Broadland Environmental Services Ltd

Strategic Environmental Assessment

Strategic environmental baseline

May 2003

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1 Introduction

1.1 Background to this report

1.1.1 This document on the strategic environmental baseline is part of a series of reports that makes up the Strategic Environmental Assessment (SEA) on the Broadland Flood Alleviation Project. The SEA for the Broadland Flood Alleviation Project sets out environmental standards for flood defence maintenance, improvements and first-time flood defences at undefended communities. These standards are the long-term context for BESL's work in Broadland during the Project.

1.1.2 The new SEA document is comprised of six parts:

1. Environmental Objectives;
2. Environmental Baseline (**this document**);
3. Environmental Specifications;
4. Environmental Monitoring;
5. Consultation Framework and
6. Strategic Appropriate Assessment (European sites).

1.1.3 Although the SEA cannot give binding commitments, it does seek to reflect stakeholder consensus. The SEA process will therefore ensure that scheme details are consistent with the agreed environmental objectives, policies and specifications.

1.2 Purpose of this report

1.2.1 This report sets out key aspects of the baseline environmental conditions in the project area that are most relevant to BESL's work.

2 Strategic environmental issues

2.1 Location and character

2.1.1 Broadland extends over the lower reaches of the Rivers Yare, Bure and Waveney together with their tributaries the Rivers Ant, Thurne and Chet. The lower reaches of these rivers are tidal up to between 40 and 50km from the mouth at Gt. Yarmouth.

2.1.2 Broadland contains a diversity of landscapes and wetland habitats that together give it a quality found nowhere else in the country. Recognised as an area of international importance for conservation it is also a significant agricultural resource and supports a wide range of tourist and recreational activities.

2.1.3 All of Broadland lies below the highest river levels that can occur and is therefore susceptible to flooding. Currently some 240km of floodbanks protect approximately 21,300 hectares of Broadland containing more than 1700 properties of which more than 1000 are residential.

2.1.4 Most of the original material used to construct these floodbanks was silty clay and many have deteriorated over time. Combined with changes to river channels, the floodbanks are now susceptible to seepage and are in danger of being undermined and/or subject to breaching.

2.1.5 Many floodbanks have also settled since they were built or last improved and are at risk of being overtopped by even fairly small tidal surges. Floodbank settlement will continue over time and the effects will be made worse by sea level rise: officially predicted to be 6mm per annum at Great Yarmouth. The combination of these effects works out to be the same as an average settlement rate of about 25mm/year.

2.1.6 In some parts of Broadland the existing defences are also threatened due to erosion of riverbanks caused by wind and waves, boatwash, normal river flows and the action of the tide. Although many areas have been protected by steel or timber sheet piles, much of this was installed over the last 40 years or so and now needs replacing.

2.2 Local communities and livelihoods

2.2.1 Undefended Communities. Although much of Broadland currently has some form of flood defence, not all areas do. There are several hundred properties including boatyards and riverside chalets that are subject to periodic flooding as in some places there are either no defences at all or where they exist, they are set well back from the river's edge. These areas can generally be divided into distinct settlements, commonly referred to as 'Undefended Communities'. These are:

Beccles	Potter Heigham	Surlingham
Brundall (E & W)	Reedham	Thurne
Chedgrave/Loddon	Somerleyton	Hoveton/Wroxham
Horning	St Olaves	Oulton Broad North

Bramerton, Burgh Castle and Stalham have also been identified as 'undefended communities' but they have no properties within them that qualify for protection under BESL's contract. All properties, whether in 'undefended communities' or not, will be considered during BESL's flood defence improvements.

2.2.2 Business. Boatyards involved in boat building make a substantial contribution (*circa* £141M) to the local economy. This industry is still generally carried out by small, often family-run businesses on established sites in riverside locations. Many of these businesses are based in Undefended Communities and therefore experience flooding. Although built locally, craft constructed in Broadland are often of a very high standard and can be found throughout the United Kingdom and mainland Europe. Provision of some level of flood defence is vital to many of these businesses.

2.2.3 Agriculture. Approximately two-thirds of land in Broadland is devoted to agriculture. Of this, about two-thirds again are grazed and the remainder is arable. Much of this grazed land in Broadland is supported by the Broads Environmentally Sensitive Area (ESA) scheme, a grant scheme run by the Department of Environment, Food and Rural Affairs (DEFRA) to enhance the landscape and conservation value of the area by encouraging the use of traditional farming practices. This includes the maintenance of high water levels in dykes on the gazing marshes. Conversion from arable farming to grazing is also supported by the ESA scheme. Recent falls in income have led farmers to consider diversifying their businesses, with provision of holiday accommodation or conversions of agricultural buildings, for example.

