Northallerton Flood Alleviation Scheme (FAS) Environmental Report

Final

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Non-Technical Summary

i. Introduction and background

This document forms the Environmental Report of the non-statutory Environmental Impact Assessment for the proposed flood alleviation scheme at Northallerton. The local planning authority, namely Hambleton District Council, have confirmed that the proposed scheme will require planning permission. However, a statutory EIA under the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 is not required as the total length of the proposed scheme would be less that the 2km threshold for linear flood defences contained within Circular 02/99[1].

Although the proposed scheme does not require a statutory EIA, we have carried out a non-statutory EIA in keeping with the Environment Agency's Management System. As the design has developed, the details of the proposed flood alleviation scheme have been amended. However, more recent discussions with the local planning authority have confirmed that their original screening decision remains valid.

An EIA 'Scoping' exercise was completed in September 2010. This allowed us to identify where environmental impacts would be likely to occur with regard to specific environmental topics. The Scoping exercise has allowed us to focus the EIA by identifying the topics to be considered in detail in this Environmental Report. For each topic, the baseline environmental conditions have been identified and the potential impacts of the scheme have been assessed. Where adverse impacts have been predicted, mitigation measures have been identified to reduce those impacts, and the significance of any residual impact has been determined.

Flooding has been a historical problem in and around Northallerton since the early 20th Century. Recent flood events have occurred in March 1979, April 1986, autumn 2000, summer 2002, January 2008 and September 2008. The proposed flood alleviation scheme would protect 259 residential properties, 32 commercial properties and a hospital against flooding during a flood event with a return period of 200 years (i.e. an event with a 0.5% chance of occurring in any given year).

During a project team options workshop in June 2009, 60 options were identified to alleviate flood risk in Northallerton. These options were reduced into a short list of viable options to be considered further. A total of 11 options were short-listed, including the do-nothing and do-minimum options. The study area was divided into two independent flood cells: the Brompton / North / Willow Beck flood cell; and the Turker Beck and Sun Beck flood cell.

Following the Option Appraisal and Comparison process, Option 3 (Embankment storage area at Brompton Beck) and Option 11 (Combination of works at Sun Beck and Turker Beck) were selected as preferred options. Since the selection of Option 3 as the preferred option for the Brompton / North / Willow Beck flood cell, the plans for this area have been put on hold. Option 11 comprises works to Sun Beck and Turker Beck in addition to 'do minimum' work that includes the repair, refurbishment or replacement of culvert sections. Option 11 is the subject of the environmental assessment in this report.

Flood alleviation works are proposed at Turker Beck and Sun Beck (refer to Figure 1). Construction works at both Turker Beck and Sun Beck would comprise excavation of material to provide capacity for the storage of flood water. At Turker Beck, the excavation would be

on either side of the existing watercourse. At Sun Beck, the design has changed since the option selection stage; the excavation would be to the south of the existing watercourse, rather than following the existing channel course. The new flood storage area would discharge into the culvert at the eastern end of the cul-de-sac known as Bramblefields. Construction access to Turker Beck would be from Bullamoor Road, and to Sun Beck would be from Scholla Lane.

ii. The Existing Environment

Northallerton is a market town in the Hambleton district of North Yorkshire. The watercourse flowing north to south through Northallerton is a single watercourse that flows through Brompton (where it is known as Brompton Beck), Northallerton (North Beck) and Romanby (Willow Beck). The main tributary to the watercourse is Sun Beck, which flows east to west through a residential part of the town. Turker Beck also flows in from the east of the town, and converges with Sun Beck to the south of Friarage Hospital. The majority of the reaches of Turker Beck and Sun Beck are culverted through Northallerton.

The landscape around Northallerton is undulating, predominantly used for arable and pastoral agriculture, and supports little mature native vegetation other than hedgerows, hedgerow trees and small copses. Fields are predominantly of a medium size and regular in shape. A series of small streams run through the agricultural land, of which Turker and Sun Beck are two. Northallerton is the largest settlement in the local area. The surrounding agricultural landscape is interspersed by small hamlets and isolated farmhouses. The road network is fairly limited and minor in nature.

The Turker Beck site is situated within rolling agricultural fields. Turker Beck runs eastwards from the urban edge of Northallerton. A public footpath runs along the south of Turker Beck which meets a second public footpath on the farm track to the east. The beck is lined with a series of small native trees.

