its management plan. To this end, it is not only important to engage the local community in the consultation process of the management plan but also the active promotion and implementation of the plan. There may also be particular areas of expertise within the local community that might be encouraged.

It will be important to identify the lead authority and/or persons for specific issues within the management plan and, also, those likely to be involved in their implementation. It is envisaged that the SHDC Marine Conservation Officer will co-ordinate the implementation of the plan on a day-to-day basis; reporting to EEMAG biannually where the majority of local decisions affecting the estuary may take place. EEMAG may also wish to engage local persons to keep an eye on the estuary at the most local level.

Issues;

- encourage the involvement of volunteers and the local community in the active implementation of the management plan and/or local conservation projects
- Estuary Management Plan to be reviewed and updated as necessary - at least every 5 years commencing in 2007/2008.

No.	Action	Implementation	Responsibility	Priority
E81	Ensure the final Environmental Management Plan dovetails with all other relevant management plans.	Consult Local Environment Agency Plan and Area of Outstanding Natural Beauty management teams on a regular basis. Encourage the update of the various plans, including the EMP, when appropriate.	MCO, EA, CCS	H
E82	Encourage the involvement of volunteers in the implementation of the management plan	Encourage the involvement of volunteers and the local community in the implementation of the management plan and active conservation projects. Investigate funding to cover volunteers' 'out of pocket' expenses.	MCO, LO, EEMAG, SHDC, DWT, BTCV	M
E83	Encourage local community conservation volunteer task force.	Advertise for local volunteers to form volunteer conservation task force.	MCO, LO, EEMAG, SHDC, DWT, BTCV	M
E84	Review Environmental Management Plan as a whole at least every 5 years.	Review Environmental Management Plan as a whole at least every 5 years. Commence review in 2007/2008	MCO, EEMAG All	H

Organisations and individuals consulted

Appendix

A

Agricultural Development and Advisory Service

Arjo Wiggins Fine Papers

British Trust of Conservation Volunteers

British Trust for Ornithology

Clyng Mill

Coast and Countryside Service - SHDC

Country Landowners Association

Dartmoor National Park Authority

Department for Environment, Food and Rural Affairs

Devon County Archaeological Service,
Devon County Council

Devon Birdwatching and Preservation Society

Devon County Council

Devon Sea Fisheries Committee

Devon Wildlife Trust

Environment Agency

English Nature

Ermington Parish Council

Forestry Commission

Flete Estate

Farming and Wildlife Advisory Group

Holbeton Parish Council

Ivybridge Town Council

Kingston Parish Council

Marine Biological Association

Marine Conservation Society

Modbury Parish Council

National Farmers Union

University of Plymouth

Royal Society for the Protection of Birds

Royal Yachting Association

Rural Development Service

South Hams District Council

South Hams Ramblers Association

South Hams Society

South West Federation of Sea Anglers

South West Marine Archaeological Group

South West Water

Devon County Geological Sites

St Anchorite's Rock

District: South Hams

Parish: Holbeton

Site reference no. SX54NE

National grid ref: 591472

OS sheets: 1:50k 202 1:25k 1362
1:10k SX54NE **GS 1:50k** 355/356

Locality description (address):

St Anchorite's Rock, on coast path 2 km west-south-west of Mothecombe.

Nature of site:

Cliff top tor and quarry (D) on inland side.

Geological/geomorphological features:

Dolerite intruded into Meadfoot Beds. The rock is relatively fine-grained, dark greenish grey, with small feldspar phenocrysts 1-2mm long. The dolerite is in contact with light greenish grey, silty slate in the northern face of the quarry on the north side of the rock. The contact exposed appears generally conformable with the slaty cleavage which dips 70° south-east and strikes 070°. The dolerite itself shows a weak foliation etched out by weathering on the southern face which is near vertical or dips steeply south-west and strikes 105°. Slate exposed in pits to the east of the rock is in a position which indicates that the intrusion narrows eastwards. Planar jointing dips to the NE is particularly prominent, giving the outcrop a bedded appearance. It seems likely that, although the foliation in the dolerite is not parallel to that in the surrounding slate, the intrusion predates the main phase of deformation.

Reasons for registration as a Regionally Important Geological/ Geomorphological Site:

The rock demonstrates a basic igneous intrusion into Meadfoot Beds with erosion during the Pleistocene etching out the harder dolerite from the less resistant slate to form a tor feature

Site sensitivity: None

Safety: Safe.

Interest groups:

Schools. Years 5-11: Years 12-16: Years 17-18.

University. Undergraduate - Research - Professional geologists - Amateur geological groups - General public.

Access and Parking:

Access from the Battsborough Cross - Noss Mayo road by the coastal footpath feeder path 2 km west of Battsborough Cross. Walk south to the coastal footpath and east c. 1.25 km. St Anchorite's Rock is a prominent feature. Limited parking (2-3 cars) on the road near the footpath signpost. |A longer approach takes the footpaths south of Battsborough Cross.

Date of assessment (V = visited): V
8th December 1995 R T Taylor

Site owner : Public access to the seaward side of the rock.

Other comments:

Site shows evidence of geological field activity. Better access to the quarry would avoid the need to hammer the more visible seaward side of the rock.

Tor Rock

District: South Hams

Parish: Kingston

Site reference no. SX64NW 1

National grid ref: 63604885

OS sheets: 1:50k 202 1:25k 1362
1:10k SX64NW **GS 1:50k** 349

Locality description(address):

Outcrop beside the road between Great Torr and Great Orcheton about 1km north of Kingston.

Nature of site: Natural tor outcrop c. 50 m long by 10 m high

Geological/geomorphological features:

Tor Rock is a natural outcrop of a hard, very fine-grained, pinkish, acid igneous rock (microgranite or felsite). The intrusion is intensely quartz veined, mainly along planar joints. Some of these quartz veined surfaces show slickensides. The height

and dimensions of the outcrop, compared with the dip of the cleavage of the slate at Pipers Cross suggest that the intrusion cuts across the cleavage. Head deposits in the road bank opposite contain large fragments of the felsite. Large boulders around the tor indicate that it has behaved as an upstanding outcrop during the Pleistocene.