2.3 European nature conservation and biodiversity

2.3.1 Broadland is one of Europe's most important wetlands with 22% of the area designated for its local, national and international nature conservation value. There are 27 Sites of Special Scientific Interest (SSSI) all of which are designated as Special Protection Areas (SPA) for their bird life, candidate Special Areas of Conservation (cSAC) for their plants and other animal species, or both. These sites are also designated as wetlands of international importance under the Ramsar Convention.

2.4 European site issues/TRHaMP 's

2.4.1 BESL has developed the Tidal Rivers Habitat Management Plan (TRHaMP's) a strategic assessment of the Projects impacts on internationally designated sites and their features. The plan also considers the impacts, positive and negative, on habitats and species that fall outside of the designated areas. Its structure and content has partly been based on the Coastal Habitat Management Plan (CHaMP) that has been adopted for assessing long-term implications of changing coastal processes on designated habitats.

The TRHaMP will be used to:

- provide an inventory ('baseline') of habitats and species that are included as qualifying features of the internationally designated sites;
- quantify likely and, through updates, actual habitat change as a result of the works;
- identify and assess likely cumulative impacts of works on designated sites;
- inform decisions about compensatory habitat;
- identify key habitats and species outside of designated sites that need to be considered as part of the assessment process;
- ensure that works comply with relevant legislation;
- provide reference data and context for assessment of impacts of individual improvement schemes (each will require an Environmental Impact Assessment);

2.5 Wider biodiversity issues

2.5.1 Approximately 20% of Broadland is designated as SSSI. Many areas outside of the designated sites, however support important habitats and species including those identified in the Norfolk Biodiversity Action Plan (BAP). The species and habitats included are based mainly on those that were identified as being important at the

national level by the UK BAP (Anon 1995) but also include some that are characteristic of the region.

2.5.2 The habitats found within Broadland include reedbed, coastal and floodplain grazing marsh, eutrophic/mesotrophic lakes and fens. The amount of grazing marsh will reduce in locations where floodbank setback is implemented, however, overall there is anticipated to be an increase through the provision of compensatory habitat. Increased amounts of reedbed are predicted on rond areas. The fen and eutrophic/mesotrophic lake habitats will remain unaffected by the Project.

2.5.3 There are 20 relevant species with Action Plans from the Norfolk and/or Suffolk Biodiversity Action Plans. Where works are within suitable habitat or known sites for these species then surveys will be undertaken and any necessary mitigation measures will be implemented to avoid or minimise any impact. In addition, opportunities to extend / enhance their habitat or increase populations will be explored.

2.6 Landscape, cultural heritage and the built environment

2.6.1 Landscape. The Broadland landscape is made up of a distinctive relationship between the 'Broads' themselves (former Medieval peat workings that have flooded), rivers, reedbeds, fen, carr woodland and drained grazing marsh with some arable cultivation. Key features in the landscape are drainage mills and isolated farmhouses, cattle, field gates, pollarded willows and reed-fringed ditches.

2.6.2 Cultural heritage and the built environment. Few Conservation Areas (for the built environment) in Broadland lie wholly within the Project area. Conservation Areas are designated with the objective to preserve or enhance the character or appearance of their special architectural or historic interest. Many individual buildings, such as drainage pumps that used to drain the grazing marshes, are of particular architectural or historic interest and have statutory protection as Listed Buildings. Other buildings and structures may also have landscape, historic or architectural interest although they are not formally designated.

2.6.3 The best available guidance will be used in the characterisation of the Broads landscape. This largely draws on the Countryside Agency's Landscape Character Map for the Broads Natural Area. The Broads Authority consider this approach alone does not take account of the very sensitive and unique landscapes in the Broads. Hence they have commissioned a specific Broads Landscape

Characterisation study – work which, at the time of writing is still in progress. Once the baseline and analysis from that study is available it is expected that it will assist with future updates of the landscape component of the Broadland SEA and assessments of flood defence schemes at a detailed level. Its absence does not, however, affect BESL's confidence about the great majority of the scheme's landscape effects since landscape and visual impact assessments are conducted using best available techniques. BESL does already carry out landscape assessments for individual schemes as part of the process to evaluate environmental effects of its work at a detailed compartment level.

2.7 Cultural heritage

2.7.1 There are approximately 70 redundant drainage mills located in the Project area, of which some 30 - 40 are listed. Many are sited close to the river frontage, where protection from flooding has been provided by the Agency or its predecessors, through the maintenance of existing floodbanks.

