Hoveton Great Broad Restoration Scheme

Environmental Statement

VOLUME I ENVIRONMENTAL STATEMENT

On Behalf of NATURAL ENGLAND

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Quality Control

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for

Hoveton Great Broad Restoration Scheme

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Volume I Environmental Statement

Contents

Volume II Figures

Contents

Volume III Appendices

Contents

Volume IV Non-technical Summary

Contents

Other Related Documents

Planning Statement

Flood Risk Assessment

Water Framework Directive Assessment

Heritage Assessment (incorporating archaeological desk-based assessment)

1 Introduction

1.1 Project Background

1.1.1 Natural England is currently leading a project to restore Hoveton Great Broad and Hudson's Bay. These Broads are situated within the Bure Valley, downstream of Wroxham, Norfolk. They form part of the Bure Broads and Marshes SSSI, which in turn is a component site of Broadland SPA, The Broads SAC and Broadland Ramsar Site. They also form part of the Bure Marshes NNR.

1.1.2 Both Broads are currently assessed as being in 'unfavourable no change' condition and are failing to meet 'good ecological status', as defined under the Water Framework Directive (WFD), despite significant improvement in the water quality of the adjoining River Bure. Assessment of historic water quality data suggests that in-lake cycling of nutrients is the main reason for the poor condition of these waterbodies. The outline proposal is therefore to remove a significant proportion of nutrient-rich sediment from both Broads. It is hoped that this will significantly reduce total phosphate concentrations. The sediment will be used to create new fen habitat within Hoveton Great Broad and widen Wroxham Island. The lakes will then be isolated from the river and dyke networks and biomanipulated to 'tip' them back into a clear water macrophyte-dominated state.

1.1.3 In addition to the lake restoration, the project will also include:

- Reinstatement/strengthening of Wroxham Island. Erosion over the last 60 years has caused the land between Wroxham Broad and the River Bure to become significantly narrowed, down to 6m in places, threatening the integrity of the river bank and riverside moorings. Part of the proposal therefore includes the use of dredged sediment from Hoveton Great Broad and Hudson's Bay to reinstate the island.
- Sediment removal from the dyke system of Hoveton Marshes to both improve their ecological quality and create a canoe access route. **This part of the project is the subject of a separate planning application**, which will encompass sediment removal, the creation of a canoe launching staithe, a new footbridge and a new viewing platform on the edge of Hoveton Great Broad.

1.1.4 Natural England is leading the project, in partnership with the Environment Agency and the Hoveton Estate, and is seeking to fund this work predominantly through two external sources; Life+ and Heritage Lottery Funding (HLF). Future phases of the project, including access provision, would be the subject of a separate planning application.

1.2 Site Location and Description

1.2.1 Hoveton Great Broad and Hudson's Broad are located in the floodplain of the River Bure, in the Norfolk and Suffolk Broads, at approximate grid reference TG 31 16 (Figure 01). The closest settlement is the town of Wroxham, to the west. The planning authority is the Broads Authority (BA). The Broads of Norfolk and Suffolk extend to approximately 120 miles of waterways amongst some of England's most important wetland and marsh landscapes.

1.2.2 Both Hoveton Great Broad and Hudson's Bay comprise open water habitat, surrounded by carr woodland, which effectively screens these waterbodies both from the river, and from the adjacent upland (Figure 02).

1.2.3 The surrounding landuse on the nearby floodplain is primarily carr woodland, with small areas of open fen and, a number of large open water bodies (the broads), including Wroxham Broad, which lies to the west of Wroxham Island and Salhouse Broad, which lies to the south of the application site. The River Bure meanders through the floodplain. Land use of the adjacent upland is primarily agricultural, and under arable management,

although the fields within and immediately adjacent to the application site are improved grassland, and there are also a number of small upland plantation woodlands.

1.2.4 The floodplain within which much of the application site is situated is flat and lies just above mean relative sea level at approximately 1m AOD. The landform of the valley displays a notable slope from the floodplain to the adjacent upland. Existing levels to the north of the site are c.7m AOD.

1.2.5 The main area of the project site, comprising Hoveton Great Broad and Hudson's Bay; together with an area of upland which will be used for a site compound lies within a loop of the River Bure.

1.2.6 The local soils and geology comprise floodplain peats (where these were not extracted for fuel to create the broads), underlain by Crag deposits, and at depth by the Upper Chalk.

2 Description of Proposal

2.1 Purpose and Need

2.1.1 Hoveton Great Broad and Hudson's Bay are part of the Bure Broads and Marshes SSSI and a designated National Nature Reserve, SAC and SPA.

2.1.2 Since the 1960's clear water conditions in these water bodies have been replaced by turbid water conditions caused by phytoplankton dominance, in association with a widespread loss of macrophyte cover in both Broads. The wastewater treatment discharges to the River Bure during the 1970's and 1980's were identified as a major source of phosphorus in the lakes, with this nutrient in turn supporting the proliferation of phytoplankton.

2.1.3 Both Hoveton Great Broad and Hudson's Bay are currently assessed as being in 'unfavourable no change' condition and are failing to meet 'good ecological status', as defined under the Water Framework Directive (WFD), despite significant improvement in the water quality of the adjoining River Bure. Assessment of historic water quality data suggests that in-lake cycling of nutrients is the main reason for the poor condition of these waterbodies. The outline proposal is therefore to remove a significant proportion of nutrient-rich sediment from both Broads. The lakes will then be isolated from the river and dyke networks and biomanipulated to 'tip' them back into a clear water macrophyte-dominated state. It is hoped that this will significantly reduce total phosphate concentrations and lead to the redevelopment of an aquatic macrophyte community, which would in turn provide a refuge for the zooplankton which feed on the phytoplankton and would also help to stabilise the remaining sediment and hence reduce turbidity from entrained silt.

2.1.4 Coupled with the water quality issues is a demonstrated reduction in extent of the reedswamp communities which formerly surrounded Hoveton Broad. Some of the sediment pumped from the broad will be used to create new fen habitat within Hoveton Great Broad.

2.2 The Proposed Development

Overview

2.2.1 The scheme seeks to use soft engineering techniques to restore the margins of the broad to reedswamp and fen communities, to reduce turbidity levels and to improve the ecosystem.

2.2.2 The scheme involves sediment pumping from Hoveton Great Broad and Hudson's Bay and the construction of a number of soft engineering structures utilising geotextile membranes to create bunded areas within Hoveton Great Broad and Wroxham Broad, within which areas of fen would be created.

2.2.3 The proposal is to restore the margins of the Broad and Wroxham Island at locations identified at Figures 03 and 05. This will restore fen habitat to an extent similar to that present in the mid 20th century (based on 1946 aerial survey records). Geotextile tubes (geotubes) will be filled with sediment and capped with fen vegetation to create bunds. Further sediment will then be pumped into the areas behind these bunds and then left to colonise with fen vegetation (see Figure 06).

2.2.4 Sediment will be removed from the broad by excavator, and will then be pumped, using a concrete pump, directly into the geotextile membranes at 3 locations within Hoveton Great broad and a 4th location adjacent to Wroxham Island, thus creating 4 bunded areas. The same equipment will also be used to cap the geotubes with vegetation and fill the space behind the bund with more sediment (Figure 06). Species-rich fen vegetation will be established on the areas thus created within Hoveton Great Broad, and a mixed

tall herb fen will be established on the area created immediately adjacent to Wroxham Island (see Figure 14).

2.2.5 The proposed geotube and reedbed locations are identified on Figures 03 and 05.

2.2.6 Fish will be removed from the waterbodies by electrofishing, and fish barriers installed to prevent the fish re-entering the broads.

2.2.7 Installation of geotubes and fish barriers would be subject to flood defence consent.

Dredging Methods

2.2.8 The soft sediment (which averages approximately 0.3m deep across the Broad) will be dug out using a 360 excavator mounted on a pontoon/barge. GPS technology will be used to ensure the accuracy of the dredge depth. Within the same continuous movement, the sediment will be placed into a concrete pump mounted on the pontoon/barge immediately adjacent to the excavator. This will pump the sediment, via a pipeline (approximately 10"/0.25m in diameter), directly into the geotubes. Each tube has 4 – 5 'ports' into which the sediment can be pumped. This whole setup will be moved around the Broad until all the sediment has been removed and all the geotubes filled.

2.2.9 There will be no sediment removal immediately adjacent to the 3 cottages at Haughs End, as Hudson's Bay is considered to be suitably clear at this point.

2.2.10 Silt curtains will be used to help prevent sediment escaping into the river when mud pumping is conducted close to the open connections with the river (at the Dam Entrance and opposite Salhouse Broad).

Retaining Structures and Geotextile Membrane in Hoveton Great Broad

2.2.11 The geotubes will be placed in position using an excavator mounted on a barge, held in place by a double row of alder poles, (which would be cut from the NNR as part of site maintenance operations), and filled directly with sediment. Ferrous compounds will be added to bind nutrients, including phosphate, to the sediment in the geotubes. The membrane is porous and the sediment will consolidate over time and become dewatered, thus forming the new bund. The geotubes, when filled, have an approximate diameter of 6-8m, depending on water depth.

2.2.12 Sediment pumped from the broad is then used to backfilled the bunded area created by the geotubes. To speed up the growth of vegetation on the consolidating muds, 'mats' of mature fen vegetation (roots and rhizomes) will be taken from a neighbouring site within the NNR. This is good practice management because succession is retarded at the donor site and pioneering species are encouraged. The scrapes are applied to the restoration site and would become established much quicker than propagated seed (plugs). Turves of fen vegetation would be placed on the geotubes and anchored in place with a geotextile mat (which will prevent material being washed away by wave action), to ensure rapid vegetation coverage of the geotubes. The fen vegetation will grow up through the geotextile mat.

2.2.13 The placed geotubes will create an area of new species-rich fen vegetation in Hoveton Great Broad measuring 4.29Ha in total.

Retaining Structures and Geotextile Membrane at Wroxham Island

2.2.14 Exactly the same technique will be used to create the reedbed/fen area immediately adjacent to Wroxham Island, with the geotubes being filled directly with sediment recovered from Hudson's Bay and Hoveton Great Broad by mud pump via a pipeline. The pipeline which has a diameter of 0.25m would be encased in a steel tube, and will run along the river bed and thus would not interfere with navigation. Temporary warning signs would be erected alerting river users that a pipeline is laid across the river bed.

2.2.15 Turves of pond sedge dominated vegetation (unpalatable to geese) would be placed on the geotubes and anchored in place with a geotextile mat (which will prevent material being washed away by wave action), to ensure rapid vegetation coverage of the geotubes. The pond sedge vegetation will grow up through the geotextile mat.

2.2.16 The area behind the geotubes will be allowed to establish naturally.

2.2.17 The placed geotubes will create an area of new tall herb fen vegetation in Wroxham Broad measuring 1.67Ha.

Other Structures

2.2.18 Seven temporary fish barriers are proposed (see Figures 03 and 06); five in Hoveton Great Broad and two in Hudson's Bay, each constructed from stone and gravel filled gabion baskets held in position by timber piling. The purpose of the barriers is to prevent fish movement, whilst minimising restriction in water flow.

2.2.19 The tops of the barriers will be set at mean high water level and approximately 0.7m AOD so would therefore project a maximum of 0.3m above normal water level, and will be no more than 5m wide and 15m long (see Figure 06).

2.2.20 These are intended to be temporary structures but must be fish-proof and will remain in place for up to 10 years, hence the need for an engineered structure. The fish barriers would be removed prior to the completion of the project. The locations are shown on Figure 03 and approximate dimensions are provided on Figure 06.

2.2.21 A pipeline will be installed to facilitate the transport of sediment to the proposed reedbed creation site on Wroxham Broad, which is located to the west of Wroxham Island and is outside the SSSI.

2.2.22 A small construction compound will be set up at The Haugh. This will also accommodate basic works facilities for construction workers and site operators, vehicle storage etc. The compound area will measure approximately 5895m^2.

Plant and machinery

2.2.23 The largest pieces of equipment/plant will be a 360 excavator and concrete pump, both mounted on a pontoon/barge. These will access the works sites via the Broads navigation system.

Enclosure, Fencing, Signage and Health and Safety

2.2.24 Chestnut pale fencing is already in existence to the rear of the 24 hour moorings along the eastern margin of Wroxham Island and would serve to ensure that members of the public cannot access the bunded area. Further temporary chestnut pale fencing would be erected if required to prevent public access to the consolidating wet mud, which may be hazardous until vegetation cover is well established. It is anticipated that the fencing would be removed within 3 years of project completion (unless the Broads Authority prefer the fencing to remain in perpetuity); although the island would be monitored so that fencing and warning signs could be removed sooner if it is safe to do so.

2.2.25 Temporary goose fencing will be erected in front of the geotubes located in Hoveton Great Broad to prevent goose grazing during the initial habitat creation phase. This is likely to remain in situ for up to 3 years. There will be no permanent fencing. Goose fencing is not required at Wroxham Island, as vegetation used in the restoration here has been chosen so as to be unpalatable to geese.

2.2.26 Temporary warning signs would be erected at 30m intervals around the periphery of Wroxham Island to warn the public of the dangers of the unconsolidated mud.

Decommissioning

2.2.27 The fish barrier will be removed after no more than 10 years. Earlier removal may be possible if monitoring indicates that this would be appropriate. All other temporary

structures will be removed as soon as monitoring indicates that it is safe and appropriate to do so.

2.3 Construction

Overall Programme

2.3.1 The habitat creation works will be phased over 2-3 years with subsequent management continuing over the 10 year duration of the bio-manipulation programme (refer also to Appendix 5, Project Timetable).

2.3.2 The initial mud pumping phase, from Hudson's Bay and the western part of Hoveton Great Broad will take place in parallel with the filling of geobags at Wroxham Island in Year 1. This phase of the work is scheduled to take place between October and March 2016/17. The areas behind will be backfilled over the winter of 2016/17 and vegetated over the following growing season(s). Subsequent project phases in winter 2017/18 would complete mud pumping from Hoveton Great Broad, to create fen habitat in the east of the Broad.

2.3.3 Thereafter, as a condition of funding, Natural England will continue to manage the Site until at least 2040. Assuming the Site remains designated as part of the NNR and Natural England continues to manage the NNR, the Site will continue to be managed by Natural England beyond 2040.

Access and Traffic

2.3.4 The proposed site compound is accessed by a private track, approximately 2km long, which leads from the A1062 to the site. The A1062 is an A class single carriageway road with ample room for vehicles to pass. It is proposed that heavier plant and materials for the mud pumping work would be brought to site by barge.

2.3.5 Other site traffic would leave the main A1062 Wroxham-Potter Heigham Road directly onto a private track and would subsequently follow a route which would avoid local residences, with the exception of the cottage at Haughs End and Drive Cottages, all of which are owned by the Hoveton Estate (refer to Figure 04). Plant, equipment and materials will only be stored on site while works are on-going and then removed upon completion. Aside from operators' vehicles, there will be minimal traffic to and from the works site while works are on-going.

Lighting

2.3.6 It is not proposed to light the project area nor compound at any point during the works programme. Winter working hours would be constrained by natural daylight, with the exception of works to complete the installation of the fish barriers, which may need to be completed at night to maximise fish exclusion. Each barrier will require a maximum of 1 night's work.

2.4 Alternatives considered

2.4.1 The applicant has considered alternative approaches to restoration of Hoveton Great Broad including:

- 'Do Nothing'. The 'Do Nothing' option is not acceptable, as Natural England are required to comply with their responsibilities under the Habitats Directive and Water Framework Directive with regard to the condition and water quantity of Hoveton Great Broad and Hudson's Bay.
- Options for the disposal of sediment were considered and included disposal to landfill, and spreading dewatered sediment on the land. Both of these options would have a high carbon footprint compared with the chosen option, and

disposal to landfill would also generate high levels of traffic, as well as being environmentally unsustainable. Landspreading could potentially lead to increased flood risk and significant additional local traffic.

- A variety of different restoration options were considered. The final positions of the proposed fen areas were determined by factors such as past extent of fen vegetation around the margins of these broads and areas where the loss of such vegetation and erosion of the banks of the broads has been greatest, as at Wroxham Island, where the prevailing wind direction and fetch have led to the strip of land separating the broad from the river being reduced to less than 6m. The proposals at Wroxham Island therefore maximise the width of the proposed new fen area in the locations where erosion has been most severe.
- Various options for biomanipulation were examined, including an option to biomanipulate sectors of the broads in turn, as well as the chosen approach, which is to isolate the entire area from the river. The latter option was selected as biomanipulation of smaller areas has been shown by previous projects to be less successful than larger-scale biomanipulation, and isolation of the entire area is likely to more effectively deliver the aims of the project.

3 Background to Environmental Impact Assessment

3.1 Context

3.1.1 The process of Environmental Impact Assessment (EIA) is governed by the Town and Country Planning (Environmental Impact Assessment) Regulations 2011. These regulations apply the EU directive "on the assessment of the effects of certain public and private projects on the environment" (usually referred to as the Environmental Impact Assessment Directive) to the planning system in England.

3.1.2 There are 3 key stages to EIA, which take place sequentially:

- **Screening:** Determining whether a proposed project falls within the remit of the Regulations, whether it is likely to have a significant effect on the environment and therefore requires an assessment.
- **Scoping:** Determining the extent of issues to be considered in the assessment and reported in the Environmental Statement. Scoping may be informed by the local planning authority (a 'scoping opinion') or can be determined by the Applicant.
- **Environmental Assessment:** Compilation of all information reasonably required to assess the likely significant environmental effects of the development within an Environmental Statement (ES).

3.1.3 The content of the ES reflects current European Commission guidance[1], the UK EIA regulations[2], and other advice, criteria or guidance specific to the project including consultation conducted as part of the scoping exercise. The ES contains:

- A description of the project including physical characteristics and land-use requirements both during construction and operation, the nature and quantity of materials used, and expected emissions and residues.
- An outline of the main alternatives studied including the reasons for that brought forward taking into account environmental effects
- A description of aspects of the environment likely to be significantly affected, also known as the baseline (refer to topic list in Section 3)
- A description of the likely significant effects of the project, its use of natural resources, emissions, construction activities, nuisance and waste on those aspects assessed in detail, and the forecasting methods employed
- A description of mitigation measures that are envisaged to reduce and offset any significant adverse effects
- Note of any difficulties or limitations
- A Non-technical Summary of the information provided in the ES.

3.2 Screening

3.2.1 The first step in obtaining consent for a new project is to determine whether it falls under Schedule 1 or Schedule 2 of the UK EIA Regulations. The project type is not described in Schedule 1, and so accordingly the project must be screened under Schedule 2. The project type is not one of those listed in Schedule 2 of the EIA Regulations, and so Environmental Impact Assessment is not required.

[1] Guidance on EIA, 2001: http://ec.europa.eu/environment/eia/eia-guidelines/g-review-full-text.pdf
[2] EIA Regulations (England and Wales) 2011: Schedule 4, information for inclusion in environmental statements: http://www.legislation.gov.uk/uksi/2011/1824/schedule/4/made

3.2.2 Taking into account the characteristics of the project (scale), its location in the open countryside and within a nationally and internationally designated wildlife site, the applicant has determined that there is potential for some significant environmental effects. Therefore, although the project is considered to be non-EIA development a voluntary Environmental Statement (ES) has nevertheless been prepared.

3.3 Scoping

3.3.1 A formal scoping exercise was undertaken by the Project Team. The approach to assessing environmental impacts associated with the proposal has been to survey, document and if necessary, update information concerning baseline (or existing) conditions at the site.

3.3.2 The list of aspects of the environment which might be significantly affected by a project includes population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the inter-relationship between the factors. Consideration should also be given to the likely significant effects resulting from the use of natural resources, the emission of pollutants, the creation of nuisances and the elimination of waste.

3.3.3 For each topic assessed, a description of the baseline conditions is provided, followed by a scoping assessment to determine whether the issue is unlikely to be significantly affected by the proposal; or whether there is potential for a significant impact, in which case the issue should be carried forward for detailed assessment. In the latter instance, where a significant impact is considered possible or likely, the issue is assessed in more detail in Chapters 7-9. If not carried forward, then justification for this determination is provided below. Any mitigation recommended to address significant impacts is also provided in Chapters 7-9 and is summarised at Chapter 11.

Topics to be addressed

3.3.4 Early discussion with the Local Planning Authority (the Broads Authority) has identified that the following topics should be considered within the ES:

- Water Quality
- Hydrology, Hydrogeology and Flood Risk
- Ground conditions
- Traffic and Access
- Landscape and Visual Impacts
- Air Quality
- Noise and Vibration
- Ecology
- Archaeology and Cultural Heritage
- Sustainability
- Waste

3.3.5 A number of other studies, surveys and assessments have been commissioned in support of this project which do not form part of the ES. The results of these are summarised in the Planning Statement:

- Flood Risk Assessment;
- Traffic and Transport Assessment
- Water Framework Directive Assessment

3.4 Topics Scoped out of Detailed Assessment

Archaeology and Cultural Heritage, Ecology, and Landscape and Visual Impacts have been assessed in detail in the ES. The remaining topics listed below have been briefly assessed in the context of the identified sensitive receptors (see Figure 07), and found not likely to give rise to significant impact.

Hydrology, Hydrogeology and Flood Risk

3.4.1 No water level management works are planned for this project nor are any of the other works expected to have an indirect effect on hydrology. Therefore no deterioration in this element is to be expected.

3.4.2 Both the basins which are to be mud pumped and the receptor sites lie within the same river catchment and also within the same hydrological unit. A Water Framework Directive (WFD) Assessment has been prepared and has considered issues such as water chemistry change and impact upon floodplain hydrology in more detail.

3.4.3 The proposals do not include any land raising, and all materials would remain within the floodplain system. The proposed fish barriers will be at existing bank level and will not exceed the 1 in 20 flood height. A Flood Risk Assessment (FRA) is submitted with the application. This concludes that the development would not increase the risk of river flooding. The scheme is therefore not anticipated to give rise to any increased flood risk (refer also to Flood Risk Assessment).

Water Quality

3.4.4 The outcome of the WFD Assessment, which considers each waterbody within the Bure system in turn, is summarised below.