Reasons for registration as a Regionally Important Geological/ Geomorphological Site:

The two related sites Tor Rock and Pipers Cross Quarry (SW64NW 2) display unusual rhyolitic rocks within slates of the Dartmouth Group. They are the only remaining accessible occurrences of these rocks as several old quarries have been filled in. The chemistry of these rocks is relevant to the interpretation of the Variscan orogeny in the South West.

Site sensitivity: None

Safety: Generally safe

Interest groups:

Schools. Years 5-11: Years 12-16: Years 17-18.

University. Undergraduate - Research - Professional geologists - Amateur geological groups - General public.

Access and Parking:

Access to Tor Rock is direct from the road. Part of the rock is at the roadside. Nearby roadside parking is limited to field entrances 2-3 cars or a minibus.

Date of assessment (V = visited) :

V 11th October 1995 R T Taylor

Site owner :

Other comments:

References:

Durrance, E. M. 1985. Lower Devonian acid igneous rocks of South Devon: Implications for Variscan plate tectonics. *Proceedings of the Ussher Society*, Vol. 6 pp. 205-210

Ussher, W.A.E. 1902. The Geology of the country around Kingsbridge and Salcombe. *Memoirs of the Geological Survey, England and Wales*. London, HMSO.

Pipers Cross Quarry

District: South Hams

Parish: Kingston

Site reference no. SX64NW 2

National grid ref: 63654880

OS sheets: 1:50k 202 1:25k 1362
1:10k SX64NW GS 1:50k 349

Locality description (address):

On the road between Great Torr and Great Orcheton at the south east corner of the roads at Pipers Cross about 1km north of Kingston

Nature of site: Quarry (D) small.

Geological/geomorphological features:

Pipers Cross quarry shows an E-W face 3-4 m high, the upper part is formed of reddish brown slate of the Dartmouth Group and the lower part of a hard siliceous reddish brown igneous rock resembling rhyolite. The contact is approximately conformable with the slaty cleavage which dips 30-40° south, but in detail appears to be cross cutting. The slate is hardened for about 0.5m above the contact

Reasons for registration as a Regionally Important Geological/ Geomorphological Site:

The two related sites Pipers Cross Quarry and Tor Rock (SW64NW 1) display unusual rhyolitic rocks within Dartmouth Group slates and are the only remaining readily accessible occurrences. The chemistry of these rocks is relevant to the interpretation of the Variscan orogeny in the South West.

Site sensitivity: None

Safety: Generally safe.

Interest groups:

Schools. Years 5-11: Years 12-16: Years 17-18.

University. Undergraduate - Research - Professional geologists - Amateur geological groups - General public.

Access and Parking:

Access to the quarry direct from the road, it is gated and marked 'private'. Nearby roadside parking is limited to field entrances 2-3 cars or a minibus.

Date of assessment (V = visited) :

V 11th October 1995 R T Taylor

Site owner :

Other comments:

The quarry is currently being used as a manure store but the face is accessible.

References:

Durrance, E. M. 1985. Lower Devonian

acid igneous rocks of South Devon: Implications for Variscan plate tectonics. Proceedings of the Ussher Society, Vol. 6 pp. 205-210.

Ussher, W.A.E. 1902. The Geology of the country around Kingsbridge and Salcombe. *Memoirs of the Geological Survey, England and Wales*. London, HMSO.

Waterloo Quarry

District: South Hams

Parish: Ermington

Site reference no. SX65SW 1

National grid ref: 6413 537

OS sheets: 1:50k 202 1:25k 1357
1:10k SX65SW GS 1:50k 349

Locality description (address):

On hillside west of the Ivybridge to Ermington road c. 800m NNE of Ermington.

Nature of site:

Quarry (D) small/medium cut into hillside, faces rising to 40m.

Geological/geomorphological features:

Dolerite, generally fine grained, dark greenish grey and altered. Some primary plagioclase laths occur in the least altered rock which is extremely hard. Quartz and epidote occur as patchy segregations sometimes with calcite. Epidote is also developed as ramifying veinlets. Soft, fibrous tremolite occurs as narrow veins *in situ*, and both epidote and tremolite are found in loose fragments. The rock in the centre of the quarry is generally massive with slickensided joints. There is a general development of southerly dipping movement planes. At south side of the entrance the dolerite is soft and fine grained, it is apparently in conformable

contact with the cleavage of the slate. The cleavage dips 68° south-east and strikes 045°. At the north side of the entrance the dolerite is also fine-grained, softer and more chloritised. It has a distinct foliation dipping south-east at about 30°.

Reasons for registration as a Regionally Important Geological/ Geomorphological Site:

The fibrous tremolite developed in this dolerite is unusual and, together with the development of epidote, demonstrates the effects of metasomatic alteration on a basic igneous rock.

Site sensitivity: None

Safety:

Generally safe but care needed as the floor of the quarry is very uneven in places.

Interest groups:

Schools. Years 5-11: Years 12-16: Years 17-18.

University. Undergraduate - Research - Professional geologists - Amateur geological groups - General public.

Access and Parking:

Parking is possible in a large lay-by on east side of road c. 250m north of field gate

Date of assessment (V = visited) :

V 18th October 1995 R T Taylor

Site owner : Sir S Day. Caton, Ermington.

Other comments:

Faces generally overgrown, mossy and shaded by small trees but there is some good exposure. Some earth and tree stumps dumped. Site would benefit from some clearance

References:

Ussher, W.A.E. 1912. The geology of the country around Ivybridge and Modbury. *Memoirs of the Geological Survey, England and Wales*. London, HMSO.

Research projects and publications that are relevant to the Erme estuary and of interest to this Estuary Management Plan.

Chapter 4: Nature Conservation

- Barn Owl Trust 1992/1993 Flete Estate Survey: Interim Report

*The results of a detailed survey of the Flete Estate for the presence of breeding or roosting sites of the barn owl *Tyto alba.*, including details of the site and owner, a location grid reference, and attached comments and updates, for areas where barn owl presence on the estate is confirmed. Furthermore, the report recommends management measures to secure nesting boxes and increase the small mammal density so as to maintain the barn owl population.*

- King, S. (1991) An investigation into the ecological effects of oil on a rocky shore, with particular reference to limpet populations. University of Plymouth. As part of the module BL 302.