2.7.2 The flood alleviation project will be providing improved flood defence through a combination of on-line strengthening and floodbank setback. The majority of Broadland mills will benefit directly from these improved flood defences. Bank setback is, however, the preferred solution where ronds are eroding rapidly or piling is beginning to fail. In these locations, new defences are likely to be located on the landward side of such mills and so will no longer provide protection. Up to four redundant drainage mills may be affected by setback. In the first five years of the project, however, BESL and the Norfolk Windmills Trust have identified three drainage mills that are likely to be affected by flood improvements. Early identification of these locations enables interested parties and organisations with a direct interest in the preservation and public interpretation of drainage mills to work with BESL as to how their longer-term future can best be secured.

2.7.3 No comprehensive database currently exists for other buildings and structures of historic and architectural interest (Listed Buildings). BESL will rely on local authorities' statutory planning registers to identify such buildings on a compartment-by-compartment basis as detailed proposals are brought forward. With regard to known archaeological resources, BESL will make use of the relevant County Councils' Sites and Monuments Register.

2.7.4 With regard to other important, but unlisted buildings of historic interest, BESL will rely on relevant authorities bringing .

2.7.5 Appendix 1 identifies, at a strategic level, where and when BESL's improvement works are likely to affect historic drainage mills. An evaluation is also made of the likely impacts on those mills on a compartment-by-compartment basis.

2.8 Recreation and tourism

2.8.1 Water based recreation. There are approximately 180 boat-related businesses (such as boat hire, boatbuilders, chandlers), 40 sailing clubs and 20 navigational organisations in the Broadland area. Together, they take advantage of the 200km of navigable waterways that make up the Broadland area. These waterways are open to the public for exploring by both powered and non-powered craft and are extensively used by both private boat owners and boat hirers. The main tourist season is between Easter and October. Broadland remains a popular destination with holidaymakers who want to enjoy a boating holiday.

2.8.2 Sailing races and regattas are also held by a number of the sailing clubs across Broadland. Local, national and international competitive sailing events are held during the summer months.

2.8.3 Land-based recreation. Public rights of way criss-cross Broadland, but most of them run along the top of the floodbanks. Horse riders and cyclists also use bridleways and "roads used as public paths". Footpaths provide access to riverbanks for the public and many people take advantage of this opportunity to exercise their right to fish, for watching birds, for walking their dog or for simple, quiet contemplation. Many of these public rights of way link sites of historical or archaeological interest as well as visitor centres and other facilities.

2.8.4 In some places footpaths have been improved to provide access for people with special needs or with mobility problems. BESL is working with a number of statutory and advisory organisations to identify how the needs of people with disabilities and mobility difficulties should be addressed where this is directly affected by BESL's flood defence work. While the Project will not be upgrading all footpaths to full mobility standard, for example, there will be opportunities to work in partnership with other organisations to highlight locations or types of situations where access improvements might be best targeted.

2.8.5 There is a public right to fish in Broadland and angling is a very popular past time for people both living within easy reach of the area and holidaymakers alike. Public footpaths give access to the riverbank for fishing. Moorings and purpose-built angling staging may also provide opportunities for anglers. The Broads Authority

and the Environment Agency are currently developing a Fisheries Action Plan in association with local angling interests.

2.8.6 A number of ronds (land between the water and the floodbank), particularly in the lower reaches of the Yare and Waveney, are shot over by wildfowling organisations.

2.8.7 Tourism. Opportunities for land-based tourism mostly include walking, cycling, bird watching and visiting nature reserves. There are numerous hotels, B&B's and a number of visitor centres providing land-based holiday accommodation, as well as camping and caravan sites.

2.8.8 Often, the best way fully to appreciate the character and qualities of Broadland is by boat. The opportunities for water-based tourism are wide-ranging and a large number of visitors to Broadland stay on both private and hire boats. Water-based tourism not only benefits boatyards, but also a wide range of associated businesses such as riverside pubs, restaurants, shops and visitor attractions. The hire boat industry also supports a network of riverside facilities to service visitors' needs. In 2002, it was estimated that the hire boat industry brought £11 million a year into the local economy through direct spending.

2.9 Material sourcing

2.9.1 At a strategic level of assessment, sourcing material locally from soke dykes seems likely to be achieved in most compartments. Experience progressing compartments 11 and 35 to date (and trial pits/boreholes) confirms that in these first, large schemes it is likely only soke dykes will need to be widened. This limits environmental damage and landowner disruption and is especially important in or adjacent to European sites.