Hoveton Great Broad and Hudson's Bay

3.4.5 Sediment removal is proposed for Hoveton Great Broad and Hudson's Bay with the aim of reducing in-lake cycling of nutrients. The removal of sediment will cause a temporary increase in turbidity and an increase in nutrients from the suspension of organic sediment, both of which can have a negative impact on macrophytes. Nutrients would then flush out of the broad and/or settle (there is little flow across the broad and therefore sediment is unlikely to travel far before settling back onto the bottom). Sediment plumes will be localised to the works area and any released nutrients will be used up by biological activity. The sediment removal has the potential to damage current macrophyte habitat but given that there are currently very few submerged macrophytes growing on the broad this is unlikely to have a significant impact.

3.4.6 The creation of marginal habitat using the dredged sediment and geobags will occur in areas where there is currently little marginal vegetation. Similar schemes in the neighbouring Salhouse Broad have shown almost immediate results with fen species colonising the newly created margins.

3.4.7 The moving of sediment in and around the broad may increase turbidity and nutrient levels due to suspension of organic sediment but this impact will only be temporary. Similarly, an increase in phytoplankton blooms may occur for a short-time after the works but the Phytoplankton bloom status should improve as entrained sediments settles and released phosphate is taken up by macrophytes.

3.4.8 The removal of sediment may also have a short-term impact on dissolved oxygen (DO) levels. The increase in nutrients, in particular total phosphorous caused by sediment disturbance will increase biological activity thus increasing oxygen demand. This could cause a temporary drop in DO levels but this should recover quickly as the suspended sediment will not persist in the broad.

Apart from a potential short-term increase in total phosphorous the long term impact of these works will be to reduce total phosphorous concentrations. Therefore sediment removal will not cause a deterioration of this quality element.

Wroxham Broad

3.4.9 Wroxham Broad connects with the River Bure. It is classed as a heavily modified waterbody which has suffered from bankside degradation due to a large volume of boat traffic. A number of morphological mitigation measures in place. The only part of the restoration project which will occur in Wroxham Broad is the creation of marginal habitat on Wroxham Island using geobags and sediment dredged from Hoveton Great Broad. These restoration works are vital for the long term health of this waterbody. The past 50 years has seen degradation of marginal habitat and banks on the broad. If this was to continue unchecked then there is a risk of the broad's banks eroding to such an extent that they merge with the River Bure itself, thus undermining the autonomy of this waterbody. Any short-term deterioration must be viewed in the context of this long-term outlook.

3.4.10 The marginal habitat creation works on Wroxham broad may cause localised turbidity through the suspension of sediment as well as an increase in total phosphorous. Any additions of phosphorous caused by the addition of sediment will be localised and focused on the margins of the broad, but are not anticipated to give rise to any significant negative impacts.

River Bure

3.4.11 The River Bure is a heavily modified waterbody which is navigable by boats for much of its length. The River Bure connects with HGB (WB ID: GB30535977) and Wroxham Broad (WB ID: GB30535953) at various points.

3.4.12 As both Hoveton Great Broad and Wroxham Broad connect with the River Bure it is likely that released phosphates and some suspended sediment will flush into the river, but this will be small amounts that will be diluted by the flow of the river Bure and will only be temporary in nature.

Proposed mitigation

3.4.13 The following mitigation measures have been developed:

- The broads will remain connected to the River Bure throughout the fen creation works, allowing for dilution and flushing of any suspended sediment.
- The works will occur in winter when flows are higher which will increase any flushing affect. Also, winter is when biological activity is at its lowest therefore any temporary impacts will be further reduced. The timing of the works will allow time for the sediment to clear by spring when biological activity and in particular macrophyte growth increases.
- Silt curtains will be placed at points around the exit points around Hoveton Great Broad and Hudson's Bay to reduce suspended sediment flushing into the River Bure.
- All chemicals, fuel, oil etc would be stored in accordance with the Environment Agency's Pollution Prevention Guidelines.

Conclusion

3.4.14 The impact of the project will be temporary and will not cause long term water quality impacts on either the broads themselves nor in the River Bure. Conversely, the removal of sediment will reduce phosphate levels in Hoveton Great Broad and Hudson's Bay, and should actually improve the macrophyte status and water quality in the long term.

Ground Conditions

3.4.15 Testing has already been carried out and no significant concentrations of contaminants have been identified. No significant impacts associated with the site surface condition are considered likely.

Traffic and Access

Access

3.4.16 The proposed site compound is accessed by a private track, approximately 2km long, which leads from the A1062 to the site. The A1062 is an A class single carriageway road with ample room for vehicles to pass. It is proposed that heavier plant and materials for the mud pumping work, including pumps and geotextile bags, would be brought to site by river. Other site traffic would leave the main A1062 Wroxham-Potter Heigham Road directly onto a private track and would subsequently follow a route which would avoid local residences, with the exception of the cottage at Haughs End and Drive Cottages, all of which are owned by the Hoveton Estate.

3.4.17 On occasion, it may be necessary to use an alternative site access route, for example when tracks are particularly muddy.

Traffic

3.4.18 The Hoveton Estate roads experience light local traffic, which includes agricultural vehicles.

3.4.19 Plant, equipment and materials will be brought onto the site at the start of the period of works, stored on site while works are on-going and then removed upon completion. The largest pieces of equipment/plant will be delivered by low-loader. These are likely to include geotubes. Small boats will be brought in on trailers and will remain on site for the duration of works.

3.4.20 There will be minimal traffic to and from the works site while works are on-going. Once equipment has been delivered to the site compound it would remain there for the duration of the works, and thereafter day-to-day traffic for site personnel would be likely to comprise fewer than 10 vehicle movements per day, these being typically 4x4 vehicles. The percentage increase in the total traffic flows on the A1062 is considered Negligible / Insignificant. It is not considered that this increase would give rise to traffic problems on A1062, nor on the private estate roads, and it is therefore surmised that the overall impact of the proposals on traffic and travel would be insignificant. Therefore the proposal is considered unlikely to significantly affect local road users and residents and would result in a very minor and temporary loss of amenity. Any damage to estate roads will be made good at the end of the works.

3.4.21 Norfolk County Council Department of Highways was consulted about the proposal and have not raised any concerns with regard to the scheme.

Air Quality and Odour

3.4.22 The closest residential properties to the proposed site are 3 cottages located east of Hudson's Bay. Other sensitive receptors include Broads users (anglers, powered and unpowered craft), who may also potentially be slightly affected. There may be some localised odour impacts resulting from release of 'marsh gas' on initially disturbing sediments, and whilst fresh mud is transferred to the geotextile bags and backfilling with sediment to create fen areas. However, these operations are not expected to result in a significant or prolonged discharge of noxious odour and the use of the geotubes and the time of year are likely to reduce the odour generated. Further, because works will be carried out during winter, there will be fewer boat users on the river, and local residents would be less likely to have windows open.

3.4.23 All material would be worked 'wet' and there is thus no potential for entrainment of airborne particulate matter.

3.4.24 No significant impacts are predicted providing that good site practice is adhered to.

Noise and Vibration

3.4.25 The closest residential properties to the proposed site are 3 cottages located east of Hudson's Bay, and Broads' users may also potentially be affected.

3.4.26 All on-site works have the potential to create noise, but particularly sediment removal operations and use of boats. However, the remoteness of the site, which is set within a private estate, means very few receptors will be closely affected by the noise. Works will be carried out during winter, when there will be fewer boat users on the river and local residents would be more likely to keep windows closed. No significant impacts are predicted providing that good site practice is adopted; for example low noise plant and engines would be used for the proposed works.

3.4.27 In terms of Broads' visitors who may be affected, works will be carried out during winter, when there will be fewer boat users on the river.

Waste

3.4.28 The sediment removed from Hoveton Great Broad and Hudson's Bay will be used to create new areas of species rich fen and tall herb fen, and in the context of national guidance on the definition of waste[3], is not considered to be a waste product.

Sustainability

3.4.29 This section considers the sustainability credentials of the development in the context of established sustainability indicators and the NPPF. The overall sustainability credentials of the development are considered below:

Sustainability Credentials of the Development

Sustainability Objective	Commentary on Impacts	Impact on the objective
Biodiversity and Geodiversity.	There are no designated sites anticipated to be adversely affected by the development and any impact on protected species can be mitigated. The scheme will deliver an overall biodiversity enhancement. There is no negative impact upon geodiversity.	Positive
Climate Change and Flooding	The development does not impact upon climate change. Flood risk does not present a constraint to development.	Neutral
Traffic and Transport	The development will give rise to a minor and temporary increase in road traffic only.	Neutral
Pollution	The potential for pollution effects to water will be addressed through appropriate construction measures.	Neutral
Landscape and historic environment.	A desk based assessment has been undertaken and no impacts on archaeology are anticipated. The development will accord with and maintain the character of the existing Broads landscape	Neutral
Undeveloped Land	The development will introduce a built form into the location but one which accords with the surrounding area.	Neutral
Water	Potential adverse impacts to water will be controlled through appropriate mitigation. Long term the scheme would give rise to enhanced water quality.	Positive
Waste	The development does not generate waste.	Neutral

[3] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69590/pb13813-waste-legal-def-guide.pdf

Sustainability Objective	Commentary on Impacts	Impact on the objective
Homes	N/A	Neutral
Poverty and Social Exclusion	N/A	Neutral
Employment	N/A	Neutral
Accessibility to Services	The development has long term potential to increase accessibility to leisure / recreation facilities.	Positive
Education	The development has long term potential to create educational and interpretation opportunities.	Positive
Health	The development has long term potential to increase accessibility to leisure / recreation facilities.	Positive
Communities	Increased access to leisure and recreational activities and enhanced local landscape and ecosystem are a benefit to the local / wider communities.	Positive
Quality of Life	Increased leisure and recreation opportunities and enhanced local landscape and ecosystem will contribute to an enhanced quality of life for the local community.	Positive
Economic Growth	N/A	Neutral

Summary of Proposals Against SA Objectives

Objective / Factor	Frequency
Positive Contribution	7
Neutral Contribution	10
Negative Contribution	0

3.4.30 The assessment demonstrates that the proposals would give rise to numerous beneficial effects and as such the scheme is considered to be sustainable development.

3.5 Potential receptors

3.5.1 Figure 07 shows the location of sensitive receptors in the vicinity of the scheme. Receptors are also listed below, with the nature of the receptor, proximity to proposed works and the type of impact identified. Due to the small scale and low-key nature of the proposed works, only receptors within 250m of the project area have been considered. The exception to this is visual receptors, which have been identified in accordance with the visual envelope of the proposed scheme, and are detailed in the Landscape topic section.

	Receptor	Type	Distance to proposed works (closest point)	Nature of potential impact
1	Haughs End (3 Estate Cottages)	Residential	Adjacent to access route, and to Hudson's Bay	Noise, Odour, Visual, Traffic
2	Drive Cottages (2 Estate Cottages)	Residential	Adjacent to access route	Traffic
3	Home Farm	Residential	c200m from access route	Traffic
4	Shearwater	Residential	c150m from proposed Wroxham Island restoration	Noise, Visual

5	Old Hall	Residential	c175m from proposed fish barrier	Noise, Visual
1	Norfolk Broads Yacht Club/others users of Wroxham Broad	Amenity	Broads users adjacent to proposed Wroxham Island restoration	Noise, Visual
2	Trafford Beach	Amenity	c300m from proposed Wroxham Island restoration	Visual
3	Hoveton Broad Nature Trail	Amenity	Adjacent to Hoveton Broad	Noise, Odour, Visual
4	River Bure navigation	Amenity	Adjacent to fish barriers; <100m from Wroxham Island, Hoveton Great Broad and Hudson's Bay	Noise, Odour, Visual
5	Salhouse Broad navigation	Amenity	<100m from Hoveton Great Broad	Noise, Odour
6	Wroxham Island 24 hr moorings	Amenity	Adjacent to proposed Wroxham Island restoration	Noise, Visual
1	Hoveton Great Broad	Wildlife (designated features)	Area to be restored.	Noise, Visual
2	Hoveton carr woodland	Wildlife (designated features)	Adjacent to area to be restored.	Noise, Visual
3	Hudson's Bay	Wildlife (designated features)	Area to be restored.	Noise, Visual

3.6 Approach to assessment

3.6.1 For each topic assessed, a description of the baseline conditions is provided, followed by a scoping assessment to determine whether there is potential for a significant impact, in which case the issue is carried forward for detailed assessment in Chapters 7-9. If not carried forward, then justification for this determination is provided. Mitigation measures recommended to address significant impacts are presented at the end of the report.

3.6.2 Information concerning baseline (or existing) conditions at the site includes limited field surveys site visits, and assembling available data and records. Survey dates are provided within each topic where relevant.

3.7 Structure of the Environmental Statement

3.7.1 The ES is presented in four Volumes as follows:

- Volume I contains
  - Chapters 1-3: Introductory Topics including background, EIA context, screening, scoping, the Project Team, Site Description and Project Description including purpose and need, the proposal, phasing etc and the assessment methodology
  - Chapter 4: Consultation
  - Chapter 5: A detailed description of the proposal, including alternatives considered
  - Chapter 6: Planning Policy context
  - Chapters 7-9: Assessment of the topics selected for detailed assessment (Archaeology and Cultural Heritage, Ecology, and Landscape and Visual Impacts): baseline and assessment results, recommended mitigation measures and significance criteria
  - Chapter 10: Cumulative impacts

- Chapter 11: Impact summaries and mitigation measures
- Chapter 12: Restoration, management and aftercare
- Chapter 13: Conclusions

- Volume II contains figures relating to the ES
- Volume III contains appendices relating to the ES
- Volume IV is the Non-technical Summary

3.7.2 Other documents will be prepared to support the application and ES and include:

- Planning Statement
- Flood Risk Assessment
- Water Framework Directive Assessment

3.8 Assessment Methodology

3.8.1 The purpose of assessment is to make judgements concerning the significance of changes under the topics considered, and to identify the need for additional mitigation measures if changes are predicted to be of sufficient significance. Impacts for each topic are assessed within their own context. However the underlying principal of assigning significance to each follows a pattern based on a combination of magnitude and importance/sensitivity, as recommended in EIA scoping guidance[4].

3.8.2 The assessment approach draws from current published EIA practice guidance[5], assessments are based broadly on the matrix of impact significance as defined below for most topics:

ASSESSMENT OF IMPACT SIGNIFICANCE			
MAGNITUDE (degree of impact)	**IMPORTANCE/SENSITIVITY (based on context, receptors, local or regional scale etc.)**		
	High sensitivity	**Moderate sensitivity**	**Low sensitivity**
High magnitude	Major	Moderate-major	Moderate-minor
Moderate magnitude	Moderate-major	Moderate	Minor
Low magnitude	Moderate-minor	Minor	Minor
Negligible/No change/beneficial	Negligible / Insignificant	Negligible / Insignificant	Negligible / Insignificant

3.8.3 Impacts may be adverse or beneficial, direct, indirect, short term, and long term. Cumulative impacts are assessed by considering the combined effects of the proposal in the context of other developments in the area with similar impacts.

3.8.4 Significance ratings are generally interpreted as follows, the manner of interpretation is ultimately subject to the judgement of the assessor and the Planning Authority:

- Major - likely to represent key factor in decision-making, and/ or represents issue(s) of national or regional significance. Mitigation measures likely to be

[4] European Commission Guidance on EIA scoping, 2001: http://ec.europa.eu/environment/eia/eia-guidelines/g-scoping-full-text.pdf

[5] Institute of Environmental Management & Assessment, Guidelines for Environmental Impact Assessment (2004). IEMA, London

mandated. Major impacts are considered significant and would be carried forward for detailed assessment.

- Moderate – a concern to the project depending on the relative importance of the issue to the decision making process, mitigation measures would be implemented where practical. Moderate impacts are likely to be significant and carried forward for detailed assessment based on the nature of the impact and professional judgment. They are more likely to be carried forward if considered moderate-minor rather than moderate-major.
- Minor – a concern at local scale, additional mitigation may be appropriate, but rating is not likely to be key to decision making. Impacts and any mitigation measures should be re-considered at the detailed design stage of the project. Minor impacts are unlikely to be significant and therefore unlikely to be carried forward for detailed assessment.
- Negligible/Insignificant – not of material importance to the decision making process. Not carried forward for detailed assessment.
- Short-medium term – impacts are associated with the active landfill phase for the period extending through to 2018/2019 (completion of restoration profile) or as otherwise specified for the relevant topic
- Long term - impacts are residual and associated with the completed landform, closure or aftercare phases

3.8.5 Standard mitigation measures required by law or best practice are assumed in the assessment process, additional mitigation measures may be proposed to compensate where significant residual impacts are predicted.

3.9 Limitations

3.9.1 There are no known limitations to the Environmental Assessment.

4 Project Team

4.1 The Project Team

4.1.1 The Project is led by Natural England (NE), as Applicant. The EIA process was coordinated by The Landscape Partnership (TLP). Tasks and responsibilities of team members are as follows:

- The Project – description and alternatives (TLP/NE)
- Environmental Statement coordination and preparation (TLP)
- Landscape (TLP)
- Ecology (NE)
- Archaeology (APS)
- Consultation and Community Involvement (NE)
- Planning Context (TLP)

4.1.2 All 'scoped out' topic sections have been prepared by TLP.

5 Consultation

5.1 Approach to consultation

5.1.1 The applicant's community and stakeholder involvement programme included the following stages:

- Notify – the community will be/ has been made aware of the proposal and consultation programme along with a timescale of local activities
- Consult – members of the public and key stakeholder groups will be invited to participate in public exhibitions/meeting/website etc.. and put forward comments and ideas for the proposal
- Compile results – having allowed an acceptable timeframe for everyone with an interest to comment, the results of the consultation are then documented
- Report back – feedback is then analysed and the results publicised within the community and through stakeholder groups, where relevant.
- Respond – the developer responds to the views received and incorporates changes into the scheme where possible and appropriate. The community and key stakeholders are informed about how their views have been taken into consideration.

5.1.2 Consultation with statutory and non-statutory consultees has been an important part of the process of developing the project.

5.1.3 All comments and suggestions from consultees and community groups and individuals have been considered and, where appropriate, have been incorporated into the emerging design for the proposed scheme.

5.2 Consultation

5.2.1 Natural England have consulted with the following organisations prior to the submission of the application:

Statutory Consultees

- Natural England
- Environment Agency
- English Heritage
- Norfolk County Council Highways

Non-Statutory Consultees

- Norfolk Wildlife Trust
- RSPB
- Broads Society
- Norfolk Landscape Archaeology
- Norfolk Geodiversity Partnership
- Norfolk Broads Yacht Club
- Broads Angling Strategy Group
- Hoveton Parish Council
- Wroxham Parish Council

- Hoveton Estate
- Woodbastwick Estate
- Trafford Estate
- Local residents

5.2.2 A copy of the standard pre-application consultation letter sent to all of the above consultees is provided at Appendix 1.

5.2.3 Verbal consultation was also undertaken with

- River Bure ferry operators
- Broads Tours

5.2.4 Responses have been received from these organisations and are provided at Appendix 2. These responses have been used to inform the scope of the voluntary ES.

5.2.5 Local residents were also consulted, and copies of the consultation letters sent is provided at Appendix 3.

5.2.6 A number of the bodies listed above were also contacted by the Applicant to advise them of the forthcoming HLF/Life+ application and were invited to comment. Letters of support for the scheme were received from the following bodies and are reproduced at Appendix 4:

- Norfolk Wildlife Trust
- Broads Authority
- Norfolk County Council
- RPSB
- Woodbastwick Estate
- Trafford Estate

5.3 Community involvement

5.3.1 A programme of consultation has been carried out that incorporates the following events and actions:

- A stand and display at the Broads Authority Lower Bure and Thurne Forum event, held on 12th June 2014
- A presentation at the Broads Local Access Forum (BLAF) on 11th June 2014
- A presentation at the Broads Forum on 1st May 2014.

6 Planning Policy Context

6.1 Planning approach

6.1.1 Under Section 38 of The Planning and Compulsory Purchase Act 2004 ('The 2004 Act'), the determination of planning applications must be in accordance with the approved development plan unless material considerations indicate otherwise. Relevant Development Plan policies and national planning policy governing the development are identified in this section of the document, but are explored in more depth in the Planning Statement.

6.2 Planning policy context

6.2.1 Planning policies can fall into the following categories:

- Local policy framework, including saved Local Plan policies, emerging LDF policies or adopted LDF policies
- National Planning Policy Framework
- International designations (where appropriate)

6.2.2 Key planning policies relevant to the application are set out below. A detailed analysis of the policy background to the application is contained within the Planning Statement.

The Development Plan

6.2.3 The adopted development plan consists of policies contained in the Broads Authority Core Strategy Development Plan Document (DPD) (adopted 2007), the Broads Authority Development Management Policies DPD (adopted 2011), and the 1997 Broads Local Plan (saved policies).

6.2.4 It is noted that The Broads Site Specific Allocations DPD is at an advanced stage. Whilst no polices are considered relevant, water quality is a key consideration.

Core Strategy Development Plan Document (DPD) (adopted 2007)

6.2.5 The following polices are considered relevant:

- Policy CS1 – Landscape Protection and Enhancement
- Policy CS2 – Nature Conservation
- Policy CS3 - Navigation
- Policy CS4 - Creation of New Resources
- Policy CS13 - Water Space Management

Development Management Policies DPD (adopted 2011)

6.2.6 The following polices are considered relevant:

- Policy DP1 - Natural Environment
- Policy DP2 - Landscape and Trees

The National Planning Policy Framework (NPPF) - March 2012

6.2.7 The NPPF was published on 27th March 2012 and now replaces previous regional Planning Policy Statements and most planning policy statements. Whilst the NPPF re-

emphasises the need for plan led decision making in accordance with The 2004 Act, it states that the policy is a material consideration in planning decisions. One of the main tenets of the policy is that development control decisions must have regard to a ***"presumption in favour of sustainable development",*** with a particular emphasis on the contribution of the planning system to the enhancement of the natural environment and conservation of wildlife within national parks and The Broads.

7 Landscape Appraisal

7.1 Background

7.1.1 This landscape appraisal assesses the landscape and visual effects of the proposed restoration of Hoveton Great Broad and Hudson's Bay. The assessment considers the effects on landscape of the site itself, the local and wider landscape character and changes to views. The appraisal is based on fieldwork, desk-based survey and review of technical reports and associated drawings.