Following the oil spillage from the Rosebay 1990, this report examines limpet populations from different shore habitats to determine the effects of the oil on the limpets, and the limpets contribution to the breakdown and dispersal of the oil. The results note the changing distribution of limpets, sponges, anemones and rock pools from June to September, but state that the results regarding the oil breakdown/dispersal are inconclusive.

- Lee, S. C. R. (1995) Little egrets *Egretta garzetta garzetta* in the Erme and Yealm Estuaries, South Devon: Their behaviour and habitat-use, spatial distribution, prey species and population dynamics. University of Plymouth with English Nature. As part of BSc. (Hons) Environmental Science.

This paper studies the increasing population of Little egrets in the Erme estuary, of which little is actually known. It discusses their history and present conservation status and examines their feeding, preening, and resting behaviour within regions of open water, mudflat, saltmarsh and woodland, so as to determine the effects of tidal regime on the population. This data is also compared with the results of an identical study of the Yealm, the latter being the wider and larger of the two.

Chapter 7: Water Quality

- Loxton, A. (1996) Investigation into inputs in the Erme estuary and their effect on the bathing waters at Mothecombe. Devon Area Internal report by National Rivers Authority South Western Region.

After the bathing waters at Mothecombe failed to comply with the bathing water directive in 1986 and 1994 an investigation into the water quality of the Erme. It concluded that one of the factors of Mothecombe's 'failure' was the inflow of contaminated water from the Erme estuary. This paper further investigates the possible origins of contamination to the River Erme that could cause non-compliance, specifically the discharges of effluent from Holbeton, Modbury, Ivybridge and Ermington STW's and freshwater discharge through the tidal cycle. The report concludes that the STW's did not have a significant detrimental effect on the water quality of the estuary's mouth.

- Stubbles, S.J., Green, J.C., Hart, M.B. and Williams, C.L. (1996) The ecological and palaeoecological implications of the presence and absence of data: Evidence from benthic foraminifera. Proceedings of the Ussher Society, 9, pp.054-062
- Stubbles, S.J., Green, J.C., Hart, M.B. and Williams, C.L. (1996) Responses of foraminifera to presence of heavy metal contamination and acidic mine drainage. Presented at the "Minerals, metals and the environment II" conference, Prague 1996. University of Plymouth

- Stubbles, S.J. (1995) Seasonal variation in agglutinated foraminiferan standing crops in the marsh and tidal flats of the River Erme, Devon. In Kaminski, M.A., Geroch, S., and Gasiński, M.A. (eds.) Proceedings of the Fourth International Workshop on Agglutinated Foraminifera: Grzybowski Foundation Special Publication. No. 3, pp. 265-270

These three papers discuss the monitoring of pollution using the responses of benthic foraminifera as primary indicators used to determine the impact of past, present and future contamination of heavy metals. Such metals may be preserved within the sediment, a residue of the heavy industrial activity that characterised Devon and Cornwall, and form a distinctive pollution horizon within the sediment layer. Being sensitive to pollution, the effects of which can cause low diversity, low standing crops, a high frequency of deformed tests and acid etched tests. Changes in benthic foraminifera populations and distribution may be indicative of a pollution incident that may otherwise go undetected, and potentially threaten the biodiversity and recreational value of the catchment.

- South Hams District Council publication. Potential disaster: The case for increased protection of the South Hams coastline against pollution arising from shipping accidents at sea. Devonshire Press

The pamphlet sets the Erme in a broader context, examining the need to protect the South Hams from the potential threat of pollution arising from shipping accidents at sea. After outlining the environmental and economic value of South Hams coastline it makes a series of management recommendations to minimise the adverse effects of pollution incidents.

Chapter 8: Fisheries

- Walsingham, M.V. (1995) An evaluation of the migratory salmonid fisheries of the River Erme, with particular reference to the establishment of a commercial rod and line fishery in the Flete Estate. Royal Agricultural College/ University Nottingham. As part of MSc./Postgraduate Diploma in Rural Estate Management.

This paper considers the ecology of the Erme and its migratory salmonid stocks to develop a management strategy for the establishment of a commercial rod and line fishery in the Flete Estate. Through the evaluation of the physical conditions of the estuary, the behaviour of the salmonid stocks and the obstructions to their migration, the paper discusses the options for effective management, including: the possibility of issuing day tickets; and leasing the fishing rights to a small syndicate, an angling association or on a timeshare basis. After discussing problems associated with angler access and numbers, revenues and fishing catch quality, the most effective and economically viable suggested management approach to the Erme fisheries is the leasing of fishing rights to a small number of easily contactable individuals.

- Walsingham, M.V. (On behalf of the Flete estate) River engineering works to improve angling conditions in the Flete fishery: A brief summary report.

This paper discusses the possibility of constructing river engineering works to improve the provision of specific "lies" for the occupation of salmon and sea trout stocks in the Erme estuary. It discusses how human alterations to the channel profile, and engineering techniques to combat erosion, may create lies that form target areas for bait and line fishing, as well as outlining the effects of such works up and downstream of two case study sites.

Chapter 14: Historical Environment

- Erme Estuary Wreck Site Survey Report 1993/94. Department of National Heritage Protection of Wrecks Order 1991. Designation No. 1. Swivel gun breechblock from the site.
- Erme Estuary Wreck Site Survey Report 1992/93. Department of the Environment Protection of Wrecks Order 1991. Designation No. 1. Artefacts from the site.

Part of a continued survey of the protected Wreck site in the Erme estuary, including a reappraisal of the interior and exterior of the main site and that of the finds in the gully of the Mary's Reef. The report discusses the commencement of a full survey of the bay, the process of identification and removal of artefacts and recommends continuous conservation,

such as the preservation of artefacts in chemical solutions and timber in Polyethylene Glycol. It also includes maps and plans of the wreck site, illustrations of selected artefacts along with a summary progress report of Proposed 1994 Electronic Sensing Survey in conjunction with Sonardyne LTD that appears as an appendix in the 1993/94 report.