2.9.2 Works need not necessarily avoid damaging European sites because there is an absence of viable and feasible alternatives. Damage will either be compensated for through the planning system or an equivalent habitat will be replaced on a voluntary basis to meet the Environment Agency's high-level objectives for the project overall. Thus, widening soke dyke drains for material sourcing is likely to be acceptable on balance.

2.9.3 Larger borrow pits in or adjacent to European sites are, however, unlikely to be 'necessary for the conservation management' of European sites and will require Appropriate Assessment (AA). AA in these cases will require an evaluation of

alternative sources of material, together with a full range of assessments about impact significance and effect on the integrity of the site. In such cases a planning application to the Minerals Planning Authority will usually require an EIA to evaluate likely significant environmental impacts.

2.9.4 A strategic assessment of soils and drift geology has been carried on a compartment basis. BESL's material sourcing assessment at this level indicates that, in the majority of compartments, adequate suitable material appears to be available locally for construction. The strategic material sourcing assessment contained in Appendix 2 identifies and evaluates the likely quality of material for construction. It highlights compartments where there *may* be a potential shortfall due to unsuitable soils either for material sourcing or due to ground conditions.

2.9.5 All, or parts, of compartments 3, 4, 10, 13, 15, 16, 17, 18, 19, 20, 21, 22, 25, 25a, 25b, 26, 27 *may* require some further investigation to determine local suitability. Pending those results, locations for borrow pits may be required.

2.9.6 As progressively more improvement works are carried out and a greater coverage of ground investigations becomes available, BESL will have a greater degree of certainty about the availability of material for construction. At this stage, the material sourcing assessment has been undertaken at a strategic level and this will indicate broad locations where more detailed scrutiny of availability is required, and in turn the feasibility of the strategic flood defence solution.

2.10 Strategic assessment of footpaths

2.10.1 Numerical analysis has been undertaken using BESL's strategic flood defence solutions against public rights of way maps. There will be permanent diversions where public rights of way will be diverted along new setback banks. BESL understands that such diversions will formally be required only where footpaths are diverted more than 5m from the existing definitive right of way. Temporary diversions will be required wherever there are works in progress effecting several footpaths at any one time.

2.10.2 Interim conclusions suggest there will be no loss of footpath length. Indeed, owning to the geometry of floodbank setback there is likely to be a modest permanent increase in the length of the footpath network. BESL expects that as a result of the project the standard of many of the rights of way will increase.

2.10.3 Appendix 3 identifies, on a strategic compartment basis, whether public rights of way are expected to be affected and the anticipated timing of flood defence improvements in those areas.

Appendix 1

Broadland Drainage Mills

No	Name	Listed Building status	Compartment	Provisional flood defence option	Provisional timing	Additional conservation information
1	Ashtree Farm	II	11 (Bure)	Strengthen and sheet pile	2008/9	
2	Mautby Marsh (House)	II	10	Strengthen and sheet pile	2015	
3	Five Mile House	II	11 (Bure)	Strengthen	2008/9	
4	Runham	II	11 (Bure)	Strengthen	2008/9	
5	Runham Swim	II	10	Manitain	n/a	
6	Six Mile House Drainage Mill	II	11 (Bure)	Setback from eroding rond	2008/9	On buildings at risk register
7	Stracey Arms	II*	11 (Bure)	Strengthen and maintain piles	2011/12	Norfolk Windmills Trust
8	Old Hall	Unlisted	10	Maintain	n/a	
9	Commision Mill	II	9	Strengthen	2015	

No	Name	Listed Building status	Compartment	Provisional flood defence option	Provisional timing	Additional conservation information
10	Hermitage Mill	Unlisted	37	Strengthen and sheet pile	2010/11	
11	Fleggburgh Mill	Unlisted	9	Away from river	n/a	
12	Clippesby Mill	II	9	Strengthen	2015	
13	Wiseman's Mill (or Oby Mill)	II*	9	Maintain and sheet pile	2015	
14	Tall Mill	II	1	Strengthen and maintain piles	2014/15	
15	Hobbs Mill	II*	Not in compartment - no flood defence option		n/a	Norfolk Windmills Trust
16	Horning Ferry	II	Not in compartment - no flood defence option		n/a	
17	Hoveton Marshes	Unlisted	Not in compartment - no flood defence option		n/a	
18	Belaugh Old Hall	Unlisted	Not in compartment - no flood defence option		n/a	
19	Kerrison's Level	II	11 (Bure)	Away from river	n/a	Norfolk Windmills Trust
20	Tunstalll Dyke Smock Mill	Unlisted	11 (Bure)	Away from river	n/a	
21	Tunstall Dyke	II	11 (Bure)	Away from river	n/a	