7.2 Methodology and scope of appraisal

7.2.1 Following consultation with the landscape officer at the Broads Authority, and in consideration of the nature of the proposed works, which are small scale and low-key, it was determined that a formal Landscape and Visual Impact Assessment was not required, and that a Landscape Appraisal would be adequate to describe the effects of the proposals upon landscape and visual amenity.

7.2.2 The appraisal includes an overview of the existing landscape features within the site. A description is also provided of the landscape and built features within the immediate vicinity of the site and how this relates to the local and wider landscape characteristics, and the contribution that these features have on views. Any statutory or local landscape designations are also identified.

7.2.3 An overview is provided of where the proposed works associated with the project are likely to be visible from, and the existing views that are present. The appraisal also considers the characteristics of the restoration proposals and how these relate to the site; the local and wider landscape character; the extent to which the development would be visible; and where it is visible from; and assesses how the view would change.

7.2.4 In order to understand how landscape features, landscape character and views would be affected; the first step in the appraisal process was to achieve an understanding of the relative sensitivity of the character of the landscape and the views being experienced. This was then reviewed in conjunction with the extent of change that would result from the proposals, whilst also taking into account factors such as seasonal variation, with a comparison of the effects during the course of the works, in the first year following completion and after a period of 10 years once the proposed fen vegetation has established.

7.2.5 To assist in understanding the various aspects of the project, a series of context photographs have been prepared to demonstrate the range and nature of available views for a variety of receptors, indicate landscape features within the site and local and wider setting, and the location and relative extent of the site.

7.3 Baseline information

Site context

7.3.1 The overall project area encompasses the full extent of Hoveton Great Broad, which lies within a wide loop of the River Bure as it follows a meandering course downstream from the village of Wroxham (see Figure 01). On the easternmost boundary, the project area encompasses a section of the narrow area of land known as Wroxham Island, a bank which separates the main river channel from the adjacent Wroxham Broad. The northern boundary wraps around a subtle knoll of grassland known as The Haugh, from which the landscape drops towards the level landscape of Hoveton Marshes on the easternmost extents of the project area.

Site features

7.3.2 The site is located at the very heart of the landscape of the River Bure and Broads, where the landscape is characterised by large areas of designated wet woodland which extend directly to the banks of both the river and connecting water bodies (see Figures

02 and 09). The overall project area includes an area of marshland at Hoveton Marshes, downstream of which lie further large areas of wet woodland associated with Woodbastwick Fens and Marshes. The direct connection between woodland and water is a characteristic that extends upstream of the site towards the village of Wroxham, where the settlement is typically based on large houses with grounds that extend towards moorings and boathouses that connect with the River Bure. Upstream of these properties, the village of Wroxham itself is a busy service and tourist village, comprising boatyards and a lively shopping centre, with road and rail connections between Norwich and the North Norfolk coast.

7.3.3 The site is located in an entirely flat landscape, beyond which the ground rises very gently southwards towards the 15m AOD contour, on which the villages of Woodbastwick, Hoveton, Salhouse and Wroxham are aligned. Directly to the north of the site, a knoll known as The Haugh forms a subtle landscape feature between Hoveton Great Broad and drainage dykes associated with the Lower Street area of Hoveton.

7.3.4 The site comprises a series of water bodies which vary in scale and character. The privately owned Wroxham Broad is a large water body in a loose parallelogram shape, with an area of approximately 34ha and an average depth of 1.3 metres. It is contained by areas of wet woodland of variable depth, age and shape, beyond which the ground rises to the southern fringes of Wroxham and open farmland under fairly intensive arable cultivation. The broad is a base for active recreation on the water, being the home of the Norfolk Broads Yacht Club, as well as being available to visiting boats, which are permitted to navigate but are not entitled to land. The Yacht Club comprises a clubhouse, boatsheds and moorings based on the western bank of the broad, focussed on eastward views out across the water towards Wroxham Island, where a number of boats are secured to private moorings. Between 2000 and 2005 the island between the two channels linking Wroxham Broad to the Bure underwent a partial restoration to stop erosion and improve the island's ecology, which had become degraded. The project was a joint initiative involving the Broads Authority, Norfolk Broads Yacht Club and the landowner, with scrub being cleared and piling installed, allowing sedge, reed and rush to grow back. The island has suffered further erosion since that date, with remnant fragments of alder/willow and straw bales being exposed on the edge of the water.

7.3.5 Close to Wroxham Broad stands the early 18th century 'Broad House', a Queen Anne style estate house and formerly the seat of the Trafford family, more recently functioning as a hotel. The property is detached from the broad itself, and is contained within well-established vegetation within the grounds.

7.3.6 Hoveton Great Broad and the adjacent Hudson's Bay are located in the floodplain of the River Bure, contained within a broad loop in the meandering river. They comprise open water habitat, surrounded by carr woodland, which effectively screens these waterbodies both from the river, and from the adjacent upland.

7.3.7 The only existing buildings close to the Site are a cluster of cottages that overlook the northern section of Hudson's Bay, which lie at the end of Haugh's End Road, a private track (see Figure 07). In the vicinity, the closest properties are a series of riverside cottages and boathouses which lie nestled amongst trees and reedbed at the northernmost point on Wroxham Broad, accessed from the village of Wroxham via Beech Road. Directly to the south of the overall project area, a series of farmhouses and associated farmsteads are arranged around the margins of the Broads landscape on the south side of the River Bure, notably Broad Farm, Hospital Farm and the agricultural complex associated with Woodbastwick Hall and Estate. Properties on the eastern fringes of the villages of Wroxham and Hoveton are approximately 2.0km away, with the properties on the easternmost fringes of these settlements located at a distance of approximately 1.5km from the centre of the site.

7.3.8 Within the wider project area, the level of the boating activity on the River Bure is seasonally heavy, particularly given the proximity of the site to the boatyards associated

with hire craft at Wroxham. Associated with this activity, two short sections of 24hr mooring are located on the western side of the Bure bank to Wroxham Island, together with a longer length of moorings on the Bure bank in the vicinity of Salhouse Broad. As well as this activity on the river itself, the privately owned Wroxham Broad provides a number of private moorings as well as being accessible for public craft. Wroxham Broad is also the home of the Norfolk Broads Yacht Club. Immediately to the south of the site, the privately owned Salhouse Broad is also accessible to the public by boat for both recreation and mooring, as well as offering canoe, kayak and bike hire. Hoveton Great Broad itself is not accessible to the public by boat; access being restricted to the site warden, and only available via a locked water-gate from the River Bure.

7.3.9 Access into the site on foot is limited to the 'Hoveton Great Broad Nature Trail' that is available to the public on a seasonal basis, via a ferry that runs from Salhouse Broad directly to the south, or by boat (there is limited mooring space along the river to facilitate this). The footpath and green spaces around Salhouse Broad otherwise provide the closest pedestrian access to the wider site area, and are accessed via a visitor car park and facilities in the village of Salhouse.

7.3.10 Directly to the west of the site, further pedestrian access to this part of the Broads is available at Wroxham Broad, reached via a private road leading to a pay and display car park before the entrance to the Norfolk Broads Yacht Club. A ramp from the car park allows for small boats to be launched, with a small green area allowing for views across the water.

Landscape-related designations

7.3.11 As outlined elsewhere in this report, desktop study shows that the proposed development lies within an area which has a number of international, national and local designations. There are also policies in the Broadland District Council Local Plan which apply to land and the wider setting of features in the vicinity of the Site (see Figure 08).

7.3.12 The majority of the proposals fall within the coincident extent of the Bure Marshes National Nature Reserve (NNR), Broadland RAMSAR site, Broads Special Area of Conservation, Bure Broads & Marshes SSSI, and the Broadland Special Protection Area (SPA). The designations cover the entire area of Hoveton Great Broad and Hudson's Bay, following the course of the River Bure as it meanders around the southern side of these water bodies. Excluded from the designation are the upland farmland which rises to the 5m contour at The Haugh to the north of the project area, and the area of drained marshes at the eastern extent of the overall project area. Wroxham Broad and Island, which lie on the western side of the project area alongside the western bank of the river, also fall just beyond the designated site boundary.

7.3.13 The Norfolk and Suffolk Broads, a network of navigable waterways, is afforded status similar to a National Park by virtue of the Norfolk and Suffolk Broads Act 1988. The Broads Authority area encompasses the River Bure valley landscape within which the site is located.

7.3.14 Two areas of Ancient Woodland are located 1.7km to the west of the site, beyond a number of roads and the rail line. Ancient Woodlands are identified by Natural England. Although they do not have statutory designation, they are recognised for their local importance and are protected from adverse development effects by the Broadland District Council Local Plan policy ENV7.

7.3.15 Areas of Landscape Value within the Broadland District Council area are defined by the Local Plan policy ENV8 as "areas of special scenic quality or importance in the landscape. The inherent visual qualities and distinctive character of these areas will be protected. Development will only be permitted where this is not detrimental to the character, scenic quality or visual benefit of the area". The designation covers the largely arable farmland to the west of the project area; immediately beyond the Broads Authority Area.

7.3.16 There are two Conservation Areas that fall within the study area of 2km from the centre of the site. Salhouse Conservation Area was designated in 2003 to aid the Broadland District Council and the Broads Authority in their commitment to protect and enhance the distinct character and historic environment of the area. The overall Conservation Area comprises a number of fragmented sections of both countryside and settlement. Directly to the south of the site, aligned to the southern banks of the River Bure, the designation includes the landscape to the north of Upper Street, covering the entire Salhouse Broad and Broad Farm area. The Conservation Area Statement highlights the presence of typical Broadland wetlands and reedbeds in the vicinity of the popular Salhouse Broad, as well as the popular seating and picnic area on the higher and sandy soils on the south side of the broad. At the north-western corner of the site, the tip of the Wroxham Conservation Area extends over the carr woodland and reedbed landscape at the northern end of Wroxham Broad. A number of riverside houses are arranged alongside the meandering northern branch of Beech Road. These include Shearwater, which lies on a small promontory that extends between two bays at the northern end of the broad, which is a characteristically low rise building under hipped and thatched roof. Local planning policy ENV16 seeks to protect and enhance the character of each of these Conservation Areas.

7.3.17 The proposals support the aims of the Broads Authority Development Management Policies DPD 2011 – 2021. In landscape terms, they are in line with policy DP1: Natural Environment, whereby the various threads of the project combine to protect the biodiversity value and minimise the fragmentation of habitats; the goal being to restore and enhance natural habitats, incorporating beneficial biodiversity. In the narrative and justification of the policy, the Broads Authority DPD (adopted November 2011) notes that despite the numerous designations, the ecosystem of the Broads is under considerable pressure. Climate change, water quality, habitat fragmentation, non-native species and scrub encroachment are identified as posing threats to biodiversity in the Broads, with the proportion of SSSIs considered to be in an 'unfavourable condition' being significantly above the national average. The development proposals seek to protect and restore the natural environment in this key section of the Broads landscape.

7.3.18 Development Management Policy DP2: Landscape and Trees, whilst referenced as being potentially relevant to the assessment, is not applicable given that the development would have no effect on, or result in the loss of a feature of landscape or ecological importance, including trees, woodlands or hedgerows. The proposals reflect and restore the local landscape character, having regard to the findings of the Broads Authority's Landscape Character Assessment.

7.3.19 Policies that relate to the use and enjoyment of water and land include Development Management Policy DP13: Bank Protection. The policy advises that development proposals that include bank protection will be permitted where it can be demonstrated that the proposal has been designed to take account of:

(a) The need for protection;

(b) The nature of the watercourse;

(c) The scale of tidal range;

(d) Safe navigation;

(e) The character of the location;

(f) The effect on European and priority biodiversity habitats and species; and

(g) The requirements of the Water Framework Directive.

7.3.20 The policy notes that soft engineering techniques, such as those proposed for dealing with the sediment to be removed from Hoveton Great Broad, should be used as a first preference. The use of the 'geobags', with the top profile covered with turves of fen vegetation, offers an example of sensitive design of bank edging, which is considered

crucial for protecting the special landscape character and conservation value of Broads habitats, as well as for maintaining the navigation area to the required standard.

7.3.21 Notable under Development Management Policy DP14: General Location of Sustainable Tourism and Recreation Development is the presence of the beautiful wetland landscapes and the associated opportunities for recreational activities including sailing, canoeing and bird-watching. The tourism economy of the Broads is therefore heavily dependent on the quality of the natural environment, with the Sustainable Tourism and Recreation Strategy for the Broads aiming to develop, manage and promote the Broads as a high quality sustainable tourism destination. The proposals are in keeping with the policy, given that they enhance the quality of the natural environment and have the potential to increase visitor numbers to the existing Nature Trail at Hoveton Great Broad.

Landscape Character

National

7.3.22 The Countryside Character Assessment for England and Wales (Natural England [formerly Countryside Commission], 1999) divides England into 159 distinct National Character Areas (NCAs) that share similar landscape characteristics and which follow natural lines in the landscape rather than administrative boundaries. The associated guidance indicates that NCA boundaries should be considered as zones of transition, rather than being a clearly defined line on the ground. The Site lies within NCA 80: The Broads[6], forming an arm associated with the Bure river valley in the western part of the overall area. The assessment describes it as a low-lying landscape, with some areas beneath sea level, which is characterised by open and extensive views over the slow meandering rivers and drained marshland. The former peat workings of the broads themselves form shallow lakes of various sizes surrounded by fens, wet woodland and large expanses of reedbed, rich in biodiversity.

7.3.23 The profile for the NCA was updated in 2013, and includes a description of the natural and cultural features that shape the Broads, how the landscape has changed over time, the current drivers for ongoing change, and a broad analysis of the characteristics and ecosystems services. The profile notes the presence of the ecologically rich wetland habitats which form one of the finest and largest marshland complexes in the UK, with the importance of the Broads for biodiversity and nature conservation meriting the conservation status of the many sites that lie within it. Internationally designated sites cover 12% of the NCA and include the Broadland and Breydon Water Ramsar site, three Special Protection Areas (SPA) and two Special Areas of Conservation (SAC). There are ten National Nature Reserves and numerous Sites of Special Scientific Interest (SSSI) that together cover 12% of the land area. The sense of tranquillity and wildness is noted as part of the description of the key characteristics of the landscape, being integral to the distinctiveness of the Broads, and inspiring many writers, artists and naturalists and increasing its popularity as a recreation and tourist destination. Although woodland cover is generally sparse, especially in the marshland area, small areas of mainly deciduous woodland occur around the broads in the vicinity of the site. Carr woodland and willow pollards are typical of the wetter areas, while broadleaved woodland is present as copses and plantations on higher land.

7.3.24 Of relevance to this appraisal, the Statements of Environmental Opportunities includes SEO 1, which identifies the need to *'Conserve and enhance the distinctive historic landscape of the Broads, which is of national and international significance for its heritage and biodiversity interest, through securing and expanding the open water, riverine and estuarine habitats which are vulnerable to abstraction, flooding, vegetation succession and altered land management. Manage the provision and quality of water in the whole catchment for human and ecological benefit'.* In terms of the balance between public enjoyment and tranquillity, Statement SEO 4 sets out the potential to *'Improve*

[6] http://publications.naturalengland.org.uk/publication/11549064?category=587130

opportunities to enhance people's enjoyment of the area while protecting high levels of tranquillity by conserving intimate Broadland valleys and extensive coast and marshland views, which contribute to sense of place, and conserve and promote the geodiversity, archaeology and historical evidence of past human settlement and landscape change'.

7.3.25 North East Norfolk and Flegg (NCA 79) borders The Broads NCA at approximately 1km to the south and east of the Site, occupying higher ground surrounding the floodplain, and being intimately linked with and sharing similar fertile characteristics as the Broads themselves. The Broads wraps around and between the three distinct parts of this NCA, which is a largely flat and low-lying landscape with limited topographic variation, which becomes flatter as it merges with the landscapes of the Broads. Copses and woodland blocks are a key feature of inland areas of the NCA, lending an intricate and enclosed character to the mix of pasture and arable land on the fringes of the Broads landscapes.

7.3.26 The profile for this NCA was updated in 2014, with the Statements of Environmental Opportunity drawing on the integrated information that it contains, and offering guidance on the critical issues affecting this landscape. Of relevance to this appraisal, Statement SEO4 seeks *'opportunities to increase the quantity and quality of semi-natural habitat mosaics and geodiversity sites and to enhance historic landscape character and its resilience to climate change, while providing additional benefits for access and recreation for local communities and visitors – thereby enhancing their experience by increasing understanding and improving the local economy'*.

District

7.3.27 The national level classifications provide the basis for the further sub-division of landscape character areas. At the district level (refer to Figure 10), the Broadland District Character Assessment (LCA) applies to the landscape to the south of the River Bure, at a distance of 0.3km from the Site at its closest point, and the more distant landscapes to the west of the villages of Wroxham and Hoveton some 3km to the west of the Site.

7.3.28 Due to the proximity of the Broadland Marshes Fringe Landscape Type LCA F1: Wroxham to Ranworth to the Site, developments have the potential to affect the setting and value. Located between the Broads Authority area and the 10m contour of elevated plateau edges, the landscape forms a transition zone of gentle slopes to the Broads river valley marshes. Key Forces for Change in this LCT include:

- Potential interruption of views to adjacent Broads marshland landscape as a result of the introduction of small-scale new development;
- Declining management of hedgerows and clumps of mature woodland, resulting in changes to woodland cover;
- Small-scale or incremental development within villages which may be inconsistent with local built character and materials.

7.3.29 Within LCA F1, land use is almost exclusively arable cultivation. Carr woodland is also an important feature, enclosing views and giving a sense of intimacy with a strong wooded horizon. Settlement patterns are generally of linear form, although Wroxham exhibits a nucleated settlement. The architecture and landscape of large houses and halls on the edge of the Broads, are important historic features and contribute to the area's rich and distinctive character.

7.3.30 The Broads Authority Landscape Character Assessment (2006) applies to land within the Authority's responsibility. The entire project area lies within the landscape character area LCA 23: Bure Valley – Wroxham to Fleet Dyke, South Walsham; with the adjacent LCA 22 Bure Valley – Upstream Wroxham to Horstead located approximately 2km upstream.

7.3.31 According to the Assessment, the key characteristics of LCA 23 include:

- Distinctive valley sides, often rising quite steeply to around 10m AOD;

- A medium-scale landscape. Land cover is dominated by regenerated carr woodland with some areas of more open fen vegetation. A high concentration of broads and significant amount of open water;
- Waterside development located at Wroxham/Hoveton and Horning are the main settlement areas. These are a mix of commercial and residential;
- Land use is split between nature conservation management and mainly recreational use of the water and land;
- Although this area includes two of the Broads' honeypot tourist areas and a seasonally busy waterway, much of this area is inaccessible by land. This inaccessibility and volume of carr woodland create areas of tranquillity.

7.3.32 The assessment notes that the condition of the landscape is influenced and affected by the loss of open fen across the overall area, with the presence of new waterside dwellings that are less contained by vegetation occasionally weakening the condition. The key forces for change include a general pressure for development, together with a demand for additional mooring spaces in the landscape of the broads.

7.3.33 The addendum to the description of the character area describes the contrast between the tranquil private broads such as Hoveton Great Broad and those in the Woodbastwick Estate, with the busy waterways of the river and the broads that are accessible for public navigation. Relevant to the overall project area, there are limited views available given the containment that the carr woodland on the valley floor provides, with this woodland providing the overall skyline. The presence of occasional waterside chalets at Wroxham Broad and Hudson's Bay are the only developed features associated in this skyline. In the vicinity of the site, these built forms include the clubhouse and storage buildings at the Norfolk Broad's Yacht Club. The strong sense of tranquillity is a special quality of the character area, due to the relative lack of access and high level of woodland cover which buffers both noise and visual intrusion. This woodland cover enhances the scenic quality of the area through the changing reflections that are possible according to wind and weather, with variations in the light.

7.4 Appraisal

Existing views and visual effects

7.4.1 The views that are available in the vicinity of the proposed works (refer to Figure 11) range from the several land-based locations (both public and private) that are accessible in the area, to a range of different locations based upon the water.

7.4.2 At the heart of the application site lies the Hoveton Great Broad Nature Trail, which is accessed via moorings adjacent to the trail on the Bure bank, or via the ferry which operates on a seasonal basis from Salhouse Broad, the trail forms a short circular boardwalk route through the wet woodland habitat which demonstrates the habitats which are the basis of the designated landscape. Half way around the route, the trail opens out and offers northwards facing views across the open water of the broad itself, with hides for bird-watching. The broad occupies the entire foreground of the view, with the woodland on the north side of the broad screening any impression of the landscape beyond, and providing a continuous and level band of vegetation along the horizon line. This woodland limits any views of the slightly raised ground in the vicinity of The Haugh, which would otherwise lie at the centre of the view at this location. There are no man-made features in the view; any potential visibility of Lower Street in Hoveton (1.2km to the north) being prevented by the combination of the flat landscape and intervening vegetation. Part-way round the loop, the boardwalk has two short bridged sections over dykes that weave through the woodland, from which additional east-facing and west-facing glimpses of the broad are possible, visible though the vegetation in the vicinity of the bridges themselves.

7.4.3 Approximately 500m downstream from the Nature Trail, the entrance to Hoveton Great Broad is glimpsed at an opening in the otherwise continuous band of woodland that extends along and beyond the north side of the River Bure. It is a view that is only experienced by those on public and private boats on the river, as the closest land-based viewpoint at Salhouse Broad is screened by vegetation on the south bank of the river. A line of alder pole piling, approximately 20m wide, stands between 0.5m and 1.0m above the water level, according to the tidal conditions. This piling follows the bank line of the river, preventing any access to the broad by public boat. A partly submerged galvanized metal field gate is supported on a framework at the centre of this line of poles, providing access to the broad for the warden, as required. A dense canopy of mature alder and willow trees frames the dyke, which extends away northwards from the centre of the view, the channel curving away into this vegetation. There is no impression of the open water of the broad itself, which lies approximately 100m from the viewpoint.