- Holt, P. (1995) Erme Estuary Site Survey: Survey Report 1995. South West Archaeology Group

Details of a continuing remote sensing survey of the site, utilising methods of surface positioning, depth measurement, magnetic target detection, acoustic positioning, side scanning, bathymetry and sub-bottom profiling and pulse induction metal detection. The results include maps of depth contours, seabed type and a land and seabed DTM (Digital Terrain Modelling) model and further recommends the completion of the survey, a target investigation, the re-positioning of previous work and the development of techniques.

Other relevant issues: Sea-level change and microfaunal studies.

- Corcoran, M. A reconstruction of the palaeoenvironment of the Erme estuary, using foraminifera as indicators. University of Plymouth. As part of BSc. (Hons) Geography: GGY293 Sea-level Change.

This study uses foraminifera to interpret the palaeoenvironmental conditions of the Erme. The data collected from a marsh in close proximity to the estuary, and analysed in accordance to the living conditions and characteristics of the foraminifera. The results conclude that, despite sea-level rise, the Erme has experienced a regression due to the silting up of the estuary.

- Charman, D.J., Roe, H., and Gehrels, W.R. (1999) Saltmarsh testate amoebae and sea-level: Zonation and response to environmental variables. University of Plymouth

This research uses testate amoebae from two saltmarshes on the River Erme as a potential for sea-level reconstruction. This is achieved by investigating a relationship between zonation and elevation, examining the similarity of zonation patterns and testing the reliability of the amoebae as sea level indicators. The results reveal a positive relationship between zonation and elevation, the principal environmental factors determining population assemblages being elevation and flood duration. In conclusion, the similarity in qualitative zonation changes between marshes could be used in interpreting fossil assemblages, and subsequently to incur trends of past sea-level. However, the study also recommends that qualitative techniques at individual sites may yield more accurate results.

- Cootes, E. (1998) Occurrence of epiphytic foraminifera in a saltmarsh at the Erme estuary, South Devon. University of Plymouth. BSc (Hons) Dissertation

This study examines the primary environmental controls that affect epiphytic foraminifera, and investigates whether the distribution of this type differs from that of saltmarsh surface foraminifera. A further study examines the impact of foraminifera in detritus on the reliability of marsh foraminifera death assemblages as a tool for reconstructing palaeoenvironmental conditions. In using samples from saltmarsh vegetation and detritus material in the estuary, a pattern of zonation related to salinity distribution and elevation was revealed, a pattern that is replicated by both types of species. Furthermore, the foraminifera in the detritus was revealed to be calcareous, and dissolved in the low pH of the saltmarsh sediments, therefore having a negligible impact on the foraminifera death assemblage and the reliability of the death assemblage as a palaeoenvironmental indicator.

- Gehrels, W.R., Roe, H.M., and Charman, D.J. (2001) Foraminifera, testate amoebae and diatoms as sea-level indicators in UK saltmarshes: a quantitative multi-proxy approach. University of Plymouth. Journal of Quaternary Science. Vol 16, pp201-220

The vertical zonation of foraminifera, testate amoebae and diatoms in the Erme and Taf (S. Wales) was investigated in an assessment of their use as multi-proxy indicators of sea-level change.

- Harwood, J. (1998) Microdistributions of saltmarsh foraminifera in the Erme estuary, South Devon, U.K. University of Plymouth. BSc. (Hons) Geography dissertation

*This research examines the factors that control the abundance and distribution of benthic foraminifera in a saltmarsh of the Erme estuary. The results reveal that ecological zonation characterises the distribution of the foraminifera, where individuals of *Jadammina macrescens* and *Miliammina fusca* were dominant throughout the study, and concludes that the combination of all biotic and abiotic factors controls this distribution.*

- Humphrey, I. (1998) The relationship between substrate particle size and test wall grain sizes of agglutinated foraminifera: A case study of the Erme estuary, South Devon, U.K. University of Plymouth: BSc (Hons) Geography dissertation

*This paper investigates the probability of a relationship between substrate particle size and grains utilised when the foraminifera construct their tests. The research focuses around three species; *Jadammina macrescens*, *Miliammina fusca* and *Trochammina inflata*, all found within the Erme estuary. The results reveal that the *Jadammina* spp. and *Trochammina* spp. choose grain size independently, and no relationship was revealed. However, a relationship is identified for the *Miliammina* spp.*

- Jefford-Horn, A. (1997) Reconstructing the Palaeoenvironments of the Erme estuary from a series of surface samples and a core study, using foraminifera as indicators. University of Plymouth. As part of BSc. (Hons) Geography: GGY 297 Sea-level Change

This research investigates foraminifera compositions across seven samples so as to establish the existence of a pattern of zonation. The results reveal that agglutinated species characterise the reed dominated areas, and calcareous species dominate the tidal flats. In conclusion, the presence of clear boundaries makes foraminifera important indicators of sea level change and their study useful in reconstructing past environments.

- Marshall, W. (2000) An examination of Late Holocene saltmarsh sediments in the Erme estuary, SW England and the response to relative sea-level change and sedimentation. University of Plymouth. As part of BSc. (Hons) Earth Science: GGY 297 Sea-level Change

This paper discusses relative sea-level evolution in the Late Holocene as examined in a saltmarsh located in the Erme estuary. Using sediment core analysis from samples from the estuary, the identification of foraminifera zonation patterns, and the presence of foraminifera in the modern inter-tidal surface, is used to infer characteristics about sedimentary environments within the tidal frame. An overall regression is identified due to silting up of the estuary.

For further information about the Erme catchment and estuary

The Environment Agency (2001) Avon and Erme Second Annual Review

The Environment Agency (2000) Avon and Erme First Annual Review

The Environment Agency (1998) Local Environment Agency Plan, Rivers Avon and Erme Consultation Report.

The Environment Agency (1998) Local Environment Agency Plan, Avon and Erme Action Plan.