No	Name	Listed Building status	Compartment	Provisional flood defence option	Provisional timing	Additional conservation information
22	Parmer's Hollow Post Mill	Unlisted	1	Setback and retain piles	2010/11	
23	St Benets Level	II*	37	Strengthen	2010/11	
24	Thurne Dyke	II*	7	Strengthen and erosion protection	2014/15	Norfolk Windmills Trust
25	Ludham Staithe	Unlisted	6	Away from river	n/a	
26	Repps Level	Unlisted	7	Strengthen	2014/15	
27	High's Mill	II	6	Strengthen	2011/12	
28	Martham Level	II	7	Strengthen	2010/11	
29	West Somerton	II	6A	Maintain	n/a	
30	Hickling Broad	Unlisted	6A	Strengthen	2015/16	
31	Swim Coots Mill	II	Not in a compartment - No flood defence work proposed		n/a	
32	Stubb Mill	II	6A	Maintain	n/a	

No	Name	Listed Building status	Compartment	Provisional flood defence option	Provisional timing	Additional conservation information
33	Horsey	II*	6A	Maintain and maintain piles	n/a	
34	Brograve Mill	II	6A	Strengthen and erosion protection	2015/16	
35	Lambrigg Mill	II	Not in a compartment - No flood defence work proposed		n/a	
36	Randall's Mill	Unlisted	Not in a compartment - No flood defence work proposed		n/a	
37	Heigham Holmes	II*	6A	Maintain	n/a	
38	Ludham Bridge Tristle Mill	Unlisted	3	Retain piles	2013	
39	Ludham Bridge	Unlisted	5	Maintain and maintain piles	n/a	
40	Neave's Mill	II	3	Maintain and maintain piles	n/a	Norfolk Windmills Trust
41	Turf Fen	II*	3	No flood defence work proposed	n/a	Norfolk Windmills Trust
42	Boardman's Mill	II*	4	Setback and retain piles	2007/8	Norfolk Windmills Trust
43	Hunsett	II	Not in a compartment - No flood defence work proposed		n/a	

No	Name	Listed Building status	Compartment	Provisional flood defence option	Provisional timing	Additional conservation information
44	Barton Broad	Unlisted	Not in a compartment - away from river		n/a	
45	Dilham Dyke	Unlisted	Not in a flood compartment		n/a	
46	Berney Arms	(SAM)	11 (Yare)	No flood defence work proposed	n/a	English Heritage
47	Langley Detached	II	35	Strengthen	2008/9	
48	Six Mile House	II	35	Setback and return banks	2003	
49	Cadge's Mill	II	11(Yare)	Strengthen and sheet pile	2002/3	Norfolk Windmills Trust
50	Reedham Marshes	Unlisted	11 (Yare)	Away from river	n/a	
51	Polkey's Mill	II	11 (Yare)	Away from river	n/a	Norfolk Windmills Trust
52	Reedham Ferry North Side	Unlisted	12	Maintain and sheet pile	2012/13	
53	Norton Marshes	Unlisted	22	Maintain and maintain piles	n/a	
54	Langley No. 3	II	12	Strengthen	2004	

No	Name	Listed Building status	Compartment	Provisional flood defence option	Provisional timing	Additional conservation information
55	Hardley	II	20	Strengthen	2010/11	Norfolk Windmills Trust
56	Buckenham Ferry	Unlisted	15	Strengthen	2006/7	
57	Lockgate Mill	II	11 (Bure)	No flood defence work proposed	n/a	
58	South Walsham Mill	II	11(Bure)	Away from river	n/a	
59	High's Mill	II	11(Bure)	Away from river	n/a	Norfolk Windmills Trust
60	Mutton's Mill	II*	11(Bure)	Away from river	n/a	
61	Stone's Mill	II	11(Yare)	Away from river	n/a	
62	Boyce's Dyke	Unlisted	22	Away from river	n/a	
63	Black Mill	II	34	Strengthen	2015	
64	Caldecott Mill	II	34	Strengthen	2015	
65	Pettingell's Mill	II	35	Strengthen (front face)	2003	
66	Toft monks	II	35	Strengthen erosion protection	2008/9	
67	Fritton Marsh	II	33	Strengthen	2011	