7.4.4 Further downstream, a similar view is experienced at the connection between the easternmost extent of the broad and the river, with a continuous line of alder pole piling defining the line of the river bank at the entrance to the broad. Known as The Dam, the dyke that extends westwards away from the view is contained by dense woodland to Hall Fen and Sedge Fen to either side, and curves gently away from the view, with the broad itself being entirely screened as a result. The river continues downstream from this viewpoint in a northwards direction, with no further visibility of the broad or wider project area.

7.4.5 The western end of Hoveton Great Broad is entirely screened from the River Bure, with two narrow dykes being imperceptible within the continuous and dense vegetation that extends along and to the rear of the riverbank. The river channel separates the tranquil Hoveton Great Broad from the distinctly different character of Wroxham Broad, which is open, well-frequented, and widely visible from boat users and hire boat passengers on the river. A viewpoint at the southern entrance to the broad includes an impression of the large body of water which lies immediately behind the narrow and linear strip of land between broad and river; locally known as Wroxham Island. There is a distinct lack of shrubby or woodland vegetation to this island, which is in sharp contrast to the banks of the water bodies in the adjacent sections of the river. Instead, a series of bank protection measures are visible, such as timber piling and straw bales, which offer a hint of the vulnerability of the island feature. The view represents a busy section of the river, given the proximity to the Broadland village of Wroxham immediately upstream, with signage denoting the limitations to boating access to Wroxham Broad, and glimpses of the Yacht Club on the broad beyond reinforcing this impression. A short section of moorings, and associated signage, are visible in the mid-distance of the view, on the river bank to Wroxham Island.

7.4.6 Within Wroxham Broad itself, a range of land and water based views towards Hoveton Great Broad and Wroxham Island are available. Views from the public car park and slipway towards the south western extent of the broad are framed and sheltered by mature trees, with a broad and open panorama over a large part of the water. A continuous line of woodland forms a low and level horizon line, beneath which a slim band of low level vegetation is faintly visible; defining the slim island between broad and river channel, largely screening views of craft on the river beyond. At the time of the site visit, the view from the car park included both boats tied to moorings and sailing craft in the water. Northwards of this public viewpoint, similar views are experienced from the private Norfolk Broads Yacht Club. The range of social and boat related facilities associated with the clubhouse create a busy feel to the viewpoint; which are in contrast to the more secluded nature of views from the water a short distance away from the bank. Views from the club are focused on sailing courses on the water immediately to the east, and in the direction of Hoveton Great Broad. As previously noted, the presence of the vegetation associated with the eastern banks of the Bure prevents any views into this water body, despite its close proximity. Instead, and as at the public viewpoint, the horizon is defined by the trees on these banks, beneath which the lower level vegetation

on Wroxham Island acts as a partial screen to craft on the River Bure itself. There are no dwellings in the view, reinforcing the feel of a landscape based solely on natural habitats and water-based recreation.

7.4.7 A cluster of traditional boat house and waterside cottages are nestled amongst mature willows and alders at the northernmost tip of Wroxham Broad. Small areas of lawn lead to moorings alongside the broad, from which long southward views along a large part of the water body are available. The river itself falls on the left side of these views, with a northern entrance to the broad from the river lies on the left side of these views, beyond which a line of reed and shrubby willow fringe the water, associated with the narrow strip of Wroxham Island. Opposite this vegetation, on the right side of the view, the clubhouse to the Yacht Club forms a distinct feature amongst the trees on the horizon line. The boat activity, moorings, and built forms on the bank in the distance provide a contrast with the more secluded and peaceful feel at the viewpoint itself.

Visual effects of the proposed works

7.4.8 As described at Section 2 above, the various elements of the project comprise a series of subtle engineering operations that cover a broad project area focused on Hoveton Great Broad and Wroxham Broad. The intention is for the habitat creation works to be phased over a 2-3 year period, with ongoing management continuing over the 10 year duration of the overall bio-manipulation programme.

7.4.9 The initial mud pumping phase, addressing Hudson's Bay and the westernmost sections of Hoveton Great Broad, is planned to take place in tandem with the filling of geobags at Wroxham Island in Year 1 (during the winter season of 2016/17). The newly bunded areas to the rear of the geobags would be vegetated over the following growing season, and subsequently, using turves of mixed tall herb fen vegetation to establish this habitat on the areas being created adjacent to Wroxham Island. Subsequent phases would involve further mud pumping from the remainder of Hoveton Great Broad (over the winter of 2017/18), to recreate former areas of fen habitat on the fringes of eastern sections of the water body. Species-rich fen vegetation would be established on these three bunded areas being created around the fringes of the water body.

7.4.10 No views would be possible of the restoration works from the Hoveton Great Broad Nature Trail, given that the trail is only open between April and mid-September. The lack of access by either foot or boat to the broad, or to the carr woodland that encircles it, ensures that the mud pumping and geotube filling operations at the construction phase of the project would have no visual effect on receptors in the surrounding landscape. The barge-mounted 360^{o} excavator and concrete pump would be able to operate whilst being entirely invisible to boat users on the adjacent river.

7.4.11 There would be no impression of the small site compound, located on the southernmost tip of the upland area at The Haugh, given the presence of the broad band of carr woodland associated with the fringes of the broad. The lack of lighting, or any operations/movements outside daylight hours, ensures that there are no indirect effects associated with the works.

7.4.12 The geotubes; secured via alder pole piling, placed in position by barge and filled directly with pumped sediment, will be installed in three separate locations adjacent to the bank on the easternmost sections of Hoveton Great Broad. Each of these areas lie outside (beyond) views that are available across the water, from the viewing point and bird hide mid-way along the route of the Nature Trail. This is the only point at which open views of the broad are available. The views of the water that are glimpsed at the footbridges along the route of the Nature Trail are narrow, and framed by dense vegetation associated with the fringes of the channels that lead to them. Where visible, the far bank of the broad is seen as a low and narrow line of vegetation between water below and carr woodland above. Given the orientation of the view from these bridges, the new areas of fen vegetation, whether based on the geotubes or the sediment to the rear, would be outside the narrow view available that is available from this brief open section

of the Nature Trail. On the completion of the works, potentially the most visible feature would be the line of temporary goose fencing erected in front of the geotubes, in order to prevent goose grazing during the initial habitat creation phase. As before, this would not be apparent in the view given that the restored fen areas lie beyond the view, which is framed by dense vegetation at this location. A consideration of the more open views that would be possible during the winter season is not relevant, given the lack of any access to the public during these months.

7.4.13 The views into Hoveton Great Broad for private and hire boats on the River Bure, at both the existing gated access opposite Salhouse Broad, and at The Dam at the easternmost end of the broad, would see a slight change associated with the line of the river bank. Fish barriers would be installed behind the existing alder poles, which are water-stained as a consequence of the seasonal variation in river level. The fish barriers are designed to prevent fish movement whilst allowing free water movement between the broad and the river. As shown in Figures 03 and 06, the fish barriers would extend across the full width of the connecting channels, behind the existing alder poles and gated access to the broad for the warden. During the implementation of the measures (during the winter months of 2016/17), the barges carrying out the works to drive the piles into the river bed, in order to secure the framework of flint-filled gabions, would be visible to sailors and boat passengers on the water. The numbers of craft on the river would be at their lowest given the season, as a result reducing the numbers experiencing the view. It is assumed that during the construction of each of the fish barriers, the barge would be secured to a mooring adjacent to the works. Although these craft, and the machinery mounted on them, are carrying out works in a landscape that is largely free of engineered features, the barges and works would be in keeping with the nature of routine and regular maintenance operations that are undertaken on the river, to maintain the moorings and river banks.

7.4.14 The bio-manipulation measures would be largely invisible on completion of their installation. Depending on the subtle variation in the tidal levels on the river in the vicinity of Hoveton Great Broad, the top line of the barrier would be faintly visible, standing approximately 0.3m above the mean high water level, marking the front line of the gabion structures beyond. These metre-square flint-filled cages would be laid on the river bed to the rear of the new line of piling, and arranged according to the channel depth at each location (this varies). Key to their arrangement would be the integrity of the fish barrier itself, hence their top line is immediately below the top line of the timber piles behind which they sit. The entire barrier at each entrance would be partly screened by the existing row of alder poles, which would be retained and would lie in front of them. As described at Section 2.2, although the barriers are intended to be temporary structures, they would be in place for 10 years and be fish-proof for their entire life, to meet the overall project aims.

7.4.15 Further upstream, the effects of the creation of the fish barriers proposed across the slim dykes which connect western end of Hoveton Great Broad and Hudson's Bay with the river would be similar to those described above. Located within the dense vegetation to either side, the two narrow dykes are almost entirely screened from the River Bure, imperceptible in the continuous and dense vegetation that extends along and to the rear of the bank itself. Although the structures would be largely invisible on the completion of the works, with just the top 0.3m of the piling standing above the mean high water line, the barges and associated machinery would be visible during the construction process. Due to the narrow channel width of the dykes, the barge may be moored either in the channel, or in the adjacent Wroxham Broad, outside the daylight hours during the winter working period.

7.4.16 Views from the broad range of craft using the River Bure at the southernmost entrance to Wroxham Broad would include an impression of the working operations of the barge-mounted machinery in the broad, behind the band of vegetation on the slender landform that separates the main channel from the broad itself. Due to the uncharacteristically

open character of the river bank at this location, where the occasional mature trees offering a remnant of formerly more intact carr woodland on the western bank of the river, the construction of the geotubes would be visible along the entire length of Wroxham Island. Although the barge itself would be screened by the island, the upper and moving sections of the machinery associated with driving the piles, and installing/filling the gabions, would be fully visible. Whilst the barges are working at the southernmost extent of the Island, connecting the geotubes with the main river bank, the craft themselves would be fully visible. The operations would be similar to those recently carried out to create the short sections of moorings on the Island, which can be faintly glimpsed in the distance. As previously, the winter working period would limit the number of craft experiencing the view.

7.4.17 The existing chestnut pale fencing to the rear of the moorings along the eastern margin of Island would remain in place on completion of the works, to ensure that members of the public cannot access the bunded area. The only elements of the work that would be visible would be the southernmost geotubes, which would be largely imperceptible, given the mats of fen vegetation secured to the front face. Even when not yet fully established, the continuous line of the young vegetation associated with the sediment filled tubes would create a slight improvement to the existing view. The measures would replace the existing straw bales and sections of timber piling that have been used to protect the Island, and isolated clumps of scrub in the otherwise eroding bank line, which give the existing view a somewhat denuded feel.

7.4.18 The only new features that would be visible from the river at this point would be the series of temporary warning signs which would be erected at 30m intervals around the periphery of Island, warning the public of the dangers of the unconsolidated mud. The visual effect of the signs would be minimal, given the presence of the existing Norfolk Broads Yacht Club signage at the entrance to the broad.

7.4.19 The fieldwork included a visit to the recent restoration works at the adjacent Salhouse Broad, to gain an understanding of the visual effect of the geotubes on the landscape when viewed from the water, representing the views likely to be experienced from Wroxham Broad. The fencing required to deter geese from grazing on the establishing vegetation, as well as the line of marker buoys which identify the front face of the geotubes to boats on the water were notable as visual detractors in the broad, which is otherwise free of these features. The mixed tall herb fen and pond sedge vegetation chosen for the restoration at Wroxham Island was selected on the basis of being unpalatable to geese, to overcome the requirement for deterrent fencing along the entire length of the geotubes at this location. Any marker buoys that might be required to protect the geotubes on the west side of the Island would be in keeping with the existing private moorings on the eastern side of the broad.

7.4.20 The views out from the public car park/slipway and the Norfolk Broads Yacht Club on the western side of Wroxham Broad are based on the eastward view out across the water towards Wroxham Island. As previously described, the river itself is concealed from the view, with only occasional glimpses of boats on the water being possible where breaks in the line of vegetation on the bank allow. During the construction of the piling to the front face of the geotubes and the formation of the flint-filled gabions which are stacked to the rear, the barge and associated machinery would be visible, working to restore the fen vegetation on the western side of the island. Seen at a distance of between 450m and 700m from the land-based viewpoints, the barges would have a backdrop of the mature woodland associated with Hoveton Great Broad, which forms a continuous band of vegetation along the horizon line. Based on the height of barges which carry out piling work associated with the creation/maintenance of moorings in the Broads landscape, the machinery would stand no higher than the yacht masts that are visible in the existing view, secured to moorings in the vicinity of Wroxham Island, with no elements rising above the horizon line. Moored in the vicinity of Wroxham Island during the course of the works, the barges would be in keeping with any yachts that are permanently moored

in the broad over the winter months. As previously noted, the winter working period would limit the numbers experiencing the view. Any boats that are on the water in Wroxham Broad over the winter months would have a closer view of the working operations, which would be in keeping with maintenance operations carried out to banks and moorings in the wider landscape of the broads.

7.4.21 The effects at the existing boathouses and cottages at northern end of Wroxham Broad would be similar to those described above during the construction phase. The southward view towards the proposed works is oblique, and follows the line of Wroxham Island into the distance. As at the Norfolk Broads Yacht Club, the impression of the working operations would comprise the machinery operating on the barge to creating the piling parallel to the Island. The barge would be working at a distance of 150m from the closest property, Shearwater, which is located on a small promontory at the northern end of the broad. Views towards the working barge would be partly screened by the vegetation associated with a further small promontory close to the northern entrance to Wroxham Broad from the main river channel. As described above, the machinery would stand no higher than the yacht masts that are present in the view, with no new elements standing above the horizon line. Moored in the vicinity of Wroxham Island during the course of the works, the barges would be in keeping with any yachts that are permanently moored in the broad over the winter months and with maintenance operations carried out to banks and moorings in the wider landscape of the broads.

7.4.22 The completed works would result in no change to the existing views from the Yacht Club, visitor car park/slipway, or from the receptors at the northern end of the broad, given that the geotubes would be in line with the surface of the water, and imperceptible given the distance between the Island and the various viewpoints on the western side of the broad. The only new features that would be visible on the far side of the water would be the series of temporary warning signs at 30m intervals around the periphery of the Island, warning the public of the dangers of the unconsolidated mud. The visual effect of the signs would be minimal, given the distance from the view and the presence of the existing signage associated with the moorings at the entrance to the broad. There would be no goose fencing, as the vegetation used in the restoration has been chosen so as to be unpalatable to geese.

7.5 Conclusions

7.5.1 The proposals present no change to the key characteristics of the Broadland landscapes local to the project area. There would be no impacts during either the course of the works, the first year following completion or after a period of 10 years once the proposed fen vegetation has established to both the Broads LCA 23 Bure Valley, or Broadland District Council Marshes Fringe F1, landscape types. The seasonal and low-key nature of the engineering operations of the construction works would be in keeping with the character of typical management operations of the landscape of the broads. The lack of any land-based operations or lighting ensures that the integrity of the carr woodland around the fringes to the river and Hoveton Great Broad is retained intact.

7.5.2 Once the vegetation to the surface of the geotubes, and the fen vegetation to the sediment to the rear, becomes fully established, the bank-side character of the river in the vicinity of Wroxham Island will be enhanced. The slim island between river and the adjacent Wroxham Broad currently has a somewhat denuded feel, with the bank line exposed and a series of fragile protection measures in place. The widened island would provide a greater depth of vegetation which will provide a more enclosed feel to the river channel. Similarly, the completed work at Hoveton Great Broad would enhance the distinctly remote and tranquil character of the landscape, which relates to the characteristics behind the designations applicable to this landscape.

8 Ecology

8.1 Background

8.1.1 This Ecological Appraisal, compiled and assessed by Natural England, describes the current biodiversity context of the site and its surrounds. Ecological data from the site and local areas is assessed using a combination of data from desk-based study and field surveys to gain an understanding of the local ecosystems. Using this information, the site is assessed for its value to wildlife. The proposed works as part of the restoration scheme are assessed for their potential to impact upon the ecological features associated with the site. Short-term and long-term impacts are considered. Where deemed necessary, mitigation measures are proposed to alleviate any adverse impacts that may be foreseen.

8.1.2 There are a number of pieces of legislation, regulations and policies specific to ecology which underpin this assessment. These are relevant at an International, National, Regional and/or Local level. References to legislation are given as a summary for information and should not be construed as legal advice. More detailed information regarding legislation and policy can be found in Appendix 6.

Birds Directive

8.1.3 The European Community Council Directive on the Conservation of Wild Birds (79/409/EEC), normally known as the Birds Directive, sets out general rules for the conservation of all naturally occurring wild birds, their nests, eggs and habitats. It was superseded by the 'new' Birds Directive (2009/147/EC) which generally updated the previous directive.

8.1.4 These requirements are interpreted into English law by the Wildlife and Countryside Act 1981 (as amended) with regard to protection of birds, and the Conservation of Habitats and Species Regulations 2010 with regard to the registration and regulation of Special Protection Areas.

Habitats Directive

8.1.5 The European Community Council Directive on the Conservation of Natural Habitats of Wild Fauna and Flora (92/43/EEC), normally known as the Habitats Directive, aims to protect the European Union's biodiversity. It requires member states to provide strict protection for specified flora and fauna (i.e. European Protected Species) and the registration and regulation of Special Areas of Conservation.

8.1.6 These requirements are interpreted into English law by the Conservation of Habitats and Species Regulations 2010 with regard to European Protected Species and the registration and regulation of Special Areas of Conservation.

Conservation of Habitats and Species Regulations 2010 (as amended)

8.1.7 The Conservation of Habitats and Species Regulations 2010 interpret the Birds Directive and Habitats Directive into English and Welsh law. For clarity, the following paragraphs consider the case in England only, with Natural England given as the appropriate nature conservation body. In Wales, the Countryside Council for Wales is the appropriate nature conservation body.

8.1.8 Special Protection Areas and Special Areas of Conservation are defined in the regulations as a 'European site'. The Regulations regulate the management of land within European sites, requiring land managers to have the consent of Natural England before carrying out management. Byelaws may also be made to prevent damaging activities and if necessary land can be compulsorily purchased to achieve satisfactory management.

8.1.9 The Regulations define competent authorities as public bodies or statutory undertakers to make an appropriate assessment of any plan or project they intend to permit or carry out, if the plan or project is likely to have a significant effect upon a European site. The

permission may only be given if the plan or project is ascertained to have no adverse affect upon the integrity of the European site. If the competent authority wishes to permit a plan or project despite a negative assessment, no alternatives and imperative reasons of over-riding public interest must be demonstrated, and there is a process involving the Secretary of State and the option of consulting the European Commission. In practice, there will be very few cases where a plan or project is permitted despite a negative assessment. This means that a planning application has to be assessed by the Local Planning Authority, based on information provided by the applicant, and the assessment must either decide that it is likely to have no significant effect on a European site or ascertain that there is no adverse affect upon the integrity of the European site.

8.1.10 The Regulations also are applicable to land use plans, including Local Plans. If the plan is likely to have a significant effect upon a European site, the permission may only be given if the plan is ascertained to have no adverse affect upon the integrity of the European site. This approach gives rise to a hierarchy of plans each with related appropriate assessments.

8.1.11 European Protected Species of animals are given protection from deliberate capture, injuring, killing, disturbance or egg taking / capturing. Their breeding sites or resting places are also protected from damage or destruction, which does not have to be deliberate. A number of species are listed as European Protected Species, with those most likely to be involved in planning applications being bats, dormouse, great crested newt and otter. Natural England may give a licence for actions that are otherwise illegal, subject to them being satisfied on the three tests of no alternatives, over-riding public interest, and maintenance of the species in favourable condition.

8.1.12 European Protected Species of plant are also listed and given protection. These species are generally very rare and unlikely to be present in proposed development sites.

8.1.13 A High Court judgement (Vivienne Morge v Hampshire County Council, November 2009) said that disturbance had to be detrimental to European Protected Species animals in a way that affected their survival, breeding or the area occupied by those animals. The judgement also said that indirect effects such as obstruction of bats commuting to and from a roost outside the works footprint is not damage or destruction of a breeding site or resting place. The judgement in 'Morge' also made clear that Local Planning Authorities are required to consider the three tests for European Protected Species licensing as used by Natural England before giving planning permission, if a planning application would be likely to commit an offence requiring a European Protected Species licence. The three tests are that there is no alternative to the development, over-riding public interest, and maintenance of the species in favourable condition.

8.1.14 Where the Local Planning Authority (LPA) has insufficient information to be able to consider the tests, for example where there is insufficient detail of the results of ecological survey, or inadequate impact assessment, it is not able to meet its duties under the EU Habitats Directive regarding protected species and so may not determine the application.

8.1.15 A number of subsequent cases have clarified that this duty should not be interpreted as onerous when Natural England is fully engaged as a consultee in a planning application. As long as the consultee does not raise any concerns as regards EPS or is silent on the point, then the LPA can assume that there is no EPS issue and should not rely on EPS as a reason to refuse planning permission. There is no need for the LPA to receive a statement from the nature conservation body that it has no objection as regards EPS; and the LPA need not itself duplicate consideration of the EPS issues. The presumption is that if the statutory nature conservation body is engaged in the planning process it can be relied upon to make any EPS concerns known. However, if Natural England simply refers a Local Planning Authority to its standing advice, the LPA cannot assume that there are no EPS issues.

Wildlife and Countryside Act 1981 (as amended)

8.1.16 The Wildlife and Countryside Act 1981 has been amended many times, including by the Countryside and Rights of Ways Act 2000. It contains provisions for the notification and regulation of Sites of Special Scientific Interest, and for protected species.

8.1.17 The Regulations regulate the management of land within Sites of Special Scientific Interest, requiring land managers to have the consent of Natural England before carrying out management.

8.1.18 All public bodies are defined as 'S28G' bodies, which have a duty to further the nature conservation of Sites of Special Scientific Interest in the undertaking of their functions. In practice, this prevents planning applications being permitted if they would harm a Sites of Special Scientific Interest as it would be a breach of that duty.

8.1.19 The Act makes it an offence to intentionally kill, injure, or take any wild bird, take, damage or destroy the nest of any wild bird while that nest is in use or being built, or take or destroy an egg of any wild bird. Special penalties are available for offences related to birds listed on Schedule 1, for which there are additional offences of disturbing these birds at their nests, or their dependent young.

8.1.20 The Act makes it an offence to intentionally kill, injure or take any wild animal listed on Schedule 5, and prohibits interference with places used for shelter or protection, or intentionally disturbing animals occupying such places. It is also an offence to intentionally pick, uproot or destroy any wild plant listed in Schedule 8.