Wildlife sites that fall within the Erme catchment area

Appendix

D

Data supplied by the Devon Biodiversity Records Centre

File Code	Site Name	Grid Reference	Area (ha)	Site Description	Status
SX64/001	Battisborough	SX602470	24.0	Mixed farmland with bird interest	CWS
SX64/004	Fernycombe Beach to Hoist Point	SX617461	21.9	Cliff communities, coastal grassland and scrub.	CWS
SX65/031	Flete Wood	SX615516	30.8	Coniferous & broadleaved plantation on an ancient woodland site	CWS
SX65/036	Kityball Wood	SX619508	3.9	Ancient semi-natural woodland (partly replanted with conifers) & unimproved neutral grassland	CWS
SX65/038	Venges Brake	SX621503	5.8	Ancient semi-natural woodland	CWS
SX65/040	Yarnicknowle Wood	SX624507	5.8	Ancient semi-natural woodland largely replanted with broadleaves & some conifers	CWS
SX65/041	Yarnicknowle Fen	SX627508	2.4	Swamp vegetation	CWS
SX65/046	Ermington Wood	SX640525	25.0	Mixed plantation on an ancient woodland site, marshy & semi-improved grassland	CWS
SX65/048	Wadland Wood	SX643548	6.5	Ancient semi-natural woodland partly replanted with conifers	CWS
SX65/053	Butland Wood	SX645503	6.0	Ancient semi-natural woodland partly replanted with conifers	CWS
SX65/054	Stidson's Copse	SX656550	3.8	Ancient semi-natural woodland mostly replanted with mixed plantation	CWS
SX65/056	Sheepham Mill	SX657527	1.4	Marshy and unimproved neutral grassland and tall herb vegetation	CWS
SX65/051	Edmeston	SX646521	3.3	Marshy and semi-improved neutral grassland	CWS
SX65/027	Ramsland	SX608512 & SX608509	2.4	Broadleaved woodland, marshy grassland, unimproved & semi-improved neutral grassland & tall herb vegetation	CWS
SX64/003	Efford House Field	SX620493	1.0	Semi-improved neutral grassland	Unc
SX65/009	Drew & Westover Woods	SX632555	5.2	Ancient semi-natural woodland	Unc
SX65/011	Yeolands Farm	SX636551	1.0	Semi-improved neutral grassland	Unc
SX65/013	Filham House	SX648554	1.3	Ponds with dragonfly interest	Unc
SX65/044	Yeolands Farm	SX637548	1.5	Semi-improved neutral grassland	Unc
SX65/043	East Worthele	SX636546	2.6	Secondary broadleaved woodland	Unc
SX65/050	Thornham	SX643539	0.8	Semi-improved neutral grassland	Unc
SX65/049	Lower Keaton	SX643545	2.8	Semi-improved neutral grassland & secondary broadleaved woodland	Unc
SX65/042	Northstock Wood	SX630547	3.6	Ancient semi-natural woodland	Unc
SX65/052	Coltlass Farm	SX645513	13.8	Semi-improved neutral grassland	Unc
SX65/037	Holbeton Field	SX620501	2.3	Unimproved neutral grassland	Unc
SX64/011	Wastor	SX638493	13.4	Secondary broadleaved woodland & semi-improved neutral grassland	Unc
SX65/045	Ermington	SX638537	10.2	Semi-improved neutral grassland	Unc
SX64/007	St.James' Field	SX635478	0.5	Marshy and semi-improved neutral grassland	LWS
SX64/006	Orcheton Mill	SX635497	0.9	Marshy grassland	LWS, part SSSI
SX65/014	Whiteleigh Fields	SX656553	1.2	Unimproved neutral grassland	LWS
SX65/047	Ashridge	SX639505	0.5	Semi-improved neutral and marshy grassland	LWS
SX65/028	Luson Cross	SX610501	3.7	Unimproved and semi-improved neutral grassland	LWS
SX65/055	Quarry Woods	SX659548	1.9	Secondary broadleaved woodland	LWS
SX64/002	Erme Estuary	SX 624491	438.3	Estuary and associated habitats	SSSI
SX64NW1	Tor Rock	SX636488	0.1	Natural tor outcrop of pinkish, acid igneous rock	RIGS
SX64NW2	Pipers Cross Quarry	SX637488	0.1	Quarry of slate from Dartmouth group and igneous rock resembling rhyolite	RIGS
SX65SW1	Waterloo Quarry	SX641537	0.4	Quarry of Dolerite with veins of Epidote & Tremolite	RIGS

Definitions:

Sites of Special Scientific Interest (SSSI): these are notified by English Nature because of their plants, animals or geological features (the latter are geological SSSIs or gSSSI). English Nature needs to be consulted before any operations likely to damage the special interest are undertaken. SSSI is a statutory designation with legal implications.

County Wildlife Sites (CWS): these are sites of county importance for wildlife, usually designated on the basis of the habitat but sometimes also on the basis of the known presence of particular species. This is not a statutory designation like SSSIs, and does not have any legal status. County Wildlife Sites are usually included in Local Plans as sites of substantive nature conservation interest and are covered by Planning Policy Guidance note nine (PPG9). CWS designation does not demand any particular actions on the part of the Landowner but may increase eligibility for land management grants.

Local Wildlife Sites (LWS): these are sites of significant wildlife interest within a local context which do not reach the criteria for County Wildlife Sites.

Potential County Wildlife Sites / Unconfirmed County Wildlife Sites (pCWS or Unc): these are sites identified as having possible interest but not fully surveyed. Some of these sites will be areas of significant wildlife interest.

Regionally Important Geological and Geomorphological Sites (RIGS): these are earth science sites that are of regional or local importance. Like CWS, they are included in Local Plans and referred to under PPG9.

Ancient Woodland: Ancient Woodland is a term applied to woodlands which have existed from at least Medieval times to the present day without ever having been cleared for uses other than wood or timber production. A convenient date used to separate ancient and secondary woodland is about the year 1600.