No	Name	Listed Building status	Compartment	Provisional flood defence option	Provisional timing	Additional conservation information
68	St Olaves Windpump	II*	33	Strengthen and erosion protection	2008	Norfolk Windmills Trust
69	Ranworth	Not Listed	This has been moved now called 'Clayacks Mill' at How Hill		n/a	
70	Middle Marsh, Catfeild	Unlisted	Not in a compartment - away from river		n/a	
71	Mays Mill – Smallburgh	Unlisted	Not in a compartment - away from river		n/a	
72	Herringfleet	Unlisted	32	Strengthen	2011	
73	Somerleyton Marsh Mill	Unlisted	22	Maintain	n/a	
74	St Benets Abbey	II	5	Maintain	n/a	Mill inside SAM

Appendix 2

Strategic Material Sourcing Assessment

Compartment	Chainage	Materials	Potential for material sourcing *	Notes and Explanation
1	0 – 4452	Alluvium	V. good	
2	0 - 3094	Alluvium	V. good	
3	0 - 3096	Alluvium	Satisfactory	
3	3096 - 4593	Peat	V. poor	Need to identify a source of material outside of the compartment / sub compartment.
3	4593 - 5872	Alluvium	Good	
3	5872 - 6245	Peat	V. poor	Need to identify a source of material outside of the compartment / sub compartment.
4	0 - 898	Peat	V. poor	Need to identify a source of material outside of the compartment / sub compartment. Chainage 33 – 898 is within a SSSI
5	0 - 10967	Alluvium	Good	
6	0 - 11017	Alluvium	Good	
7	0 - 11435	Alluvium	Good	
8	0 - 1402	Alluvium	Satisfactory	

Compartment	Chainage	Materials	Potential for material sourcing *	Notes and Explanation
9	0 - 8486	Alluvium	V. good	
10	0 - 343	Sand and gravel	V. poor	Need to identify a source of material outside of the compartment / sub compartment.
10	343 - 3418	Alluvium	Good	
10	3418 - 4122	Alluvium	Poor	
10	4122 - 13288	Alluvium	V. good	
11 (Bure)	0 - 16042	Alluvium	V. good	
12	0 - 5235	Alluvium	V. good	
13	0 - 745	Made Ground	V. poor	British Sugar – Cantley. Need to identify a source of material outside of the compartment / sub compartment.
14	0 - 3581	Alluvium	V. good	
15	0 - 1673	Alluvium	V. good	
15	1673 - 2152	Peat	V. poor	Need to identify a source of material outside of the compartment / sub compartment. Chainage 1673 – 2152 is within a SSSI
16	0 - 2226	Peat	V. poor	Need to identify a source of material outside of the compartment / sub compartment. The whole compartment is within a SSSI
17	0 - 4118	Peat	V. poor	Need to identify a source of material outside of the compartment / sub compartment.

Compartment	Chainage	Materials	Potential for material sourcing *	Notes and Explanation
18	0 - 3072	Peat	V. poor	Need to identify a source of material outside of the compartment / sub compartment.
19	0 - 365	Peat	V. poor	Need to identify a source of material outside of the compartment / sub compartment.
19	365 - 745	Alluvium	Satisfactory	
19	745 - 3589	Alluvium	Satisfactory	
20	0 - 5032	Alluvium	V. poor	Need to identify a source of material outside of the compartment / sub compartment.
21	0 - 1784	Peat	V. poor	Need to identify a source of material outside of the compartment / sub compartment.
21	1784 - 5116	Alluvium	V. good	
22	0 - 5360	Peat	V. poor	Need to identify a source of material outside of the compartment / sub compartment.
22	5360 - 5636	Alluvium	Poor	
22	5636 - 21421	Alluvium	V. good	
23	0 - 3370	Alluvium	Satisfactory	
24	0 - 5331	Alluvium	Good	
25	0 - 4820	Peat	V. poor	Need to identify a source of material outside of the compartment / sub compartment.
25a				

Compartment	Chainage	Materials	Potential for material sourcing *	Notes and Explanation
25a	0 - 1264	Peat	V. poor	Need to identify a source of material outside of the compartment / sub compartment.
25b	0 - 770	Sand and gravel	V. poor	Need to identify a source of material outside of the compartment / sub compartment.
25b	770 - 1774	Alluvium	Satisfactory	
25b	1774 - 4875	Peat	V. poor	Need to identify a source of material outside of the compartment / sub compartment.
25b				
26	0 - 1617	Peat	V. poor	Need to identify a source of material outside of the compartment / sub compartment.
26	1617 - 4327	Alluvium	Poor	
27	0 - 1617	Alluvium	Satisfactory	
27	1617 - 2090	Peat	V. Poor	Need to identify a source of material outside of the compartment / sub compartment.
27	2090 - 2829	Alluvium	Poor	
27	2829 - 4979	Alluvium	V. good	
28	0 - 5014	Alluvium	V. good	Whole compartment is within a SSSI
28	5014 - 8238	Peat	V. poor	Need to identify a source of material outside of the compartment / sub compartment. Whole compartment is with in a SSSI
29	0 - 64	Peat	V. poor	Need to identify a source of material outside of the compartment / sub compartment.