National Planning Policy Framework

8.1.21 The National Planning Policy Framework dated March 2012 (NPPF) replaces previous Government Policy in relation to nature conservation and planning, which was set out in Planning Policy Statement 9. Paragraph 109 of the NPPF says that the planning system should contribute to and enhance the natural and local environment by minimising impacts on biodiversity and providing net gains in biodiversity where possible.

8.1.22 Paragraph 113 describes policy for designated sites, where Local planning authorities should set criteria based policies against which proposals for any development on or affecting protected wildlife or geodiversity sites or landscape areas will be judged. Further policy is within paragraph 118, where local planning authorities should aim to conserve and enhance biodiversity when determining planning applications by applying the following principles:

- if significant harm resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused;
- opportunities to incorporate biodiversity in and around developments should be encouraged;
- planning permission should be refused for development resulting in the loss or deterioration of irreplaceable habitats, including ancient woodland and the loss of aged or veteran trees found outside ancient woodland, unless the need for, and benefits of, the development in that location clearly outweigh the loss.

8.1.23 Government circular 'Biodiversity And Geological Conservation – Statutory Obligations and their Impact Within the Planning System' referenced ODPM 06/2005 and Defra 01/2005 has not been replaced and remains valid. It sets out the legislation regarding designated and undesignated sites and protected species, and describes how the planning system should take account of that legislation. It does however pre-date the NERC Act 2006 (see below) which includes a level of protection for a further list of habitats and species regardless of whether they are on designated sites or elsewhere.

8.1.24 Natural Environment and Rural Communities (NERC) Act 2006

8.1.25 This Act includes a list of habitats and species of principal importance in England. Local Authorities are required to consider the needs of these habitats and species when making decisions such as on planning application.

8.2 Study objectives

8.2.1 The objectives of the ecological study are as follows.

- to determine whether the Site, as identified in Figure ES-01 (in whole or in part) is of ecological interest, and to determine any potential for impact
- to determine whether the Site (in whole or in part) is, or is likely to be, of value to protected species, and to determine any potential for impact to identify areas of ecological value in the vicinity
- to determine whether the Site supports or has the potential to support non-native invasive species and identify measures to control and prevent their spread
- to identify any potential ecological constraints on the proposal
- to minimise damage to ecological assets and look for opportunities to enhance biodiversity

8.2.2 The objectives will be achieved through:

- Desktop study
- Habitat survey
- Otter survey
- Water vole survey

8.3 Methodology

Desktop study

8.3.1 A desktop study was undertaken in June 2014. The purpose of the study was to identify existing biological data and wildlife designations relevant to the Site and immediate environs.

8.3.2 Natural England's interactive website Nature on the Map and Defra's Magic Map were consulted to determine the proximity of statutory wildlife sites and ancient woodland.

8.3.3 The search area for statutory wildlife sites, non-statutory sites, and rare/scarce and protected species records was within a 2km buffer of the red line boundary of the Site.

Habitat survey

8.3.4 A habitat survey was undertaken on 30th June 2014 by Chris Bielby and Will West of Natural England. The habitats present and areas or features of ecological interest within such habitats were recorded.

8.3.5 The survey visit was also used to identify potential for protected species, for example, bats, mammals, amphibians and reptiles, to occur on, or in the vicinity of, the Site. Although the survey was not intended to identify all species, any rare, scarce or protected species which were incidentally seen during the survey were noted.

Water vole survey

Protected status

8.3.6 Water vole *Arvicola terrestris* have legal protection under the Wildlife and Countryside Act 1981 (as amended). This makes it an offence to intentionally or recklessly damage,

destroy or obstruct access to any structure or place which water voles use for shelter or protection, and to disturb water voles while they are using such a place. If water voles are known or suspected to be present at a site, then precautions should be taken to ensure the population is safeguarded.

8.3.7 Water vole is a UK and Norfolk Biodiversity Action Plan Priority Species. Water voles are known to be present throughout the middle Bure.

Method

8.3.8 A survey of the suitable wetland habitat immediately adjacent to the proposed sediment fen creation areas and the proposed locations of the fish barriers was undertaken on 30th June 2014, following the methodology outlined below.

8.3.9 Detailed survey of the bank edges was carried out from the water, using a small boat. Any occurrence of water vole signs (latrines, feeding signs, paths, footprints, burrows and sightings) were noted. The number and distribution of signs may be used to identify probable core habitat along the watercourse.

Limitations to survey

8.3.10 Works are not currently scheduled to start on site until September/October 2016. Water vole use of the site may change in that time and it is possible that water vole may colonise the fen habitat close to where works will be carried out. If this were to occur, the risk to water vole would change.

Otter survey

Protected status

8.3.11 In England, otter *Lutra lutra* are protected under the Wildlife and Countryside Act 1981 (as amended), the Berne Convention Appendix 2, the Habitats and Species Directive Annex 4, The Conservation of Habitats and Species Regulations 2010 (as amended) and EC Cites Annex A. Otters are protected from intentional killing, injuring, taking, possession and trade, interference with places of shelter or protection and disturbing animals using such places.

8.3.12 Otter are listed as a priority species in the UK Biodiversity Action Plan as well as the Norfolk Local Biodiversity Action Plan.

8.3.13 Watercourses and waterbodies in the catchment of the tidal River Bure are known to support otter.

Method

8.3.14 A survey of the suitable wetland habitat immediately adjacent to the proposed fen creation areas and the proposed locations of the fish barriers was undertaken on 30th June 2014 to determine the presence or absence of otters; specifically the presence of holts or lying-up places. Where practicable, the standard methodology for otter survey, as detailed below, was adopted.

- A search of the banks of the watercourse in the area around the Site
- Any occurrence of footprints, spraints, feeding remains, holts, lying up sites and refuges recorded
- Possible pathways entering the waterway are followed back to assess whether they might lead to holts or lying up places in the surrounding area
- The trail warden was also consulted to identify areas where otter activity was regularly seen.

Limitations to survey

8.3.15 Works are not currently scheduled to start on site until September/October 2016. Otter use of the site may change in that time and it is possible that otter may establish holts or

places to rest up close to where works will be carried out. If this were to occur, the risk to otter on site would change.

Assessment methodology

8.3.16 The assessment method for determining ecological value is that published in the Handbook of Biodiversity Methods (CUP, 2005) and, along with the 3-stage assessment, is also that used in major scheme assessments (TAG, GOMMMS, DMRB etc)[7]. The three-stage process allows the value of the ecological receptor and the magnitude of the impact to be cross-tabulated to identify impact significance. The assessment methodology is detailed in Appendix 8.

8.3.17 The assessment of the potential impacts of the application will take into account both on-Site impacts and those that may occur to adjacent and more distant ecological features. Impacts can be positive or negative. Negative impacts can include:

- direct loss of wildlife habitats;
- fragmentation and isolation of habitats;
- disturbance to species from noise, light or other visual stimuli;
- changes to key habitat features; and
- changes to the local hydrology, water quality and/or air quality.

8.3.18 Negative and positive impacts on nature conservation features are characterised based on predicted changes as a result of the proposed activities. In order to characterise the impacts on each feature, the following parameters are considered:

- the magnitude of the impact;
- the spatial extent over which the impact would occur;
- the temporal duration of the impact;
- whether the impact is reversible and over what timeframe; and
- the timing and frequency of the impact.

8.3.19 Both short term (i.e. during the construction phase of the project) and long term (i.e. habitat change) impacts are considered.

8.4 Baseline information

Desktop study results

Sites of international and national importance

8.4.1 Much of the Site, including Hoveton Great Broad and Hudson's Bay, lies within Bure Marshes National Nature Reserve (Figure ES-12) This in turn is part of The Bure Broads and Marshes Site of Special Scientific Interest (SSSI); a component SSSI of The Broads Special Area of Conservation (SAC), Broadland Special Protection Area (SPA) and Broadland Ramsar Site. As the NNR, SAC, SPA and SSSI share the same boundary within the Site, for the purposes of this report, they shall be collectively referred to as the Designated Site.

8.4.2 The species for which Broadland SPA and The Broads SAC are designated (conservation objectives) are listed in Appendix 7. Appendix 7 also includes The Bure Broads and Marshes SSSI citation, the notified features of the SSSI and the Broadland Ramsar Citation.

[7] Hill, D, Fasham M, Tucker G, Shewry M, Shaw P (eds) 2005 Handbook of Biodiversity Methods: Survey, Evaluation and Monitoring

8.4.3 While it is important to assess the potential impacts of the proposed works on all designated features, the following are regarded as most likely to be at risk from the proposed works:

- Natural eutrophic lakes (the 2 broads)
- Vascular plant assemblage (standing open water)
- Otter
- Wintering waterfowl assemblage

8.4.4 Baseline data for the status of otter were gathered through an otter survey, the results of which are presented later in this chapter (see 8.5.19 below). Further data relating to the other features are presented below.

Natural Eutrophic Lakes feature / vascular plant assemblage

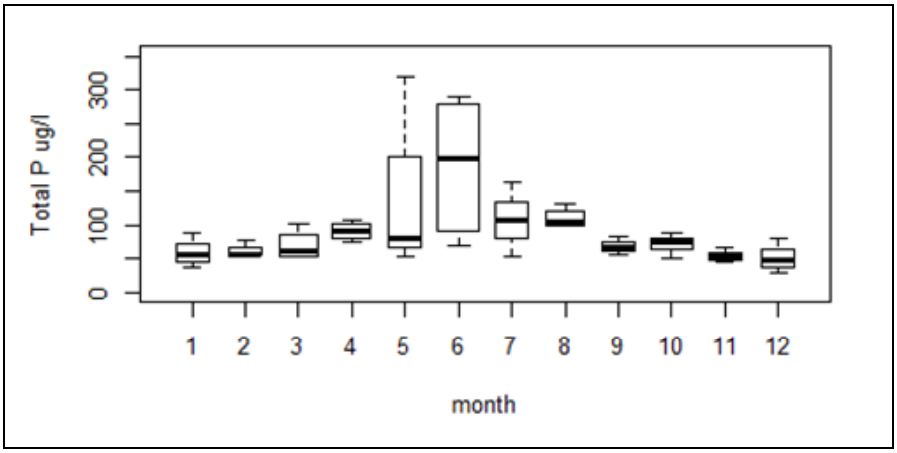
8.4.5 The status of the eutrophic lakes feature is largely determined by the abundance and diversity of macrophytes, along with nutrient status (total phosphate - TP). Hoveton Great Broad is surveyed annually for macrophytes by the Broads Authority. The table below is taken from the 2013 Broads Annual Water Plant Monitoring Report[8]. These data are also used to assess the status of the vascular plant assemblage.

Broads Annual macrophyte survey data for Hoveton Great Broad, 2009 - 2013

Species	2009	2010	2011	2012	2013
Filamentous algae	*	*	*	0.052	0.104
Rigid hornwort *Ceratophyllum demersum*	*	*	*	0.091	0.098
Yellow water lily *Nuphar lutea*	*	*		0.025	0.033
Fennel-leaved pondweed *Potamogeton pectinatus*	*	*	*	0.016	0.029
Nuttall's waterweed *Elodea nutalli*				0.004	0.005
Curled pondweed *Potamogeton crispus*				0.012	0.003
Canadian waterweed *Elodea canadensis*		*	*		
Horned pondweed *Zanichellia palustris*		*			
White water lily *Nymphaea alba*	*	*			
Holy leaved naiad *Najas marina*	*				
Total number of species	6	7	4	6	6

[8] Broads Authority Annual Water Plant Survey Report, Harris, 2013, Broads Authority.

8.4.6 Total phosphate is monitored monthly by the Environment Agency. The graph below shows monthly mean TP concentrations for HGB, between 2007 and 2012.



Monthly mean total phosphate (TP) concentration – Hoveton Great Broad, 2007 – 2012.

Wintering waterfowl assemblage

8.4.7 Winter bird counts on Hoveton Great Broad are taken monthly throughout the winter as part of the Wetland Bird Survey (WeBS) scheme. The full results from the last 10 years of survey are presented in Appendix 9. The table below shows the results for selected species.

WeBS count data, Hoveton Great Broad, 2003 - 2014

Species	2003	2004	2005	2006	2007	2008	2013	2014
Coot	70	45	6	10	23	17		26
Gadwall	180	667	49	13	50	117		5
Goldeneye	2		10			20		
Great Crested Grebe	8	17	28	21	8	7		2
Mallard	12		6	15	19	12	2	
Mute swan	3	2	2	9	6	3	2	19
Pochard	3	23	31	11	31	30		4
Shoveler	10	6	7			2		
Teal	3	43	12	3	3			
Tufted Duck	71	95	58	72	30	40		37
Wigeon	20	8	13			10		

No data are available for 2009 – 2012 inclusive.

Protected, rare and scarce species

8.4.8 The NNR is leased from the Hoveton Estate and managed by Natural England. It has been (and continues to be) subject to regular survey and monitoring, including:

- SSSI condition assessment
- The UK Butterfly Monitoring Scheme transect has been walked since the start of the scheme in 1976.
- WeBS counts

- Monitoring of particular breeding bird species (common tern, marsh harrier and bittern)
- Broads Authority annual aquatic macrophytes survey
- Regular trapping by the Norfolk Moth Group
- The site is part of the current Natural England/Broads Authority fen vegetation/fen invertebrate/fen management survey
- The site is part of the CEH atmospheric ammonia monitoring network, and part of the NE England Climate Change Biodiversity Network, which involves records from an on-site weather station as well as vegetation monitoring and Common Bird Census.

8.4.9 In addition, a nature trail is situated on the south side of Hoveton Great Broad. This is wardened by Natural England staff from April to September inclusive. Staff keep records of the flora and fauna seen from the trail each year.

8.4.10 Based on the above information, the following protected, rare and scarce habitats and species are known or are believed to be present on or close to the designated part of the Site. The table below highlights whether a particular species is a feature of a designated site or sites, as well as whether it is protected in its own right, rare and/or scarce.

8.4.11 Given the proximity of Wroxham Broad and Wroxham Island to the Designated Site, it is assumed that the same species are likely to be present there.

Non-native invasive species

8.4.12 An aquatic macro invertebrate survey in May 2014 recorded killer shrimp *Dikerogammarus villosus* in Hoveton Great Broad and Hudson's Bay. It is also likely that the species is present in the adjacent River Bure and Wroxham Broad. Zebra mussels are also known to be present in the middle reaches of the River Bure.

8.4.13 Himalayan Balsam *Impatiens glandulifera* was recorded growing on the eastern side of Wroxham Island.

BAP Broad Habitat Type	Specific Feature	Explanation of Feature/Ranking	Legal Site Designations						Other Classifications						
			SAC	SPA	Ramsar	Other	SSSI	GCR	EPS	National BAP	Nationally rare	Nationally scarce	Protected species	Character Area	Other
Standing open water	Natural eutrophic lakes	Broads	✓		✓		✓			✓				✓	
	Natural eutrophic lakes	Dykes	✓		✓		✓			✓				✓	
	Hard oligo-mesotrophic waters	Turf ponds	✓		✓		✓			✓					
	Otter *Lutra lutra*		✓		✓				✓	✓			✓		
	Vascular plant assemblage: *Najas marina* *Potamogeton coloratus* *Potamogeton friesii* *Stratiotes aloides*	 Holly-leaved naiad Fen pondweed Flat-stalked pondweed Water soldier			✓		✓			✓	✓ ✓				
	Breeding bird assemblage including: Gadwall Shoveler Pochard Water rail Kingfisher Common tern A further seven species				✓		✓ ✓						✓ ✓		
	Wintering waterfowl assemblage including: Gadwall Shoveler Teal Pochard Mute swan			✓	✓		✓								
	Invertebrate assemblage				✓		✓								

BAP Broad Habitat Type	Specific Feature	Explanation of Feature/Ranking	Legal Site Designations						Other Classifications						
			SAC	SPA	Ramsar	Other	SSSI	GCR	EPS	National BAP	Nationally rare	Nationally scarce	Protected species	Character Area	Other
	• Broad Assemblage Type: o W21 mineral marsh & open water o W31 permanent wet mire Including Outstanding Assemblages of: Odonata (inc 2 RDB dragonflies) Coleoptera (inc 9 RDB water beetles) Hemiptera (inc 2 RDB water measurer)	Norfolk hawker			✓					✓	✓ ✓ ✓				
	Water vole *Arvicola terrestris*									✓			✓		
Fen, marsh & swamp	Calcareous fens with *Cladium mariscus* (S2, S24, S25)		✓		✓		✓			✓				✓	
	Phragmites australis reedbed (S4)	Including floating reedswamp			✓		✓			✓				✓	
	Phragmites-Peudcedanum tall-herb fen (S24)		✓		✓		✓			✓				✓	11
	Fen meadow (M22)	Mown marshes and rides			✓		✓			✓					
	Molinia meadow (M24)		✓							✓					
	Vascular plant assemblage: • *Carex appropinquata* • • *Cicuta virosa* • *Dactyloriza traunsteineri* • • *Dryopteris cristata* • *Lathyrus palustris*	Fibrous tussock-sedge Cowbane Narrow-leaved marsh orchid Crested buckler fern Meadow vetchling Milk parsley Marsh sow-thistle			✓		✓				✓ ✓ ✓ ✓ ✓ ✓	✓ ✓ ✓ ✓ ✓ ✓			

BAP Broad Habitat Type	Specific Feature	Explanation of Feature/Ranking	Legal Site Designations						Other Classifications						
			SAC	SPA	Ramsar	Other	SSSI	GCR	EPS	National BAP	Nationally rare	Nationally scarce	Protected species	Character Area	Other
	• *Peucedanum palustre* • *Sonchus palustris* • *Sium latifolium* • *Thelypteris palustris*	Great water parsnip Marsh fern										✓			
	Breeding bird assemblage including: Gadwall Shoveler Bittern Marsh harrier Cetti's warbler Bearded tit Reed bunting Song thrush			 ✓ ✓	 ✓ ✓ ✓ ✓ ✓		 ✓ ✓ ✓ ✓ ✓			 ✓ ✓ ✓ ✓			✓ ✓ ✓ ✓ ✓ ✓		
	Invertebrate assemblage • Broad Assemblage Type: • W31 permanent wet mire Specific Assemblage Type**:** W313 mesotrophic fen W314 rich fen Including Outstanding Assemblages of: Lepidoptera (inc 9 RDB butterflies & moths) Coleoptera (inc 10 RDB beetles) Diptera (inc 35 RDB flies) Arachnida (inc 3 RDB spiders) Hymenoptera (3 RDB bees & wasps)	 Swallowtail			✓ ✓		✓ ✓			 ✓	 ✓ ✓ ✓ ✓				
	Vertigo moulinsiana	Desmoulin's whorl snail	✓		✓				✓	✓	✓				

BAP Broad Habitat Type	Specific Feature	Explanation of Feature/Ranking	Legal Site Designations						Other Classifications						
			SAC	SPA	Ramsar	Other	SSSI	GCR	EPS	National BAP	Nationally rare	Nationally scarce	Protected species	Character Area	Other
	Herptiles Common frog Common toad Common lizard Grass snake Smooth newt									 ✓ ✓ ✓ ✓			 ✓ ✓		
Broadleaved, mixed and yew woodland	*Salix-Betula-Phragmites* wet woodland (W2)						✓			✓				✓	
	Wet woodland with *Alnus glutinosa* (W5)		✓		✓		✓			✓				✓	
	Invertebrate assemblage Broad Assemblage Type: • W31 permanent wet mire Specific Assemblage Type: • W314 rich fen • W126 sheltered seepage				✓			✓							
	• **Bats** • Daubenton's • Long-eared • Noctule • Pipistrelle (3 spp)								 ✓ ✓ ✓ ✓	 ✓ ✓ ✓ ✓			 ✓ ✓ ✓ ✓		

Habitat survey

8.4.14 As explained above (Section 8.4.1), much of the Site, including Hoveton Great Broad and Hudson's Bay, lies within Bure Marshes NNR. As a result, these areas are already well surveyed and monitored. The habitat survey therefore focused on those parts of the Site that lie outside of the designated area:

- Wroxham Island (and Wroxham Broad immediately adjacent to it), where new fen habitat will be created
- The Haugh, where a small site compound will be established to store equipment, machinery, materials and where the site hut and welfare facilities will be based.

8.4.15 The results of habitat survey of each area are described below.

Wroxham Broad / Wroxham Island

8.4.16 Wroxham Broad is a large, shallow eutrophic water body, approximately 35ha in area and varying between approximately 2m and 0.5m deep. Macrophyte abundance and diversity is generally low, as evidenced by the Broads Authority's annual macrophyte surveys[9], which have typically recorded 2 – 6 species over the last 5 years.

8.4.17 Wroxham Island is a narrow piece of land immediately to the east of Wroxham Broad, separating it from the River Bure. The majority of the Island is covered with rank fen vegetation and low scrub. A species list and their typical abundance are presented below.

8.4.18 The Island is subject to erosion both from wave action caused by the prevailing wind on the western shore and by boat wash on the western shore. In recent years, efforts have been made to strengthen the Island by using straw bales. These offer possible basking opportunities for reptiles and hauling-out places for otter.

Typical species abundance on Wroxham Island

Species	Abundance (DAFOR)	Species	Abundance (DAFOR)
Alder *Alnus glutinosa*		Guelder rose *Viburnum opulus*	R
Great willow herb *Epilobium hirsutum*	A	Common reed *Phragmites australis*	R
Nettle *Urtica dioica*	R	Marsh fern *Thelypteris palustris*	R
Raspberry *Rubus idaeus*	R	Bittersweet *Solanum dulcamara*	R
Hemp-agrimony *Eupatorium cannabinum*	A	Ash *Fraxinus excelsior*	
Hop *Humulus lupulus*	R	Marsh nettle *Stachys palustris*	R
Balckcurrant *Ribes nigrum*	R	Hawthorn *Crataegus monogyna*	R
Bindweed *Convolvulus sp.*	R	Great water dock *Rumex hydrolapathum*	R
Grey sallow *Salix cinerea*		Greater tussock sedge *Carex paniculata*	R
Sycamore *Acer pseudoplatanus*		Gypsywort *Lycopus europaeus*	R
Greater pond sedge *Carex riparia*	O	Dog rose *Rosa canina*	R
Reed mace *Typha latifolia*	R	Purple loosestrife *Lythrum salicaria*	R

[9] Broads Authority Annual Water Plant Survey Report, Harris, 2013, Broads Authority.