Notable Species that fall within the Erme catchment area

Appendix

E

Data supplied by the Devon Biodiversity Records Centre

Common Name	Scientific Name	Location	Date	WCA schedule	EU Status	UK Status
Badger	<i>Meles meles</i>	A3121, close to Haredon Cross, Ugborough.	04/05/99	WCA 6, BA	Bern III	
Badger	<i>Meles meles</i>	Above lane from Goutford Gate to Crownhill Cross,	01/02/99	WCA 6, BA	Bern III	
Badger	<i>Meles meles</i>	B3392, just past Seven Stones Cross	20/09/99	WCA 6, BA	Bern III	
Badger	<i>Meles meles</i>	B3392, near Kingston and A379	07/99	WCA 6, BA	Bern III	
Badger	<i>Meles meles</i>	Drew Woods	09/06/00	WCA 6, BA	Bern III	
Badger	<i>Meles meles</i>	Dunwell Wood	16/10/92	WCA 6, BA	Bern III	
Badger	<i>Meles meles</i>	Flete Wood	04/09/92	WCA 6, BA	Bern III	
Badger	<i>Meles meles</i>	Garden Cottage, Cleeve	05/06/00	WCA 6, BA	Bern III	
Badger	<i>Meles meles</i>	Garden Cottage, Cleeve	05/06/00	WCA 6, BA	Bern III	
Badger	<i>Meles meles</i>	Garden Cottage, Cleeve	09/06/00	WCA 6, BA	Bern III	
Badger	<i>Meles meles</i>	Garden Cottage, Cleeve	10/06/00	WCA 6, BA	Bern III	
Badger	<i>Meles meles</i>	Garden Cottage, Cleeve	10/06/00	WCA 6, BA	Bern III	
Badger	<i>Meles meles</i>	Garden Cottage, Cleeve	10/06/00	WCA 6, BA	Bern III	
Badger	<i>Meles meles</i>	Garden Cottage, Cleeve	11/06/00	WCA 6, BA	Bern III	
Badger	<i>Meles meles</i>	Garden Cottage, Cleeve	11/06/00	WCA 6, BA	Bern III	
Badger	<i>Meles meles</i>	Garden Cottage, Cleeve	12/06/00	WCA 6, BA	Bern III	
Badger	<i>Meles meles</i>	Garden Cottage, Cleeve	12/06/00	WCA 6, BA	Bern III	
Badger	<i>Meles meles</i>	Garden Cottage, Cleeve	05/06/00	WCA 6, BA	Bern III	
Badger	<i>Meles meles</i>	Long lane SW of Kingston	08/99	WCA 6, BA	Bern III	
Badger	<i>Meles meles</i>	North Stock Woods	09/06/00	WCA 6, BA	Bern III	
Badger	<i>Meles meles</i>	Whympston Farm	18/05/00	WCA 6, BA	Bern III	
Bastard Balm	<i>Melittis melissophyllum</i>	Erme Valley, nr Torr Down	1985			DN2; NS
Blackbird	<i>Turdus merula</i>	Ermington Wood	21/09/92			Amber
Blue Tit	<i>Parus caeruleus</i>	Butland Wood	06/10/92			UKBAP3
Blue Tit	<i>Parus caeruleus</i>	Ermington Wood	21/09/92			UKBAP3
Blue Tit	<i>Parus caeruleus</i>	Wadland Wood	31/10/92			UKBAP3
Bluebell	<i>Hyacinthoides non-scripta</i>	Stidson's Copse	11/09/92			UKBAP3
Bluebell	<i>Hyacinthoides non-scripta</i>	Whiteleigh Fields	11/09/92			UKBAP3
Brown Hare	<i>Lepus capensis</i>	Gnaton Hall, near Yealmpton	13/03/99			DBAP; UKBAP1
Buzzard	<i>Buteo buteo</i>	Dunwell Wood	16/10/92			UKBAP3
Buzzard	<i>Buteo buteo</i>	Edmeston	10/10/92			UKBAP3
Buzzard	<i>Buteo buteo</i>	Ermington Wood	21/09/92			UKBAP3
Buzzard	<i>Buteo buteo</i>	Yarnicknowle Wood	25/08/92			UKBAP3
Cirl Bunting	<i>Emberiza cirius</i>	Battisborough	1992			UKBAP2, UKBAP2+, DBAP
Clouded Yellow	<i>Colias croceus</i>	Luson Cross	18/08/92			Migrant
Common Dormouse	<i>Muscardinus avellanarius</i>	Garden, Modbury	04/11/93	WCA 5, 6	EC Iva; Bern III	DBAP; UKBAP1
Common Frog	<i>Rana temporaria</i>	29 Brook Road, Ivybridge	02/00	WCA 5(S)	EC Va; Bern III	UKBAP3
Common Frog	<i>Rana temporaria</i>	Pond at 23 Ivydene Road, Ivybridge.	04/00	WCA 5(S)	EC Va; Bern III	UKBAP3
Common Frog	<i>Rana temporaria</i>	Pond at 23 Ivydene Road, Ivybridge.	04/00	WCA 5(S)	EC Va; Bern III	UKBAP3
Common Frog	<i>Rana temporaria</i>	Pond at Broadaford Farm, Ivybridge.	04/00	WCA 5(S)	EC Va; Bern III	UKBAP3
Common Frog	<i>Rana temporaria</i>	Pond at Broadaford Farm, Ivybridge.	04/00	WCA 5(S)	EC Va; Bern III	UKBAP3
Common Frog	<i>Rana temporaria</i>	Ramsland	08/92			UKBAP3
Common Frog	<i>Rana temporaria</i>	Sheepham Mill	13/09/92	WCA 5(S)	EC Va; Bern III	UKBAP3
Common Toad	<i>Bufo bufo</i>	Ashridge	06/10/92			UKBAP3
Common Toad	<i>Bufo bufo</i>	Pond at 23 Ivydene Road, Ivybridge.	04/00	WCA 5(S)	Bern III	UKBAP3
Goldcrest	<i>Regulus regulus</i>	Ermington Wood	21/09/92			UKBAP3
Goldfinch	<i>Carduelis carduelis</i>	Edmeston	10/10/92			Amber; UKBAP3