Compartment	Chainage	Materials	Potential for material sourcing *	Notes and Explanation
29	64 - 2541	Alluvium	Good	
30	0 - 1248	Alluvium	Good	
31	0 - 3094	Alluvium	Good	
32	0 - 2986	Alluvium	Satisfactory	
33	0 - 3610	Alluvium	Satisfactory	
33	3610 - 4179	Sand	V. poor	Need to identify a source of material outside of the compartment / sub compartment.
34	0 - 580	Sand	V. poor	Need to identify a source of material outside of the compartment / sub compartment.
34	580 - 3518	Alluvium	Good	
35				
36	0 - 6680	Alluvium	V. good	
37	0 - 4537	Alluvium	V. good	

* V. good - Alluvium within 500m + of the existing floodbank THEREFORE adequate material available on site for floodbank strengthening, maintain and setback with the option to source additional material from internal drains and dykes and borrow pits.

Good - Alluvium within 300 - 500m of the existing floodbank THEREFORE adequate material available on site for floodbank strengthening, maintain and setback with the option to source additional material from internal drains and dykes.

Satisfactory - Alluvium within 100 - 300m of the existing floodbank THEREFORE adequate material available on site for floodbank

Appendix 3

Strategic Assessment of Public Rights of Way

Compartment	Floodbank total length (m)	PROW total length (m)	Setback total length (m)	Notes	Programme	
					Phase 1	Phase 2
1	4452	4452	2057	Footpath along entire compartment length	2010/11	2014/15
2	3094	3094	784	Footpath along entire compartment length	2007/8	2012/13
3	6245	0	1567	No public right of way	2009/10	2013
4	898	0	43	No public right of way	2007/8	*
5	10967	10967	5909	Footpath along entire compartment length	2007/8	2012/13
6	11017	0	851	No public right of way	2011/12	2015/16
6a	26548	4249	114	Public footpath along 4249m only	2011/12	2015/16
7	11435	11435	3097	Footpath along entire compartment length, the Weavers Way – National Trail - 4500m	2010/11	2014/15
8	1402	1402	553	Footpath along entire compartment length, the Weavers Way – National Trail – 3100m	2010/11	2014/15
9	8486	8486	3141	Footpath along entire compartment length	2010/11	2015
10	13288	13288	655	Footpath along entire compartment length	2009/10	2015
11(Bure)	16042	16042	5271	Footpath along entire compartment length	2008/09	2011/12

Compartment	Floodbank total length (m)	PROW total length (m)	Setback total length (m)	Notes	Programme	
					Phase 1	Phase 2
12	5235	5235	613	Footpath along entire compartment length	2009	2012/13
13	745	0	0	No public right of way	2012	2015/16
14	3581	3581	88	Footpath along entire compartment length	2012	2015/16
15	2152	1100	0	Footpath along 1100m only none of which is setback	2006/7	2014
16	2226	0	1192	No public right of way	2006/7	*
17	4118	1400	580	Footpath along 1400m only	2009/10	2014
18	3072	3072	1203	Footpath along entire compartment length	2004	2012
19	3589	0	955	No public right of way	2010/11	2015
20	5032	5032	827	Footpath along entire compartment length	2010/11	2015
21	5116	5116	2179	Footpath along entire compartment length	2005/6	2010
22	21421	550	4624	Footpath along 550m only	2004/5	2009/10
23	3370	0	531	No public right of way	2007/8	2013/14
24	5331	0	394	No public right of way	2007/8	2013/14
25	4820	0	1147	Footpath along entire compartment length	2007/8	2013/14
25a	9169	1800	1567	Footpath along 1800m only	2013/14	2008/09
25b	8570	0	1105	No public right of way	2008/9	2014
26	4327	4100	877	Angles Way – National Trail along 4100m	2005/6	2013
27	4979	4979	1535	Angles Way along entire compartment length	2005/06	2013