The Haugh

8.4.19 The Haugh is a large area (approximately 5ha) of species-poor improved grassland. At the time of survey it was being used to graze a small flock of sheep and appears to have been under an agricultural regime since at least the end of the 18th Century (see Heritage Desk-based Assessment).

Water vole survey

8.4.20 No signs of water vole were found on Wroxham Island but the habitat, dominated by rank tall herb vegetation, did not lend itself to effective surveying. Given the plant species present, it is considered that water vole are likely to be present on the Island. However, the lack of evidence for them, particularly in areas that would often be considered particularly suitable locally (e.g. at the base of greater tussock sedge, low areas of bank at the water's edge) suggests that they are not present in substantial numbers.

8.4.21 Very limited signs of water vole activity were found at 2 points on the margins of Hoveton Great Broad (1 small feeding station and one possible above-ground nest). Again, it was considered that the habitat did not lend itself to effective surveying and that water vole are likely to be present where ever there is suitable habitat at the broad's edge. Elaine Green, the nature trail warden, reported that sightings of water vole are occasionally reported by visitors but the frequency of the reports suggests that water voles are not present in substantial numbers.

Otter survey

8.4.22 Very few signs of otter were found, either on Wroxham Island or along the shores of Hoveton Great Broad where the new fen will be created.

8.4.23 Two old spraints were found on Wroxham Island; one towards the northern end and another on the southern-most part of the Island where straw bales have been used to strengthen it. In the latter area, it was perhaps surprising not to find more evidence of otter, given the hauling-out opportunities the straw bales present.

8.4.24 One otter spraint was found on the northern shore of Hoveton Great Broad, within the area where the northern-most fen will be created. However, this was not considered to be evidence of a significant hauling-out point.

8.4.25 Despite the limited signs of otter presence, it is considered that otter use both Hoveton Great Broad and Wroxham Broad on a regular basis. However, no significant hauling-out points or holts were identified within the proposed works area during the survey.

8.5 Assessment of value and impact

Assessment of value

8.5.1 The ecological value of the Site is considered below and evaluated using the methodology set out in Appendix 8.

Sites of international importance

8.5.2 The part of the Site that falls within the boundary of The Broads SAC, Broadland SPA and Broadland Ramsar site is classed as being of **Very High** value to wildlife at the **International** scale.

8.5.3 As confirmed with Natural England[10], as the works are required as part of the direct management of both The Broads SAC and Broadland SPA, further assessment of the works under the Habitat Regulations is not required. However, given that both the SAC and SPA are of Very High Value at the International Scale, it is still prudent to assess the

[10] Email correspondence with Catherine Whitehead, Sustainable Development delivery team.

impacts of both the 'development' phase of the project and the long-term impacts of habitat change. An assessment of the impacts on each feature is presented in the table below.

8.5.4 In summary; the sediment removal operations, creation of the new fen areas and installation of the fish barrier will cause localised, short term disturbance/damage to those features present. The features likely to be affected are wintering waterfowl, macrophytes (and water quality generally) and the fen habitat immediately adjacent to where the new fen will be created.

8.5.5 In the long term, the project will create new fen vegetation around the margins of Hoveton Great Broad, significantly improve water quality and, it is hoped, encourage significant macrophyte growth. This will create significantly improved habitat for macro-invertebrates and breeding and over-wintering birds. Initially the significant reduction in fish may have a minor impact on piscivorous species (although alternative feeding opportunities will still be available on the adjacent marshes and the River Bure) but ultimately, the clear-water conditions created and the change in the relative abundance of the fish species present (more rudd and perch) is likely to benefit these species.

Natura 2000 Feature	Status on site	Construction Phase Impacts (short-term)	Impacts of habitat change (long term)
SPA features			
Botaurus stellaris; Great bittern (Breeding)	Bittern are known to breed locally and there is potential for the species to breed in the near-by Hoveton Marshes. Bittern are likely to use the site for feeding during the breeding season.	Works will only take place during the winter (September to February inclusive), therefore there will be no impact on this feature. Removal of fish may have a negative impact on feeding opportunism for bittern. However, not all fish species will be removed and other prey taxa (such as amphibians) will be unaffected by the works. **Neutral** impact	Creation of reedbed/fen habitat will create new lengths of reedbed/fen – open water interface, potentially creating more feeding opportunities for bittern. **Neutral** impact
Cygnus columbianus bewickii; Bewick"s swan (Non-breeding)	Not recorded on the site within the last 10 years.	**Not assessed further.**	**Not assessed further.**
Cygnus cygnus; Whooper swan (Non-breeding)	Not recorded on the site within the last 10 years.	**Not assessed further.**	**Not assessed further.**
Anas penelope; Eurasian wigeon (Non-breeding)	Not present in significant numbers. Mean peak counts over the last 10 years = 13.	**Not assessed further.**	**Not assessed further.**
Anas strepera; Gadwall (Non-breeding)	Hoveton Great Broad is a significant over-wintering site for this species within the SPA. Mean peak counts over the last 10 years = 154. This represents approximately 25% of the SPA population (based on RSPB counts 1999/2000).	Mud pumping works are likely to cause disturbance to over-wintering birds. However, based on experience of works at Duck Broad[11], disturbance is likely to be localised and birds will relocate to elsewhere on HGB/Hudson's Bay or elsewhere within the designated parts of the Bure valley. Similarly, works to install fish barriers will be short-term and localised and birds will be able to locate to other parts of the two broads. **Neutral** impact	As a minimum, HGB and Hudson's Bay will remain tranquil and undisturbed, offering refuge areas for over-wintering waterfowl. The key aim of this project is to significantly improve the ecological quality of the two broads. If this is achieved, it is likely that they will offer better feeding opportunities for wintering waterfowl. **Neutral to minor positive** impact
Anas clypeata; Northern shoveler (Non-breeding)	Not present in significant numbers. Mean peak counts over the last 10 years = 6	Mud pumping works are likely to cause disturbance to over-wintering birds. However, based on experience of works at Duck Broad[5], disturbance is likely to be	As a minimum, HGB and Hudson's Bay will remain tranquil and undisturbed, offering refuge areas for over-wintering waterfowl. The key aim of this project is to significantly

[11] McColl, S. 2012. Assessment of Wetland Bird Monitoring. Broads Authority.

Natura 2000 Feature	Status on site	Construction Phase Impacts (short-term)	Impacts of habitat change (long term)
		localised and birds will relocate to elsewhere on HGB/Hudson's Bay or elsewhere within the designated parts of the Bure valley. Similarly, works to install fish barriers will be short-term and localised and birds will be able to locate to other parts of the two broads. **Neutral** impact	improve the ecological quality of the two broads. If this is achieved, it is likely that they will offer better feeding opportunities for wintering waterfowl. **Neutral to minor positive** impact
Circus aeruginosus; Eurasian marsh harrier (Breeding)	Marsh harrier are known to breed locally and there is potential for the species to breed in the near-by Hoveton Marshes. Marsh harrier are likely to use the site for feeding during the breeding season.	Works will only take place during the winter (September to February inclusive), therefore there will be no impact on this feature. **Neutral** impact	Creation of reedbed/fen habitat may improve feeding/breeding opportunities for marsh harrier on the site. **Neutral** impact
Circus cyaneus; Hen harrier (Non-breeding)	Not present.	**Not assessed further.**	**Not assessed further.**
Philomachus pugnax; Ruff (Non-breeding)	Not present.	**Not assessed further.**	**Not assessed further.**
Botaurus stellaris; Great bittern (Non-breeding)	Bittern are not regularly recorded on the Site during winter, however it is assumed they may occasionally use it. There are other known wintering sites within the NNR.	It is assumed that, give n the scarcity of developed margin habitat on both broads, they are unlikely to be of significant importance to this feature. **Neutral** impact.	Improved margin habitat may be of some limited benefit. **Neutral to minor positive** impact.
Anser brachyrhynchus; Pink-footed goose (Non-breeding)	Not recorded on the site within the last 10 years.	**Not assessed further.**	**Not assessed further.**
Waterbird assemblage	Hoveton Great Broad / Hudson's Bay is a significant over-wintering site for waterbirds.	Mud pumping works are likely to cause disturbance to over-wintering birds. However, based on experience of works at Duck Broad[5], disturbance is likely to be localised and birds will relocate to elsewhere on HGB/Hudson's Bay or elsewhere within the designated parts of the Bure valley. Similarly, works to install fish barriers will be short-term and localised and birds will be able to locate to other parts of the two broads. **Neutral** impact	As a minimum, HGB and Hudson's Bay will remain tranquil and undisturbed, offering refuge areas for over-wintering waterfowl. The key aim of this project is to significantly improve the ecological quality of the two broads. If this is achieved, it is likely that they will offer better feeding opportunities for wintering waterfowl. **Neutral to minor positive** impact

Natura 2000 Feature	Status on site	Construction Phase Impacts (short-term)	Impacts of habitat change (long term)
SAC feature			
Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.; Calcium-rich nutrient-poor lakes, lochs and pools	Not present	**Not assessed further.**	**Not assessed further.**
Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation; Naturally nutrient-rich lakes or lochs which are often dominated by pondweed	Hoveton Great Broad and Hudson's Bay are both designated as naturally eutrophic lakes. The condition of both is currently assessed as Unfavourable No Change.	Mud pumping works and creation of the fish barriers will cause disturbance of the sediment, resulting in an increase in turbidity and decrease in water quality (release of nutrients, reduced DO). Works are also likely to damage macrophytes (if present). However, impacts on water quality/macrophytes are likely to be localised and temporary and will have no impact on the overall condition of the feature. **Neutral** impact	A major aim of this project and the primary aim of these works is to tip both broads into a clear-water, macrophyte-dominated state. This would represent a major improvement in the ecological condition Creation of new fen habitat will result in a moderate loss of open water habitat (approximately 13%) but an improvement in the quality of marginal vegetation. The loss of open water habitat is relatively minor when compared to the extent of open water in 1946, which was approximately half (17.7 ha) of what it is today. **Major positive** impact
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*); Purple moor-grass meadows	Not present.	**Not assessed further.**	**Not assessed further.**
Transition mires and quaking bogs; Very wet mires often identified by an unstable `quaking` surface	Not present	**Not assessed further.**	**Not assessed further.**
Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*; Calcium-rich fen dominated by great fen sedge (saw sedge)*	A small area of this habitat (<0.1 ha) is known to be present adjacent to the nature trail. There may also be some fragments of habitat around the perimeter of the broads that have not been specifically identified.	The works will have no adverse impact on existing fen, other than very localised impacts where the geotubes are laid and capped with fen vegetation and where there is fen immediately adjacent to the areas of back-fill. **Neutral** impact	The creation of more fen/reedbed and biomanipulation of the two broads will have no net impact on the existing fen. **Neutral** impact
Alkaline fens; Calcium-rich springwater-fed fens	There are areas of species-rich fen around Hoveton Great Broad (see Figure ES-13)	The works will have no adverse impact on existing species-rich fen, other than very localised impacts where the geotubes are laid and capped with fen vegetation and	The creation of more fen/reedbed and biomanipulation of the two broads will have no net impact on the existing fen. **Neutral** impact

Natura 2000 Feature	Status on site	Construction Phase Impacts (short-term)	Impacts of habitat change (long term)
		where there is fen immediately adjacent to the areas of back-fill. **Neutral** impact	
Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*); Alder woodland on floodplains*	There are significant areas of wet woodland around both Hoveton Great Broad and Hudson's Bay (see Figure ES-13.	The works will have no adverse impact on wet woodland, other than very localised impacts where the geotubes are laid and capped with fen vegetation and where there is fen immediately adjacent to the areas of back-fill. **Neutral** impact	The creation of more fen/reedbed and biomanipulation of the two broads will have no net impact on the wet woodland. **Neutral** impact
Vertigo moulinsiana; Desmoulin`s whorl snail	Known to be present in the fen vegetation on the Site.	The works will have no adverse impact on fen vegetation, other than very localised impacts where the geotubes are laid and capped with fen vegetation and where there is fen immediately adjacent to the areas of back-fill. **Neutral** impact	Creation of more fen/reedbed vegetation may create more habitats suitable for *V. moulinsiana*. **Neutral** impact
Lutra lutra; Otter	Otter are known to use both broads and the surrounding fen habitat. No otter holts were identified around the perimeter of HGB during the otter survey.	The works may cause minor disturbance to otter but this will be short term and localised. Note that works will not be carried out or will need to be significantly modified if they risk damage to an otter holt. Biomanipulation will reduce the availability of fish in the broads but there will still be some fish present and other hunting opportunities will be still be locally available (e.g. Hoveton Marshes dykes, the adjacent river Bure). **Neutral** impact	The key aim of this project is to significantly improve the ecological quality of the two broads. If this is achieved, it is likely that they will offer better feeding opportunities for otter. **Minor to moderate positive** impact
Liparis loeselii; Fen orchid	Not present.	**Not assessed further.**	**Not assessed further.**
Anisus vorticulus; Little whirlpool ram's-horn snail	Not present.	**Not assessed further.**	**Not assessed further.**

Sites of national importance

8.5.6 The Bure Broads and Marshes SSSI, which falls within the majority of the site boundary, is assessed as being of **High** value at the **National** scale. The impact assessment on the Natura 2000 features of the Site is presented in the table above. The designated status of these features is under-pinned through their designation as SSSI features.

8.5.7 The assessment of the likely impact on the remaining SSSI features is presented in the table below.

SSSI Feature	Status on site	Construction Phase Impacts (short-term)	Impacts of habitat change (long term)
Vascular plant assemblage – open water	Both HGB and Hudson's Bay have the ecological potential to support components of the vascular plant assemblage but macrophyte abundance and diversity in both broads is low and the status of both broads is Unfavourable No Change.	Works, particularly mud-pumping, are likely to damage macrophytes where they are present. While this damage is likely to be significant in terms of the plants that are there, macrophytes are so scarce in the two broads that the works will not alter the condition status of this feature. Where macrophytes are obvious (such as lily beds, for example), damage can be avoided. **Neutral** impact	A major aim of this project and the primary aim of these works is to tip both broads into a clear-water, macrophyte-dominated state. This should result in an increase in both the abundance and diversity of macrophytes present, thus resulting in a significant improvement in the status of the vascular plant assemblage. **Major positive** impact
Invertebrate assemblage – open water	Some components of the designated invertebrate assemblage are present within the broads but only localised around the margins.	Creation of fen habitat will have a negative impact on the invertebrate assemblage, where present. However, works will be confined to limited areas and areas of particularly good marginal vegetation have been specifically avoided. Recent macro-invertebrate surveys have found the open water to be devoid of components of the designated invertebrate assemblage. **Neutral** impact	A major aim of this project and the primary aim of these works is to tip both broads into a clear-water, macrophyte-dominated state. The consequences of this should be of major direct benefit to the invertebrate assemblage through improves habitat structure, feeding and breeding opportunities. **Major positive** impact
Phragmites australis reedbed (S4)	There are patches of species-rich fen around Hoveton Great Broad (see Figure ES-13)	The works will have no adverse impact on fen vegetation, other than very localised impacts where the geotubes are laid and capped with fen vegetation and where there is fen immediately adjacent to the areas of back-fill. **Neutral** impact	The creation of more fen/reedbed and biomanipulation of the two broads will have no net impact on the existing fen. **Neutral** impact
Fen meadow (M22)	Not present	**Not assessed further.**	**Not assessed further.**
Vascular plant assemblage – fen, marsh and swamp	A number of the species that make up the vascular plant assemblage (fen, marsh and swamp) are found in the fen habitat surrounding	The works will have no adverse impact on fen vegetation, other than very localised impacts where the geotubes are laid and capped with fen vegetation and where there is fen immediately adjacent to the areas of back-fill. **Neutral** impact	Creation of more fen/reedbed vegetation may create more habitat suitable to support key vascular plant species. **Neutral** impact

SSSI Feature	Status on site	Construction Phase Impacts (short-term)	Impacts of habitat change (long term)
	HGB and Hudson's bay, including: *Cicuta virosa* *Lathyrus palustris* *Peucedanum palustre* *Sonchus palustris* *Sium latifolium* *Thelypteris palustris*		
Invertebrate assemblage – fen, marsh and swamp	A number of the species that make up the invertebrate assemblage (fen, marsh and swamp) are found in the habitat surrounding HGB and Hudson's bay.	The works will have no adverse impact on fen vegetation, other than very localised impacts where the geotubes are laid and capped with fen vegetation and where there is fen immediately adjacent to the areas of back-fill. **Neutral** impact	Creation of more fen/reedbed vegetation may create more habitats suitable for invertebrates. **Neutral** impact
Salix-Betula-Phragmites wet woodland (W2, W6, W7)	There are significant areas of wet woodland around both Hoveton Great Broad and Hudson's Bay	The works will have no adverse impact on wet woodland, as the wet woodland is set back from the broad's edge. **Neutral** impact	The creation of more fen/reedbed and biomanipulation of the two broads will have no net impact on the wet woodland. **Neutral** impact
Breeding bird assemblage (fen, marsh and swamp; standing open water)	The site supports a broad suite of breeding bird species. The breeding bird assemblage features of the SSSI are currently assessed as favourable.	Works will only take place during the winter (September to February inclusive) and there will be no significant loss/degradation of breeding habitat. Biomanipulation will reduce the availability of fish for piscivorous species, such as common tern and kingfisher, although some fish will still be present and other feeding opportunities will still be available in immediately-adjacent water bodies (Hoveton Marshes dykes, River Bure) which are currently already used. **Neutral** impact	The creation of more fen/reedbed will create more nesting habitat for some species. The clear-water conditions resulting from lake restoration may offer better feeding opportunities for piscivorous species, including species that currently do not breed on the site. **Moderate positive** impact

Protected, rare and scarce species

Breeding birds

8.5.8 Although a specific breeding birds survey was not undertaken, the species using Hoveton Great Broad are well-recorded. It is reasonable to assume, given its proximity to Hoveton Great Broad, that many of the species present there are likely to also use Wroxham Island and Wroxham Broad, albeit probably less frequently. The breeding birds outside of the designated site are therefore assessed as being of **High** value at the **National** scale, with some species of **Very High** value at the **International** scale also likely.

8.5.9 The assessment of the likely impact on breeding birds outside of the Designated Site is very similar to that within it:

- Construction phase impacts - Works will only take place during the winter (September to February inclusive) and there will be no significant loss/degradation of breeding habitat. **Neutral** impact.
- Habitat change impacts - The creation of more fen/reedbed will create more nesting/feeding habitat for some species. **Neutral** impact.

Wintering birds

8.5.10 Hoveton Great Broad and Hudson's Bay are significant sites for over-wintering waterbirds found within The Broads SPA. Mud-pumping works and installation of the fish barriers are likely to cause noise and visual disturbance to over-wintering birds. However, based on previous experience at Duck's Broad[12], disturbance would be localised and birds will relocate to unaffected areas elsewhere within Hoveton Great Broad and Hudson's Bay, or other areas of suitable habitat within the Bure valley.

8.5.11 Like Hoveton Great Broad, Wroxham Broad is expected to support and be used by various species of birds, particularly waterfowl, over the winter. However, unlike Hoveton Great Broad, there is public access onto Wroxham Broad, which is also used recreationally by the local sailing club. Disturbance is likely to be higher and therefore the broad offers less attractive habitat to over-wintering birds and especially those seeking somewhere undisturbed to rest following their winter migration. The wintering birds outside of the designated site are therefore assessed as being of **Medium** value at the **Regional** scale.

- Construction phase impacts - Given its exposed nature, Wroxham Island and the immediate surrounding area of open water is not considered to be of particular importance for wintering birds. While other parts of Wroxham Broad may be used by wintering birds, these are likely to be to some extent habituated to human disturbance and sufficiently distant from the works areas so as not to be disturbed by the works. **Neutral impact.**
- Habitat creation impacts – the widening of Wroxham Island will neither benefit nor impact upon wintering birds, but the aim to improve the ecological quality of Hoveton Great Broad and Hudson's Bay is also likely to offer better feeding opportunities for overwintering wildfowl. **Neutral** to **Minor Positive** impact**.**

Reptiles

8.5.12 Although a specific reptile survey was not undertaken, grass snake and common lizards are known to be present within the Designated Site. It is reasonable to assume, given its proximity to Hoveton Great Broad, that many of the species present there are likely to also use Wroxham Island and Wroxham Broad, albeit probably less frequently.

[12] McColl, S. *Assessment of Wetland Bird Monitoring*. Broads Authority, 2012

8.5.13 Given that reptiles are not designated features and that they are likely to be present throughout the middle Bure but that the Broads are likely to be an important stronghold for both common lizards and grass snake, they are assessed as being of **Medium** value at a **Regional** level.

8.5.14 The assessment of the likely impact on reptiles is as follows:

- Construction phase impacts - The majority of works will be carried out almost exclusively from the water. There is negligible risk of these activities killing or injuring reptiles. There is however a risk that the movement and storage of materials to, from and within the compound on The Haugh could result in the killing or injury of reptiles. While the majority of the works will be carried out during the colder months, when reptiles are not active, and are likely to have moved to higher ground for hibernation, there is a risk that reptiles may be present on The Haugh when the compound is being established. In addition, if conditions are warm enough, reptiles may still be active during the first 1 – 2 months of works each year and they may seek refuge within the compound. Mitigation is necessary in order to prevent any adverse impact upon reptiles. Grass and other vegetation within and around the compound will be kept closely mown to discourage reptiles from moving from other near-by habitat (wet woodland/fen) to seek refuge within the compound. Initial impact, pre-mitigation would be **Minor negative** but this could be reduced to **Neutral** where mitigation is put in place.
- Habitat change impacts - there will be no significant change to any of the habitats likely to be used by reptiles. **Neutral** impact.

Bats

8.5.15 Although a specific bat survey was not undertaken, the species using Hoveton Great Broad are well-recorded. It is reasonable to assume, given its proximity to Hoveton Great Broad, that many of the species present there are likely to also use Wroxham Island and Wroxham Broad.