Common Name	Scientific Name	Location	Date	WCA schedule	EU Status	UK Status
Goldfinch	<i>Carduelis carduelis</i>	St. James' Field	12/06/92			UKBAP3
Goldfinch	<i>Carduelis carduelis</i>	Venges Brake	02/09/92			UKBAP
Great Tit	<i>Parus major</i>	Edmeston	10/10/92			UKBAP3
Great Tit	<i>Parus major</i>	Ermington Wood	21/09/92			UKBAP3
Grey Bush Cricket	<i>Platyceis albopunctata</i>	Fernycombe Point to Hoist Point CWS	01/07/92			Nb
Grey Wagtail	<i>Motacilla cinerea</i>	Orcheton Mill	30/10/92			UKBAP3
Ivy-leaved Crowfoot	<i>Ranunculus hederaceus</i>	Sheepham Mill	13/09/92			UKBAP3
Kestrel	<i>Falco tinnunculus</i>	Butland Wood	06/10/92			UKBAP3
Kestrel	<i>Falco tinnunculus</i>	Fernycombe Beach to Hoist Point	07/92			UKBAP2, UKBAP2+
Linnet	<i>Carduelis cannabina</i>	Fernycombe Beach to Hoist Point	07/92			UKBAP2, UKBAP2+
Linnet	<i>Carduelis cannabina</i>	St. James' Field	12/07/92			UKBAP2, UKBAP2+
Mallard	<i>Anas platyrhynchos</i>	Orcheton Mill	30/10/92			UKBAP3
Marsh Tit	<i>Parus palustris</i>	Wadland Wood	31/10/92			Amber; UKBAP3
Meadow Pipit	<i>Anthus pratensis</i>	Edmeston	10/10/92			UKBAP3
Nuthatch	<i>Sitta europaea</i>	Ermington Wood	21/09/92			UKBAP3
Nuthatch	<i>Sitta europaea</i>	Wadland Wood	31/10/92			UKBAP3
Nuthatch	<i>Sitta europaea</i>	Yarnicknowle Wood	25/08/92			UKBAP3
Otter	<i>Lutra lutra</i>	A379	05/00	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Clyng Mill/Orch	18/06/97	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Clyng Mill/Orch	21/09/97	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Clyng Mill/Orch	16/03/97	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Clyng Mill/Orch	20/12/97	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Ivybridge	16/03/99	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Ivybridge	17/06/99	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Ivybridge	23/09/99	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Ivybridge	12/12/98	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Ivybridge	15/03/97	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Ivybridge	13/06/97	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Ivybridge	14/09/97	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Ivybridge	19/12/97	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Ivybridge	14/03/98	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Ivybridge	19/06/98	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Ivybridge	11/09/98	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Ivybridge	15/03/97	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Ludbrook	16/03/99	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Ludbrook	17/06/99	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Ludbrook	23/09/99	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Ludbrook	12/99	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Ludbrook	19/06/98	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Ludbrook	13/06/97	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Ludbrook	14/09/97	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Ludbrook	29/12/97	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Ludbrook	14/03/98	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Ludbrook	11/09/98	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Ludbrook	12/12/98	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Ludbrook	16/03/97	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Pamflete Pond	21/03/98	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Pamflete Pond	15/06/98	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Pamflete Pond	16/09/98	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Pamflete Pond	13/12/98	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Pamflete Pond	13/12/98	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Pamflete Pond	09/03/99	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Pamflete Pond	09/03/99	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Pamflete Pond	27/06/99	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Pamflete Pond	26/09/99	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Pamflete Pond	21/03/98	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Ringmore	15/03/97	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Ringmore	14/03/98	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Ringmore	15/03/99	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Ringmore	15/03/97	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Sequer's Bridge	16/03/97	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Sequer's Bridge	18/06/97	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Sequer's Bridge	19/09/97	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Sequer's Bridge	20/12/97	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Sequer's Bridge	21/03/98	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Sequer's Bridge	21/03/98	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Sequer's Bridge	15/06/98	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Sequer's Bridge	15/09/98	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Sequer's Bridge	12/12/98	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Sequer's Bridge	09/03/99	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Sequer's Bridge	25/06/99	WCA 5	EC Ila, IIIa; Bern II	DBAP; UKBAP1

Common Name	Scientific Name	Location	Date	WCA schedule	EU Status	UK Status
Otter	<i>Lutra lutra</i>	Sequer's Bridge	22/09/99	WCA 5	EC IIa, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Sequer's Bridge	16/03/97	WCA 5	EC IIa, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Shilston Bridge	13/09/97	WCA 5	EC IIa, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Shilston Bridge	13/12/97	WCA 5	EC IIa, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Shilston Bridge	19/03/98	WCA 5	EC IIa, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Shilston Bridge	16/06/98	WCA 5	EC IIa, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Shilston Bridge	20/09/98	WCA 5	EC IIa, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Shilston Bridge	12/12/98	WCA 5	EC IIa, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Shilston Bridge	12/12/98	WCA 5	EC IIa, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Shilston Bridge	12/03/99	WCA 5	EC IIa, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Shilston Bridge	10/06/99	WCA 5	EC IIa, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Shilston Bridge	29/09/99	WCA 5	EC IIa, IIIa; Bern II	DBAP; UKBAP1
Otter	<i>Lutra lutra</i>	Shilston Bridge	14/06/97	WCA 5	EC IIa, IIIa; Bern II	DBAP; UKBAP1
Primrose	<i>Primula vulgaris</i>	Ermington Wood	21/09/92			DBAP
Primrose	<i>Primula vulgaris</i>	Flete Wood	04/09/92			DBAP
Primrose	<i>Primula vulgaris</i>	Ramsland	08/92			DBAP
Primrose	<i>Primula vulgaris</i>	Stidson's Copse	11/09/92			DBAP
Primrose	<i>Primula vulgaris</i>	Wadland Wood	31/10/92			DBAP
Primrose	<i>Primula vulgaris</i>	Yarnicknowle Wood	25/08/92			DBAP
Smooth Newt	<i>Triturus vulgaris</i>		02/00	WCA 5(S)	Bern III	UKBAP3
Sparrow-hawk	<i>Accipiter nisus</i>	Yarnicknowle Wood	25/08/92			UKBAP3
Stoat	<i>Mustela erminea</i>	Minor road between Yealmpton and Holbeton	03/03/00		Bern III; CITES (UK reservation)	
Stonechat	<i>Saxicola torquata</i>	Fernycombe Beach to Hoist Point	07/92			UKBAP3
Treecreeper	<i>Certhia familiaris</i>	Wadland Wood	31/10/92			UKBAP3
Western Gorse	<i>Ulex gallii</i>	Fernycombe Beach to Hoist Point	07/92			UKBAP3
White-throat	<i>Sylvia communis</i>	St. James' Field	12/06/92			UKBAP3
Wren	<i>Troglodytes troglodytes</i>	Edmeston	10/10/92			UKBAP3; UKBAP2+; UKBAP2; endemic
Wren	<i>Troglodytes troglodytes</i>	Ermington Wood	21/09/92			UKBAP3; UKBAP2+; UKBAP2; endemic
Wren	<i>Troglodytes troglodytes</i>	Venges Brake	02/09/92			UKBAP3
Wren	<i>Troglodytes troglodytes</i>	Wadland Wood	31/10/92			UKBAP3; UKBAP2+; UKBAP2; endemic
Wren	<i>Troglodytes troglodytes</i>	Yarnicknowle Fen	25/08/92			UKBAP3
Wren	<i>Troglodytes troglodytes</i>	Yarnicknowle Wood	25/08/92			UKBAP3
Yellow-hammer	<i>Emberiza citrinella</i>	St. James' Field	12/06/92			UKBAP3