Compartment	Floodbank total length (m)	PROW total length (m)	Setback total length (m)	Notes	Programme	
					Phase 1	Phase 2
28	8238	4600	513	Footpath along 4600m (of which 2100m is the Angles way)	2006/7	2012/13
29	2541	0	1164	No public right of way	2010	2013
30	1248	0	0	No public right of way	2007/8	*
31	3094	0	0	No public right of way	2007	2012
32	2986	0	300	No public right of way	2004	2011
33	4179	0	3	No public right of way	2008	2011
34	3518	0	440	No public right of way	2012	2015
35	18568	18568	5372	Footpath along entire compartment length	2003/4	2008/9
36	6680	6680	0	Footpath along entire compartment length	2011/12	*
37	4537	4537	2105	Footpath along entire compartment length, Weavers Way - National Trail along 1600m	2010/11	2013/14
Totals	**280,720**	**143,762**	**55,865**			

* No second phase of works for compartment

Appendix 4

Biodiversity species from the Norfolk and Suffolk BAPs

SPECIES	LEGAL PROTECTION	BROADS STATUS/HABITATS
Plants		
Fen orchid	W&CA Schedule 8; Hab. Regulations Schedule 4	3 extant sites, all within SSSIs. In amongst Sphagnum pools on fen peat.
Floating water-plantain	W&CA Schedule 8; Hab. Regulations Schedule 4	Found at Calthorpe Broad and marsh dykes at Potter Heigham. Introduced.
Holly-leaved naiad	W&CA Schedule 8	Locally frequent in broads in the upper Thurne and mid-Bure
Greater water parsnip	None	Declining species of fen and dyke margins
Grass-wrack pondweed	None	Restricted to dykes at Upton/South Walsham
Mammals		
Pipistrelle	Hab. Regulations Schedule 2; W&CA Schedule 5	Widespread
Water Vole	W&CA Schedule 5	Widespread in soke dykes and internal dykes.
Otter	Hab. Regulations Schedule 2; W&CA Schedule 5	In most river systems; expanding its range.
Brown Hare	None	Widespread, usually associated with mixed farmland.
Birds		
Skylark	W&CA	Widespread on arable and rough grassland.
Bittern	W&CA Schedule 1	Very scarce; reedbeds >20ha.

SPECIES	LEGAL PROTECTION	BROADS STATUS/HABITATS
Reed bunting	W&CA	Widespread in reedbeds, tall herb
Amphibians		
Great crested newt	Hab. Regulations Schedule 2; W&CA Schedule 5	Scarce; ponds and dykes around the upland margins.
Beetles		
A reed beetle *Donacia aquatica*	None	Recent records for How Hill and Ludham. Margins of Glyceria and sedge beds
A weevil *Melanapion minimum*	None	Six post 1965 records for the Broads. Willows alongside watercourses
Molluscs		
Little-whirlpool ram's-horn snail *Anisus vorticulus*	None	Several sites in the Broads – main sites are North Cove and Carlton Marshes on the Suffolk side of the Waveney; marsh dykes.
Depressed river mussel *Pseudanodonta complanata*	None	Present in Yare, Waveney and Wensum. Confined to sediments in the river so unlikely to be affected.
Shining ram's-horn Snail *Segmentina nitida*	None	Key populations in the Waveney valley but also present in the Yare valley. Ditches choked with vegetation including foot drains.
Narrow-mouth whorl snail *Vertigo angustior*	None. Annex II Habitats Directive requires sites to be designated (SAC) to conserve the species.	Emergent vegetation + damp, short grass. 1 site in the Waveney valley (compartment 33).
Desmoulin's whorl snail *Vertigo moulinsiana*	None. Annex II Habitats Directive requires sites to be designated (SAC) to conserve the species.	Increasing no. of records in fen sites within Ant, Bure & Yare. Tall swamp vegetation including ronds.

- Hab. Regulations Schedule 2 – Animals of Community interest (i.e. endangered, vulnerable, rare or endemic in the European Community) in need of strict protection. They are protected from killing, disturbance or the destruction of their habitat.
- Hab. Regulations Schedule 4 – Plants of Community interest (i.e. endangered, vulnerable, rare or endemic in the European Community) in need of strict protection. It is an offence to deliberately pick, collect, cut, uproot, destroy, sell or exchange them.
- W&CA Schedule 1 – Additional protection afforded to certain bird species making it an offence to intentionally or recklessly disturb them during the breeding season.
- W&CA Schedule 5 – Wildlife & Countryside Act - Schedule 5 lists all animal species that are protected. Varying levels of protection according to species. Includes those on Hab. Regulations Schedule 2.
- W&CA Schedule 8 – Plants that are specially protected.