8.5.16 Given that all bats species are European Protected Species (EPS) in their own right, they are assessed as being of **Very High** value at an **International** level, although in the context of the site, the use of this part of the Bure valley by bat species is likely to be of importance at a **County** level.

8.5.17 The assessment of the likely impact on bats outside of the Designated Site is very similar to that within it:

- Construction phase impacts - Works will only be carried out in winter (September – February inclusive) and will only be carried out during daylight hours. Works will not involve the modification/disturbance/destruction of possible bat roost sites. It is therefore unlikely that these actives will disturb, kill or injure bats. **Neutral** impact.
- Habitat change impacts – Enhancement of the ecological condition of the two broads and the creation of new fen habitat is likely to improve the quality of the Site for bats. **Minor positive** impact.

Water vole

8.5.18 Although the survey found little evidence of water vole, this species is thought to be present throughout the site, albeit not in substantial numbers. Given that water vole are protected under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) but that the site does not appear to support a significant population, they are assessed as being of **Medium** value at a **Regional** level.

8.5.19 The assessment of the likely impact on water vole is as follows:

- Construction phase impacts – the creation of the new fen areas may cause some disturbance to water vole and has the potential to cause damage/destruction to their burrows in the immediately adjacent existing fen. Survey results have shown water vole

populations to be low in these areas and therefore through the use of appropriate mitigation, impacts will be minimal and a **Minor Adverse** impact would be likely. Details of appropriate mitigation in respect of water vole are given in Section 8.6 below.

- Habitat change impacts – creation of new fen, particularly within Hoveton Great Broad, is likely to create new habitat for water voles and arguably of better quality than what is currently present. **Neutral to minor positive** impact.

Otter

8.5.20 Although the survey found few recent signs, otter are thought to be present throughout the Site. Given that otter are an SAC feature and are a European Protected Species (EPS) in their own right, they are assessed as being of **Very High** value at an **International** level, although in the context of the site, the use of this part of the Bure valley by otter is likely to be of importance at a County level.

8.5.21 The assessment of the likely impact on otter outside of the Designated Site is very similar to that within it:

- Construction phase impacts – The works may cause minor disturbance to otter but this will be short term and localised. Note that works will not be carried out or will need to be significantly modified if they risk damage to an otter holt. Further survey would be undertaken prior to commencement of works to determine whether an otter holt is present in proximity to the works. Biomanipulation will reduce the availability of fish in the broads but there will still be some fish present and other hunting opportunities will be still be locally available (e.g. Hoveton Marshes dykes, the adjacent River Bure). **Neutral** impact.
- Habitat change impacts – The key aim of this project is to significantly improve the ecological quality of the two broads. If this is achieved, it is likely that they will offer better feeding opportunities for otter. **Minor to moderate positive** impact.

Invertebrates

8.5.22 A number of rare and scarce invertebrate species are regularly recorded within the Designated Site. It is reasonable to assume that some of these species are also likely to be present in Wroxham Broad or on Wroxham Island. Given this, and that the invertebrate assemblages (both open water and fen, marsh and swamp) are designated features of the Bure Broads and Marshes SSSI, invertebrates are assessed as being of **High** importance at the **National** scale.

8.5.23 The assessment of the likely impact on invertebrates outside of the Designated Site is very similar to that within it:

- Construction phase impacts - The works will have no negative impact on fen vegetation, other than very localised impacts where the geotubes are laid and capped with fen vegetation and where there is fen immediately adjacent to the areas of back-fill. **Neutral** impact.
- Habitat change impacts – The area of open water habitat to be lost currently offers poor habitat for invertebrates. Creation of more fen vegetation is likely to create more habitat suitable for invertebrates. **Neutral to major positive** impact.

Fish

8.5.24 While fish are considered to be of low ecological value (there are no protected or designated species present), recreational angling is of significant economic importance within the middle Bure. The impacts on fish are being assessed as part of on-going work to inform the project. If these impacts are assessed by Environment Agency fisheries specialists as being significant, biomanipulation will not proceed.

Sites of regional and local importance

8.5.25 Figure ES12 – Ecological designations shows the locations of county wildlife sites and ancient semi-natural/ancient replanted woodland in the local area. Given the nature of the works and that the nearest of these sites is over 1km away from the development site, it is considered that this proposal will have no impact on these sites and therefore further assessment of the impacts to them was not considered. **Neutral** impact.

Habitats

8.5.26 The habitats present within the site itself include Wroxham Broad which is a large, shallow eutrophic water body with generally low macrophyte abundance and diversity in recent years. Wroxham Island is a narrow piece of land immediately to the east of Wroxham Broad, separating it from the River Bure. The majority of the Island is covered with rank tall herb fen vegetation and low scrub. The Haugh is a large area of species-poor improved grassland. Species-rich fen and wet woodland occur on the margins of Hoveton Great Broad and Hudson's Bay. These habitats are used by a wide range of rare, scarce and protected as well as common animal species including otter, water vole, breeding and wintering birds, bats, reptiles, invertebrates and fish. The habitats also support a range of plants, though none are locally uncommon or protected. The ecological value of the habitats varies across the site area from **Medium** at the **County** level to **Very High** at **International** level. Overall, the site habitats are considered to be of **Very High** ecological value at **International** level because they support priority features of the Designated Site.

- In the short-term, during the construction phase, there will be disturbance to the habitats within the site that are mentioned above. Mitigation is required for several species that use these habitats and this detailed in Section 8.6 below. The habitats themselves will suffer **Minor Adverse** impacts during the short term.
- In the longer term, the changes to habitats will be beneficial. There will be an improvement in the water quality that will benefit a number of species. There will also a net increase in ecologically valuable habitats including species-rich fen, reedswamp and mixed tall herb fen. The compound area within The Haugh will be re-seeded as agricultural ley thus restoring the original habitat. In the longer term, the impact upon habitats within the site will be between a **Neutral** and a **Major Positive** Impact. Overall the impact is judged to be **Major Positive**.

Non-native invasive species

8.5.27 Killer shrimp is already established in the three broads and it would be virtually impossible to remove them, particularly given the direct connections with the river where killer shrimp is also established. However, it is **vital** to prevent the transfer of killer shrimp from the project area to other unaffected areas. Appropriate check-clean-dry protocols will therefore be followed throughout the works.

8.5.28 Himalayan Balsam is already established on Wroxham Island and could spread to the fen creation areas. Himalayan Balsam will therefore be controlled as part of the management of the new fen areas.

8.6 Mitigation

Sites of International and National importance

8.6.1 Mitigation has been proposed for some of the features for which these sites have been designated, i.e. breeding birds, macrophytes and Otter (see specific points below).

Water vole

8.6.2 The water vole survey did not find any evidence of habitation on Wroxham Island and found few signs including 2 feeding stations and 1 nest on Hoveton Great Broad and Hudson's Bay. However, it should be remembered that surveying was hampered to some extent by the tall and rank vegetation. The habitat at both Wroxham Island and Hoveton Great Broad/Hudson's Bay is considered to be optimal for water vole and as such, their presence should not be ruled out.

8.6.3 National law protects water voles, their places of shelter and the habitat which they use. This means that the presence or potential presence of water vole in habitat within and adjacent the proposed works areas requires mitigation to be put in place to prevent any harm to animals or damage/destruction of their burrows and habitat.

8.6.4 The initial stage of the restoration scheme, the mud pumping, is due to be carried out between October and March 2016/17. This is a time of year when water voles are less active. They do not hibernate as such, but will spend prolonged periods in their burrows during cold winter weather. They may show very low densities of above ground signs of activity on milder winter days. This therefore means that although water vole will not be breeding and there will be no fully dependant young, they will still be vulnerable in their use of their burrows.

8.6.5 The mud pumping works involve the pumping of sediment into a void of water that will be created between the existing water frontage (where the voles are present) and newly placed geobags. The mud pumping operations will cover and fill the existing vole burrow entrances in these locations. It may be possible for voles to access or retreat from their burrows if they have entrances in the top of the bank further back from the water's edge. If they do not, or during particularly cold weather when they are much less active, there is a risk of them being injured or killed.

8.6.6 The proposed mitigation techniques are persuasive measures to encourage voles to leave the area of their own accord. However, water voles are strongly territorial creatures and are therefore notoriously persistent when withstanding such mitigation techniques, often returning to old burrows when moved on, if they are not quickly or effectively prevented in doing so. Therefore, the proposed mitigation should be carried out in advance of works starting at each location (no longer than one month preceding the start of works) so that water voles do not have a chance to return to their burrows. Repeat strimming of the vegetation over a prolonged period may result in water voles becoming accustomed to the new 'management' and moving back to their burrows. Water drawdown, which is a more effective tool in persuading voles to move away, is not achievable in this scenario due to the broad frontage location.

8.6.7 Water voles are only likely to be successfully displaced through vegetation removal during the period late-February to early-April. Therefore in order to avoid more intrusive and destructive mitigation methods, it is proposed that those locations where there are no or very low densities of signs of water vole activity (determined through the update vole surveys), are worked on during the earlier part of the working period i.e. between October and early February, and those locations which showed greater densities of vole activity signs are worked on from mid/late February to the end of March.

8.6.8 Outline mitigation is given below and should be followed in the order in which it is set out, so to lessen the adverse impacts of the proposed restoration scheme upon water vole. A detailed scheme of water vole mitigation will be drawn up and agreed with the relevant SNCO's well in advance of works on site beginning.

- Update water vole surveys to be carried out during May and early September 2016 to determine presence/absence of water voles in areas to be affected by the works and to obtain a population size estimate.
- It should be noted that if the update surveys show that water vole populations have grown in both terms of number of animals and size of occupied habitat, then it may no longer be appropriate to use displacement mitigation techniques as they would not be effective. Should it be determined that trapping and relocating of animals is required, then a water vole trapping licence application would need to be made to Natural England's licensing team. This should be considered at the earliest opportunity following the May update survey.

8.6.9 If water voles are found to be present, the following mitigation should be carried out prior to any works on site starting.

- All burrow entrances within the working area to be clearly marked out on site using coloured cane markers/flags.
- All vegetation in the working area and a 5m buffer zone around it, to be removed to ground level using a hand strimmer with the strimmer cord angled into the ground to ensure all vegetation is removed and bare ground is left behind. Vegetation which is known or suspected to hold a water vole nest (an above ground nest), should be excluded until an Ecologist has determined no animals are present.
- All vegetation arisings to be raked off and removed from site and all burrow entrances unblocked where necessary.
- Monitor daily for any new signs of water vole activity
- Undertake a destructive search after three days following vegetation strimming
- Works should start immediately after the destructive search has been completed.

Otter

8.6.10 Based on the findings of otter survey, no mitigation is proposed. However, the survey should be repeated prior to commencement of works on site and the risk to otter re-assessed.

Reptiles

8.6.11 As identified in Section 8.5.12, there is a risk that reptiles may still be active when the compound is first set up each year. Standing machinery, piles of materials (such as geotubes / geotextiles) and temporary structures (site cabin / welfare facilities) may offer refuge opportunities for reptiles. There is then a risk that reptiles may be injured or killed when the machinery/materials/structures are moved.

8.6.12 To mitigate this risk, the grass and other vegetation within and around the compound will be kept closely mown to discourage reptiles from moving from other near-by habitat (wet woodland/fen) to seek refuge within the compound.

Bats

8.6.13 Works will take place during daylight hours only. There will be no floodlighting of the site.

Breeding birds

8.6.14 Works will take place outside of the bird nesting season.

Macrophytes

8.6.15 Were possible, sediment removal works should work around existing macrophyte beds. If macrophytes are removed by accident during the works, they should be returned to the water.

8.7 Enhancement

8.7.1 As part of the works to create new tall herb fen to widen Wroxham Island, efforts should be made to create a kingfisher bank with existing material from the island. This can be replaced with sediment from HGB and Hudson's Bay.

8.7.2 A small amount of scrub may need to be cleared as part of the works to install the geotubes adjacent to Wroxham Island. This should be cut and stacked on the island to create habitat piles for the benefit of reptiles and invertebrates.

8.8 Conclusions and recommendations

8.8.1 Overall, the Site is assessed as being of **Very High** value at the international scale. A large part of the Site is designated as SPA, SAC, Ramsar Site, SSSI and NNR. In addition, the Site also supports a number of protected and nationally rare species including reptiles, bats and water vole.

8.8.2 The impacts of the sediment removal works, creation of new fen habitat and installation of the fish barriers will be localised and short-term, resulting in a **Neutral** impact upon the ecological interest of the Site following delivery of mitigation.

8.8.3 In the long term, the creation of new fen habitat, improvements in water clarity and a significant increase in macrophyte growth will have a **Major Positive** impact on the ecological value of the Site.

9 Archaeology and Cultural Heritage

9.1 Background

9.1.1 Archaeological Project Services (APS) was commissioned by Natural England to produce a Heritage Statement to identify heritage assets and likely impacts during a scheme of wetland restoration at Hoveton Great Broad, Hoveton, Norfolk. A desk-based archaeological assessment was prepared as part of the work undertaken. The Heritage Statement and associated desk-based assessment was submitted as part of the planning application, and is also summarised below.

9.2 Methodology and scope of assessment

9.2.1 The aim of the archaeological assessment was to establish the known and potential heritage resource within the Site, which may be affected by the proposed development. The assessment was undertaken in accordance with the principles presented by the National Planning Policy Framework.

9.2.2 The archaeological desk-based assessment collated data based on a 1km radius from the centre of the Site. The associate Heritage Assessment focusses on an area of c500m radius around the Site. The assessment seeks to interpret the resource through consideration of previous discoveries, archaeological investigations and data, with a view to providing information for Norfolk Historic Environment Service to determine recommendations on the need for and appropriateness of further work in this area. Data was obtained from Norfolk Historic Environment Record, Norfolk Record Office and the local studies section of Norwich Central Library.

9.2.3 A site reconnaissance (walkover survey) was undertaken on 18th June 2014.

9.3 Baseline information

9.3.1 Records exist of various heritage resources and assets in close proximity to the Site, including archaeological investigations, sites, finds and Listed Buildings. Documentation associated with these was obtained from the Norfolk Historic Environment Record.

9.3.2 The summary information presented below is based on the desk-based assessment (see separate Heritage Assessment) which examined data from a wider assessment area. The description of the heritage assets in this document focuses on an area of up to 500m from the Site.

Archaeological and historical evidence

9.3.3 Prehistoric remains have not been recorded within the Site but are known from the wider assessment area. Peat development within the Bure valley started during the earlier prehistoric period.

9.3.4 There are no Romano-British entries within the assessment area, although some metalwork has been identified on multi-period sites. This includes finds from the southern field of The Haugh.

9.3.5 No Saxon entries are recorded within the assessment area, although Late Saxon metalwork has been retrieved from a multi-period site near Hoveton House. Hoveton is first mentioned in a charter of St Benet of Holme Abbey between 1044-7. The Domesday Survey records that St Benet's Abbey still held Hoveton in 1086. A turbary (peat extraction site) was sold to St Benet's Abbey in the late 12th century.

9.3.6 Peat extraction created vast pits which were subsequently flooded to form the Broads, including Hoveton Great Broad, Hudson's Bay and Wroxham Broad. Once flooded, the lakes were adapted for use as fisheries. An important fishery is recorded in the 13th century along the waters of Wroxham, Belaugh and Hoveton.

9.3.7 Post-medieval sites include buildings (5 of which in the wider area are listed), parkland, cropmarks and finds recovered from the multi-period sites. None are known from the immediate vicinity of the Site.

9.3.8 The site reconnaissance (walkover) survey found that, although the Broads were created by medieval peat extraction, the extent of this industry is obscured by more recent vegetation growth. One 'island' of unexcavated peat of pre-medieval origins lies within Larkbush on the southern shore of Hoveton Great Broad. No visible archaeological remains were recorded.

9.3.9 No previous archaeological intervention has been undertaken in proximity to the Site.

9.4 Significance of heritage resource

Nearby heritage assets

9.4.1 Buildings, artefact scatters and buried remains are located close to the Site. The buildings comprise five Grade II Listed Buildings of regional significance. The nearest Listed Buildings are associated with Broad Farm, Salhouse, and lie at a distance of 370m from the broad, and a greater distance from the proposed geotubes. The other nearby heritage assets, mostly cropmarks, are of high local significance.

9.4.2 There are no Scheduled Monuments within 2km of the Site.

Heritage assets at the Site

9.4.3 Heritage assets at the Site include a significant peat extraction site associated with St Benet's Abbey which has created the Broads. These are of high local significance.

9.5 Impact assessment

Physical Impact

9.5.1 The physical impact of the proposed development on nearby known heritage resources will be NONE.

9.5.2 The physical impact of the wetland restoration on heritage assets at the Site will be LOW as the limits of peat extraction were greater than the current extent of the Broads. Although remnants of unexcavated peat baulks, which may contain unidentified remains, lie within the Site, and potential physical impact could be MODERATE to HIGH, because the proposed sediment removal would only remove recent deposits, there would be minimal actual physical impact upon these features as a result of the proposals and the overall impact is assessed as NONE to LOW.

9.5.3 There would be no impact upon any potential buried remains on The Haugh, where the site compound is located.

9.5.4 The physical impact on built heritage assets will be NONE to LOW.

Visual and Setting Impacts

9.5.5 There are five Listed Buildings within the wider 2km search area. The nearest is located at a distance of 370m from the proposed restoration works. Therefore the setting impact will be NONE. Existing tree belts means that there is no intervisibility between Listed Buildings and the Site and the overall impact will be NONE to LOW.

9.6 Conclusions

9.6.1 The Site lies principally within a medieval peat extraction site. This will have removed traces of earlier exploitation and use of the area, though unexcavated baulks may potentially contain such evidence.

9.6.2 Other designated and non-designated heritage assets are located in proximity to the Site. These include Listed Buildings, other buildings, cropmarks and findspots. In consideration of the foregoing, the physical impact of proposed development upon the known archaeological and historical resources of the area is assessed as NONE to LOW.

9.6.3 In terms of the impact of the proposed development on the setting of nearby heritage assets, this is assessed as NONE to LOW.

10 Cumulative impacts

10.1 Definition of schemes and projects likely to give rise to cumulative effects

10.1.1 Cumulative effects are those associated with other 'reasonably foreseeable' projects interpreted to include those that are 'committed'. Similarly impact interactions are the results of "inter-relationships" between specified environmental effects. These should include:

- Development projects with valid planning permissions granted by the Local Planning Authority, and for which formal EIA is a requirement or for which non-statutory environmental impact assessment has been undertaken.
- Development projects for which an application has been made to the Local Planning Authority and which has been validated; and for which formal EIA is a requirement or for which non-statutory environmental impact assessment has been undertaken.

10.1.2 Due to the nature of the proposed Hoveton Great Broad restoration scheme, particular attention would be paid to schemes or projects likely to result in impacts upon the environment of the River Bure floodplain.

10.2 Identification of schemes and projects likely to give rise to cumulative effects

10.2.1 No schemes or projects have been identified within the mid-Bure valley area which might potentially give rise to cumulative effects in combination with the proposed Hoveton Great Broad restoration scheme.

11 Impact Summaries and Mitigation Measures

11.1 Hydrology, Hydrogeology and Flood Risk

11.1.1 A Flood Risk Assessment (FRA) is submitted with the application. This concludes that the development would not increase the risk of river flooding. The scheme is therefore not anticipated to give rise to any increased flood risk (refer also to Flood Risk Assessment).

11.2 Water Quality

11.2.1 The impact of the project on water quality will be temporary and will not cause long term water quality impacts on either the broads themselves nor in the River Bure. Conversely, the removal of sediment will reduce phosphate levels in Hoveton Great Broad and Hudson's Bay, and should actually improve the macrophyte status and water quality in the long term.

11.2.2 The following mitigation measures are proposed:

- The broads will remain connected to the River Bure throughout the works allowing for dilution and flushing of any nutrients.
- The works will occur in winter when flows are higher which will increase any flushing affect. Also, winter is when biological activity is at its lowest therefore any temporary impacts will be further reduced. The timing of the works will allow time for the sediment to clear by spring when biological activity and in particular macrophyte growth increases.
- Silt curtains will be placed at points around the exit points around Hoveton Great Broad and Hudson's Bay to reduce suspended sediment flushing into the River Bure

11.3 Ground Conditions

11.3.1 Testing has already been carried out and no significant concentrations of contaminants have been identified. No significant impacts associated with the site surface condition are identified.

11.4 Traffic and Access

11.4.1 The proposed site compound is accessed by a private track, approximately 2km long, which leads from the A1062 to the site. It is not considered that this increase would not give rise to traffic problems on A1062, nor on the private estate roads, and it is therefore surmised that the overall impact of the proposals would not significantly affect local road users and residents.

- Any damage to estate roads will be made good at the end of the works.

11.5 Air Quality and Odour

11.5.1 There may some localised odour impacts resulting from release of 'marsh gas' on initially disturbing sediments, and whilst fresh mud is transferred to the geotextile bags and backfilling with sediment to create reedbed areas. However, material would be worked 'wet' and there is thus no potential for entrainment of airborne particulate matter, and these operations are not expected to result in a significant or prolonged discharge of noxious odour.

11.5.2 No significant impacts are predicted providing that good site practice is adhered to.

11.6 Noise and Vibration

11.6.1 No significant impacts are predicted providing that good site practice is adopted; for example low noise plant and engines would be used for the proposed works.

11.7 Sustainability

11.7.1 The assessment demonstrates that the proposals would give rise to numerous beneficial effects and as such the development can be found to contribute to the delivery of sustainable development.

11.8 Landscape and Visual Impacts

11.8.1 The proposals present no change to the key characteristics of the Broadland landscapes local to the project area. There would be no impacts during either the course of the works, the first year following completion or after a period of 10 years once the proposed fen vegetation has established to both the Broads LCA 23 Bure Valley, or Broadland District Council Marshes Fringe F1, landscape types. The seasonal and low-key nature of the engineering operations of the construction works would be in keeping with the character of typical management operations of the landscape of the broads. The lack of any land-based operations or lighting ensures that the integrity of the carr woodland around the fringes to the river and Hoveton Great Broad is retained intact.