Appendix F

List of discharges and Consented Sewage Outlets

Data supplied by the Environment Agency

Consent No.	Discharge Site Name	Receiving Water	Outlet NGR
004296/TF/01	Mill Leat Trout Farm	River Erme	SX6408053360
004296/TF/01	Mill Leat Trout Farm	River Erme	SX6410053340
004296/TF/01	Mill Leat Trout Farm	River Erme	SX6412053320
004379/TF/01	Ludbrook Trout Farm	Lud Brook	SX6415053100
2898/43	Holbeton STW	River Erme Estuary	SX6246049790
DRA 1339	Southleigh Caravan Park	Tributary to River Erme	SX6840051700
DRA 1393	Flete House	River Erme	SX6295051400
DRA 1456	Bittaford STW	River Erme (S)	SX6650056600
DRA 1456	Bittaford STW	River Erme (S)	SX6650056600
DRA 1503	Ivybridge STW	River Erme	SX6280056100
DRA 759	Trehele Farm	Tributary to River Erme	SX6710051200
FDA 1331	Spring Cottage	Tributary to River Erme	SX6607054240
NRA-SW-0009	Widland Farm		SX6740051600
NRA-SW-0222	Ermington STW	River Erme (S)	SX6330052300
NRA-SW-0222	Ermington STW	River Erme (S)	SX6330052300
NRA-SW-0769	2-5 Fore Street	River Erme	SX6361056170
NRA-SW-1188	Ermington STW	River Erme	SX6330052300
NRA-SW-2720	Ermington Workshops	River Erme	SX6414053300
NRA-SW-3340	Wiggins Teape	Stowford Leat	SX6366056650
NRA-SW-5262	Anna Mill Business and Dist. Park	Tributary to Forder Brook	SX6780057340
NRA-SW-5358	Ivybridge Recycling Centre	River Erme	SY1100095500
NRA-SW-5669	Ivybridge STW	River Erme	SX6313055560
NRA-SW-5670	Ivybridge STW	River Erme	SX6312255725
NRA-SW-6213	Whiteley Farm	Lud Brook	SX6569055360
NRA-SW-6610	Heathfield Down Farm Barn Conversion	An unnamed tributary to the River Avon	SX6795050750
NRA-SW-7442	The Old Gas House	Ayleston Brook	SX6555051220
NRA-SW-7524	Plot 2 Merryfield		SX6508056130
NRA-SW-7732	Endsleigh Garden Centre (Staff WC)		SX6212055680
NRA-SW-7804	Wrangaton STW		SX6825057850
SWWA 2108	Filham STW		SX6502056220
SWWA 2259	Modbury STW	Ayleston Brook (S)	SX6533051390
SWWA 2259	Modbury STW	Ayleston Brook (S)	SX6540051350
SWWA 2344	New Mills Industrial Estate	Tributary to Ayleston Brook	SX6520051700
200018/PW/01	Meadow Cott. Willow Barn.	Tributary to River Erme	SX6335057700
NRA-SW-1329	Kingston STW	Kingston Stream	SX6380047400
NRA-SW-1674	Ugborough STW	Ugborough Stream	SX6760055500
200954	Minton Springs	Lud Brook	SX6617056090
200801	Orchard Barns	Tributary to Ayleston Brook	SX6609051110
200744	Low Mead	Tributary to Ayleston Brook	SX6585051990
200488	Brownston STW	Tributary to River Erme (S)	SX6970052770
201037	Fernham Cottage	Mill Leat	SX6420053650
DRA 771	Ramsland Farm	Tributary to River Erme	SX6080051200
201332	Seven Dwellings	Sheepharn Brook	SX6438051910
NRA-SW-5691	Stowford Mill	Leat on River Erme	SX6366056810
201757	Swanbridge Mill Farm CSO	Stream (S)	SX6565651338
201862	Erme Road CSO	River Erme (S)	SX6360256237
201861	Keaton Road CSO	River Erme (S)	SX6330255765
201860	Station Road CSO	River Erme (S)	SX6360656475
201962	Poundwell Meadow CSO	Stream (S)	SX6573251463
201685	Swanbridge Hotel CSO	Stream (S)	SX6571051410
201996	Ruffaton Cottage	River/Stream	SX6357049830
201975	Barns 1 & 2	Sub Surface Irrigation System	SX6751057880
NRA-SW-6965	Ugborough STW	Tributary to Lud Brook (S)	SX6753055400
NRA-SW-6965	Ugborough STW	Tributary to Lud Brook (S)	SX6753055400
NRA-SW-6965	Ugborough STW	Tributary to Lud Brook (S)	SX6753055400
NRA-SW-6965	Ugborough STW	Tributary to Lud Brook (S)	SX6753055400
202195/CS/01	Holbeton STW	River Erme (E)	SX6246049790
202170	Ivybridge Pavillion PCSO/EO	River Erme (S)	SX6319055580

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