11.8.2 Once the vegetation to the surface of the geotubes, and the fen vegetation to the sediment to the rear, becomes fully established, the bank-side character of the river in the vicinity of Wroxham Island will be enhanced. The slim island between river and the adjacent Wroxham Broad currently has a somewhat denuded feel, with the bank line exposed and a series of fragile protection measures in place. The widened island would provide a greater depth of vegetation which will provide a more enclosed feel to the river channel. Similarly, the completed work at Hoveton Great Broad would enhance the distinctly remote and tranquil character of the landscape, which relates to the characteristics behind the designations applicable to this landscape.

11.8.3 No mitigation is proposed, although close cooperation between the project team has allowed for successive design iterations and modifications to the restoration proposals which have taken the potential for visual impact into account, so that, for example, the design of the fish barriers was modified so ensure minimal visual impact to river users, and vegetation restoration at Wroxham Island was developed so as to negate the need for visually intrusive goose-exclusion fencing. The scheme allows for rapid establishment of vegetation on the geotubes themselves, both to prevent erosion, and also to minimise the visual impact of these structures.

11.9 Ecology

11.9.1 Overall, the construction phase of the works will have a neutral impact on the ecological receptors of the site (providing mitigation is put in place). In the long term, lake restoration, with associated improvement in water quality, clarity and an increase in the diversity and abundance of macrophytes, will significantly improve the ecological status of the Site. The creation of new fen habitat will also be of ecological benefit. The assessment of the potential impacts to the key ecological receptors of the site is summarised in the table below.

11.9.2 The table below summarises how the scheme will impact the ecological features present on the site

Feature	Level of value	Scale	Un-mitigated impact	Mitigated impact	Short-term impact (construction phase)	Long-term impact (habitat change)
Sites of International importance	Very High	International	Minor Adverse	Neutral	Neutral	Neutral to Minor Positive

Sites of National importance	High	National	Minor Adverse	Neutral	Neutral	Neutral to Minor/Moderate Positive
Sites of Regional/Local importance	Medium	Regional	Neutral	Neutral	Neutral	Neutral
Habitats	Lower	Parish/Neighbourhood	Minor Adverse	N/A	Minor Adverse	Neutral to Minor Positive
Bats	Very High	International	Neutral-Moderate Adverse	Neutral	Neutral	Minor Positive
Reptiles	Medium	County	Minor Negative	Neutral	Neutral	Neutral
Breeding Birds	Very High	International	Minor-Moderate Adverse	Neutral	Neutral	Neutral
Wintering birds	Lower	Parish/Neighbourhood	N/A	N/A	Neutral	Neutral
Water Vole	Medium	Regional	Moderate Adverse	Minor Adverse	Neutral	Neutral to Minor Positive
Otter	Very High	International	N/A	N/A	Neutral	Minor to Moderate Positive
Invertebrates	High	National	N/A	N/A	Neutral	Neutral to Major Positive
Fish	Low	Parish/Neighbourhood	N/A	N/A	N/A	N/A
Macrophytes	Very High	International	Minor Adverse	Neutral	Neutral	Major Positive

N/A = Not applicable because no mitigation is required or proposed or in the case of fish, the impact of the scheme will be assessed by the Environment Agency in a separate study.

Ecological value and impact are assessed using the methodology set out in Appendix 8.

11.9.3 The following is a summary of the mitigation proposed to lessen the impact of the scheme upon ecological features at the site.

- Sites of International and National importance – Mitigation has been proposed for some of the features for which these sites have been designated, i.e. breeding birds, macrophytes and Otter (see specific points below)
- Bats – Works will take place during daylight hours only. There will be no floodlighting of the site.
- Breeding birds – Works will take place outside of the bird nesting season.
- Water Vole – Proposed mitigation is given in Section 8.6 above which includes update surveys in the year preceeding works starting. It also includes the displacement of water voles through vegetation management and destructive searches. A detailed mitigation scheme will need to be agreed with the appropriate SNCO's.
- Otter – No mitigation as such is proposed but there will be a re-survey prior to commencement of works and re-assessment of risk to Otter. If an Otter holt is in risk of being damaged/disturbed, works will not be carried out or they will be significantly modified.
- Reptiles – Grass and other vegetation around the compound area will be kept closely mown to discourage reptiles from using the area.

- Invertebrates – Works will be confined to limited areas. Areas of particularly good marginal vegetation have been specifically avoided.
- Macrophytes – Any macrophtyes removed by accident during the works will be returned to the water.
- A number of invasive non-native species were also identified in and around the Site. Killer shrimp are already established in the three broads and it would be virtually impossible to remove them, particularly given the direct connections with the river where killer shrimp are also established. However, it is vital to prevent the transfer of killer shrimp from the project area to other unaffected areas. Appropriate check-clean-dry protocols will therefore be followed throughout the works.
- Himalayan Balsam is already established on Wroxham Island and could spread to the fen creation areas. Himalayan Balsam will therefore be controlled as part of the management of the new fen areas.

11.9.4 Proposals have been put forward that would take place to enhance the biodiversity value of the site as part of the scheme. These are summarised below.

- A Kingfisher bank will be created using consolidated material from Wroxham Island. This material will then be replaced using sediment from Hoveton Great Broad and Hudson's Bay.
- A small amount of scrub may need to be cleared as part of the works to install the geotubes adjacent to Wroxham Island. The removed scrub will be cut and stacked on Wroxham Island to create habitat piles that will benefit invertebrates and reptiles.

11.10 Archaeology and Cultural Heritage

11.10.1 There are several listed buildings, artefact scatters, cropmarks and buried remains located close to the Site. The buildings comprise Grade II Listed Buildings of regional significance. The other nearby heritage assets, mostly cropmarks, are of high local significance. The broads themselves are peat extraction sites associated with St Benet's Abbey, and are of high local significance.

11.10.2 Removal of the peat during the medieval period would have largely erased traces of earlier exploitation of the wetlands of the Bure valley, although unexcavated baulks of peat occur adjacent to the river and towards the centre of Hoveton Great Broad.

11.10.3 The development proposals would have minimal impact upon nearby known heritage resources, and no impact upon nearby listed buildings, and the physical impact of the wetland restoration on heritage assets within the site area will be low, as the limits of peat extraction were greater than the current extent of the Broads. There is minimal anticipated impact upon the remnants of unexcavated baulks of solid peat within the broads

11.10.4 The overall impact of the proposed scheme upon the known archaeological and historical resources of the area is assessed as NONE to LOW. In terms of the impact of the proposed scheme on the setting of nearby heritage assets, this is assessed as NONE to LOW.

11.10.5 It is not considered that there is any requirement for mitigation, nor for a watching brief or other recording of the works.

11.11 Consideration of loss of open water habitat

11.11.1 The scheme would inevitably result in the loss of a small area of open water in Hoveton Great Broad and Wroxham Broad.

11.11.2 In Wroxham Broad, the loss of open water for sailing and navigation is offset by the purpose of the proposal, which is to stabilise and maintain the integrity of Wroxham Island, which is eroding rapidly, to a width of less than 6m in some locations. The loss of the island through

continued erosion would result in the broad becoming an extension of the River Bure, rather than a waterbody in its own right.

11.11.3 Whilst open water habitat is being lost to species rich fen, the nature conservation value of the fen vegetation effectively outweighs the value of the open water habitat. Moreover, the areas of species rich fen which are being created, are situated in locations which previously supported fen and swamp vegetation which has been lost to erosion. The habitat creation can therefore be viewed as replacement of lost habitat.

12 Restoration, management and aftercare

12.1 Proposed restoration

12.1.1 Figure 14 sets out detail of the proposed restoration, which can be summarised as follows:

Wroxham Broad Island

- The proposed extension to Wroxham Broad Island would be restored to mixed tall herb fen. Vegetation would be allowed to regenerate naturally from the seedbank, with the exception of a 1m wide strip at the water's margin, which would be vegetated using turves cut from an area of pond sedge swamp. The pond sedge is unpalatable to grazing geese, and would create an effective barrier between the edge of the water and the potentially more palatable vegetation present within the area of tall herb fen. The use of pond sedge would also provide an additional degree of protection from erosion due to wave action, although it is anticipated that the use of a geotextile mesh to cover the consolidating mud would in itself provide sufficient erosion protection.
- Chestnut pale fencing is already in existence to the rear of the 24 hour moorings along the eastern margin of Wroxham Island and would serve to ensure that members of the public cannot access the bunded area. Further temporary chestnut pale fencing would be erected if required to prevent public access to the consolidating wet mud, which may be hazardous until vegetation cover is well established. It is anticipated that the fencing would be removed within 3 years of project completion (unless the Broads Authority prefer the fencing to remain in perpetuity); although the island would be monitored so that fencing and warning signs could be removed sooner if it is safe to do so.
- Warning signs would be erected at 30m intervals around the periphery of the Island to warn the public of the dangers of the unconsolidated mud.

Hoveton Great Broad species rich fen

- The bunded areas within Hoveton Great Broad would be restored to species-rich fen. Turves of fen vegetation, including reed rhizomes, would be harvested from a site elsewhere within the National Nature Reserve and would be spread on the geobag areas to ensure rapid establishment of vegetation cover.
- The use of turves would ensure rapid vegetation establishment, as noted above, which would provide protection from erosion due to wave action once the vegetation becomes established, although it is anticipated that the use of a geotextile mesh to cover the consolidating mud would in itself provide sufficient erosion protection.
- Low fencing would be installed around the periphery of each of the bunded areas to prevent geese from grazing off the developing vegetation.
- It is anticipated that the fencing would be removed within 3 years of project completion, although the vegetation development would be monitored so that fencing could be removed sooner if it is appropriate.

Hoveton Great Broad Reedswamp

- No restoration is proposed to the reedswamp around the margins of the broad, which is anticipated to vegetate naturally from existing plant rhizomes. Existing management by scrub control will continue.

Site Compound

- This area would be rotovated and seeded with an appropriate agricultural ley mix, similar to that present prior to works commencing.

12.2 Monitoring, targets and remediation

12.2.1 Initially, and for the first 2 years following completion, the project site would be monitored monthly by a Natural England staff member. Thereafter, monitoring would take place at 3-monthly intervals for a period of a further 3 years.

12.2.2 Monitoring would seek to identify any areas where erosion might be occurring, and would consider and record the density of the re-establishing vegetation on the geotubes and the material contained behind the geotubes, and the main vascular plant species present, using the Domin scale of abundance, where the percentage cover of the live above-ground plant parts is estimated and converted to a Domin value. Any areas of bare ground would similarly be ascribed a Domin value.

Domin scale

Percent cover	Domin value
91 – 100	10
76 – 90	9
51 – 75	8
34 – 50	7
26 – 33	6
11 – 25	5
4 – 10	4
<4 (many individuals)	3
<4 (several individuals)	2
<4 (few individuals)	1

12.2.3 The ability of the consolidating mud within the bunded areas to bear human weight would be assessed, so that any protective fencing, and warning signs, can be removed when it is appropriate and safe to do so.

12.2.4 Any evidence of goose grazing, erosion of deposited material or damage to the geotubes would also be identified and recorded.

12.2.5 It is anticipated that 50% vegetation cover (a Domin value of 8 or above) would be achieved within 1 growing season of completion of each bunded restoration area. Should this level of cover not be achieved, then Natural England would identify the reasons for the failure and would implement additional restoration measures as set out below.

12.2.6 The establishment of swamp communities about the margins of Hoveton Great Broad and Hudson's Bay would also be monitored.

12.2.7 It is considered that the design of the scheme and the nature of the materials used is such that goose grazing nuisance and the risk that vegetation would fail to establish on the geotubes due to erosion would be negligible. However, additional measures have been identified which could be deployed in the event that this proves necessary. Such measures might potentially include goose barrier fencing or stilling curtains. Any measures which would require the erection of additional fencing or signage would be discussed and agreed with the Landscape Officer at the Local Planning Authority prior to implementation, and materials would be carefully chosen and positioned so as to ensure minimal visual impact.

12.2.8 It is anticipated that swamp vegetation would rapidly establish around the margins of the restore brads, however, in the event that establishment of swamp communities about the

margins of Hoveton Great Broad and Hudson's Bay is minimal or non-existent within 2 growing seasons following scheme completion, then rhizomes and root mat from stands of *Schoenoplectus lacustris* and *Typha angustifolia* would be harvested from elsewhere within the NNR and transplanted to receptor sites around the broads to speed the establishment of this habitat.

12.2.9 Monitoring of water quality and aquatic macrophytes cover would also be undertaken, and if the results of this are favourable, then it may be possible to remove the fish barriers earlier than currently anticipated.

12.2.10 All other temporary structures would be removed as soon as monitoring indicates that it is safe and appropriate to do so.

12.3 Proposed management

12.3.1 Full detail of the proposed site management would be set out in a management plan, which is a requirement of the external funding expected to fund this project, and which could be a condition of any planning permission.

12.3.2 It is envisaged, however, that the habitats created would be managed as follows, and as indicated at Figure 15:

Wroxham Broad Island

- The proposed extension to Wroxham Broad Island would be restored to mixed tall herb fen. It is suggested that this area is subject to periodic scrub removal, to ensure that diverse tall herb fen and reed dominated communities can develop. It is proposed that scrub removal is undertaken once every 7-10 years, or when scrub cover on the island exceeds 5%. The area subject to scrub removal includes both the existing growth and that created through the restoration scheme. It is not proposed to mow the vegetation which develops on the island.

Hoveton Great Broad species rich fen

- The fen created at Hoveton Great Broad would be subject to periodic scrub removal, to ensure that species-rich communities can develop and persist. It is proposed that scrub removal is undertaken once every 7-10 years, or when scrub cover exceeds 5%. It is not proposed to mow the vegetation.

Hoveton Great Broad Reedswamp

- No additional management is proposed to the reedswamp around the margins of the broad, which is anticipated to develop naturally. Existing management by scrub control will continue.

Site Compound

- This area would be managed as agricultural ley by the Hoveton Estate.

13 Conclusions

This section summarises the outcome of the EIA process and presents residual impacts assuming standard mitigation measures for each topic assessed. The need for additional mitigation measures is identified, where appropriate.

13.1 Consideration of loss of open water habitat

13.1.1 The scheme would inevitably result in the loss of a small area of open water in Hoveton Great Broad and Wroxham Broad.

13.1.2 In Wroxham Broad, the loss of open water for sailing and navigation is offset by the purpose of the proposal, which is to stabilise and maintain the integrity of Wroxham Island.

13.1.3 The loss of open water habitat in Hoveton Great Broad is offset by the creation of species rich fen of higher nature conservation value, to replace similar habitat lost to erosion.

13.2 Landscape and Visual Impact

13.2.1 The project area is located at the very heart of the landscape of the River Bure and associated broads, where the landscape is characterised by large areas of designated wet woodland which extend directly to the banks of both the river and connecting water bodies The direct connection between woodland and water is a characteristic that extends upstream of the site towards the village of Wroxham.

13.2.2 The Site lies within National Character Area 80: The Broads. This is a low-lying landscape, with some areas beneath sea level, which is characterised by open and extensive views over the slow meandering rivers and drained marshland. The former peat workings of the broads themselves form shallow lakes of various sizes surrounded by fens, wet woodland and large expanses of reedbed, rich in biodiversity.

13.2.3 The national level classifications provide the basis for the further sub-division of landscape character areas. At the district level, the Broadland District Character Assessment (LCA) applies to the landscape to the south of the River Bure. Due to the proximity of the Broadland Marshes Fringe Landscape Type LCA F1: Wroxham to Ranworth to the Site, developments have the potential to affect the setting and value. Located between the Broads Authority area and the 10m contour of elevated plateau edges, the landscape forms a transition zone of gentle slopes to the Broads river valley marshes.

13.2.4 The entire project area lies within the Broads Authority's landscape character area LCA 23: Bure Valley – Wroxham to Fleet Dyke, South Walsham; with the adjacent LCA 22 Bure Valley – Upstream Wroxham to Horstead located approximately 2km upstream.

13.2.5 For the purposes of appraising the effect of the proposals on the character of the landscape, the qualities of both Broadland District and the Broads Authority landscape character assessments were taken into account.

13.2.6 The proposals present no change to the key characteristics of these landscapes. There would be no impacts during either the course of the works, the first year following completion or after a period of 10 years once the proposed fen vegetation has established to both the Broads LCA 23 Bure Valley, or Broadland District Council Marshes Fringe F1, landscape types. The seasonal and low-key nature of the engineering operations of the construction works would be in keeping with the character of typical management operations of the landscape of the broads. The lack of any land-based operations or lighting ensures that the integrity of the carr woodland around the fringes to the river and Hoveton Great Broad is retained intact.

13.2.7 Once the vegetation to the surface of the geotubes, and the fen vegetation to the sediment to the rear, becomes fully established, the bank-side character of the river in the vicinity of Wroxham Island will be enhanced. The slim island between river and the adjacent Wroxham Broad currently has a somewhat denuded feel, with the bank line exposed and a series of

fragile protection measures in place. The widened island would provide a greater depth of vegetation which will provide a more enclosed feel to the river channel. Similarly, the completed work at Hoveton Great Broad would enhance the distinctly remote and tranquil character of the landscape, which relates to the characteristics behind the designations applicable to this landscape.

13.3 Ecology

13.3.1 Much of the Site lies within the Bure Broads and Marshes SSSI; a component site of The Broads SAC, Broadland SPA, Broadland Ramsar Site and part of the Bure Marshes NNR. The ecology of this part of the Site is well-recorded and is known to be particularly important for wintering waterfowl. Both broads are designated as SAC waterbodies but are currently assessed as being in 'unfavourable no change' condition and in 'poor' ecological status under the Water Framework Directive. Evidence of otter and water vole were found but neither the Designated Site nor Wroxham Island are thought to support significant populations of these species.

13.3.2 Overall the construction phase of the works is expected to have a short-term negligible impact on the species and habitats present providing appropriate mitigation measures are put in place. Mitigation has been put in place for a number of species. In the long term, lake restoration and the creation of new fen habitat will significantly improve the ecological status of Hoveton Great Broad and Hudson's Bay, particularly in terms of the diversity and abundance of macrophytes and invertebrates.

13.3.3 .Some additional enhancement of the habitat on Wroxham Island, particularly to benefit kingfisher and reptiles, is proposed.

13.3.4 In summary; the sediment removal operations, creation of the new fen areas and installation of the fish barrier will cause localised, short term disturbance/damage to the ecological features that are present. The features likely to be affected are the general water quality and those species of animal and plant associated with the fen habitat immediately adjacent to where the new fen will be created.

13.3.5 In the long term, the project will create new fen vegetation around the margins of Hoveton Great Broad, significantly improve water quality and, it is hoped, encourage significant macrophyte growth. This will create significantly improved habitat for macro-invertebrates and breeding and over-wintering birds. Initially the significant reduction in fish may have a minor impact on piscivorous species (although alternative feeding opportunities will still be available on the adjacent marshes and the River Bure) but ultimately, the clear-water conditions created and the change in the relative abundance of the fish species present (more rudd and perch) is likely to benefit these species.

13.4 Archaeology and Cultural Heritage

13.4.1 An archaeological desk-based assessment and heritage statement were prepared.

13.4.2 There are several listed buildings, artefact scatters, cropmarks and buried remains located close to the Site. The buildings comprise Grade II Listed Buildings of regional significance. The other nearby heritage assets, mostly cropmarks, are of high local significance. The broads themselves are peat extraction sites associated with St Benet's Abbey, and are of high local significance.

13.4.3 Removal of the peat during the medieval period would have largely erased traces of earlier exploitation of the wetlands of the Bure valley, although unexcavated baulks of peat occur adjacent to the river and towards the centre of Hoveton Great Broad.

13.4.4 The development proposals would have minimal impact upon nearby known heritage resources, and no impact upon nearby listed buildings, and the physical impact of the wetland restoration on heritage assets within the site area will be low, as the limits of peat extraction were greater than the current extent of the Broads. There is no anticipated impact upon the remnants of

13.4.5 The overall impact of the proposed development upon the known archaeological and historical resources of the area is assessed as NONE to LOW. In terms of the impact of the proposed development on the setting of nearby heritage assets, this is assessed as NONE to LOW.

14 Glossary

The following acronymns and abbreviations have been used in this Environmental Statement:

AA	Appropriate Assessment
AIES	Assessment of Implications on European Sites
AOD	Above Ordnance Datum
AONB	Areas of Outstanding Natural Beauty
BA	Broads Authority
BGS	British Geological Survey
BLAF	Broads Local Access Forum
BS	British Standard
C	Carbon
CO2	Carbon Dioxide
Cropmark	A mark that is produced by the effect of underlying archaeological features influencing the growth of a particular crop.
CWS	County Wildlife Site
DEFRA	Department for Environment, Food and Rural Affairs
Domin	Scale of vegetative abundance
DPD	Development Plan Document
EA	Environment Agency
EIA	Environmental Impact Assessment
ES	Environmental Statement
EU	European Union
FRA	Flood Risk Assessment
Geobag	Geotube; filled with sediment
Geotube	Geotextile tube
GIS	Geographical Information Systems
GLVIA	Guidelines for Landscape and Visual Impact Assessment
HER	Historic Environment Record
HLF	Heritage Lottery Fund
HRA	Habitats Regulations Assessment
JNCC	Joint Nature Conservation Committee
Km	Kilometre
LCA	Landscape Character Area
LCT	Landscape Character Type
LDF	Local Development Framework
LI	Landscape Institute
LNR	Local Nature Reserve
LVIA	Landscape and Visual Impact Assessment
m	Metre
MAGIC	Multi-Agency Geographical Information for the Countryside
N/A	Not Applicable
NCC	Norfolk County Council
NE	Natural England
NNR	National Nature Reserve
NO_2	Nitrogen Dioxide
NPPF	National Planning Policy Framework
NWT	Norfolk Wildlife Trust
PPG	Pollution Prevention Guidance
PPG	Planning Policy Guidance
PPS	Planning Policy Statement
PRoW	Public Rights of Way
RIGS	Regionally Important Geological/Geomorphological Sites
RSPB	Royal Society for the Protection of Birds
SAC	Special Area for Conservation

SAM	Scheduled Ancient Monument
SPA	Special Protection Area
SPZ	Groundwater Source Protection Zone
SSSI	Site of Special Scientific Interest
VP	Viewpoint
WFD	Water Framework Directive
ZRV	Zone of Theoretical Visibility
ZVI	Zone of Visual Influence
µg	Micrograms