The Sun Beck site is situated within rolling agricultural fields. Sun Beck runs south eastwards from the urban edge of Northallerton. The beck is partially lined by a native hedgerow and a small clump of native trees.

Bullamoor Park is located approximately 800m west of the flood storage works proposed at Turker Beck and Sun Beck. The park is bounded to the north and east by residential properties. Friarage Hospital abuts the western boundary of the park while Bullamoor Road passes along the southern extent of the park.

iii. Environmental Impacts and Proposed Mitigation Measures

Without mitigation, the following environmental receptors would be impacted by the scheme:

- Human Beings;
- Flora and Fauna;
- Air Quality (construction only);
- Landscape and Visual Amenity;
- Land Use;
- Water Quality (construction only);
- Historic Environment;
- Traffic and Transport; and
- Soils and Geology.

Within this Environmental Report we have identified and committed to the following

measures, among others, to mitigate the potential adverse impacts of the scheme during construction:

- We plan to divert the footpath at Turker Beck around the construction works, ensuring footpath users continue to gain access to the land further to the east.
- We will agree hours of work and traffic management arrangements with North Yorkshire County Council, prior to construction starting.
- The landowners who would be directly affected by the proposed scheme have been consulted throughout the development of the scheme, and therefore are aware of the nature of the proposed works. We are continuing to liaise with the landowners to mitigate the impacts that could potentially arise.
- Our contractors would follow good environmental site practice, audited by an Environmental Clerk of Works (ECW).
- We will adhere to our Pollution Prevention Guidelines and storage away from watercourses to minimise risk of pollution incident to water (in particular PPG 5).
- We will minimise the removal of existing vegetation and we will reinstate those sections of hedgerow that are removed to allow for construction activities. We will also plant trees along Turker Beck and Sun Beck and within Bullamoor Park.
- We will retain and protect identified hedgerows and trees in accordance with BS5837:2012, for example tree protection fencing around the mature Ash tree near the works area at Turker Beck.
- We will sow grass seed and native wildflower seed within the flood retention area and other disturbed areas to reduce visual impact and provide biodiversity.
- Topsoil to be spread across adjacent agricultural land, allowing it to be returned to agriculture in addition to appropriate compensation for the landowner for the permanent loss of agricultural land associated with the scheme.
- We will undertake a geophysical survey of the footprint of the proposed development within the Turker and Sun Beck study areas to test for the presence or absence, character and extent of archaeological remains. We will also carry out a geophysical survey of haul/access roads and construction compounds to test for the presence or absence, character and extent of archaeological remains. This will include Asset 5, the site of a building identified from historic mapping.
- We will, if appropriate, carry out evaluation by trial trenching based on the results of the proposed geophysical survey, to establish the date, character, quality and state of preservation of any archaeological remains identified; and mitigate the impacts to any archaeological remains identified through preservation where possible, or an agreed programme of investigation and recording.
- We will undertake further ground investigation in the area that requires excavation to characterise the material for re-use or off-site disposal.

Mitigation of Operational Impacts:

- Reinstatement of the footpath at Turker Beck along a slightly altered route through the flood storage area.

With this mitigation in place, it is considered that there will be the following residual impacts:

Environmental Receptor	Residual Impacts During Construction	Residual Impacts During Operation
Human Beings	Negligible / Temporary Minor Adverse	Major beneficial impact
Flora and Fauna	Minor adverse	No significant effect (minor beneficial impact to be achieved through enhancement)
Air Quality	Moderate adverse	No Significant effect
Water Quality	No significant effect	No significant effect
Land Use	Minor adverse	Minor adverse
Traffic and Transport	Minor adverse	No significant effect
Landscape & Visual	Minor / Moderate / Major adverse (dependent on receptor)	Minor Beneficial (to be achieved partially through enhancement), Not Significant and Minor / Moderate / Major adverse (dependent on receptor)
Historic Environment	Neutral	No significant effect
Soils and Geology	No significant effect	No significant effect

iv. Environmental Enhancements

We plan to plant trees and shrubs along both Turker Beck and Sun Beck, both to replace vegetation removed prior to construction, and to close existing gaps thereby improving wildlife corridors. In addition, we plan to seed the gentle slopes of the flood storage areas with wild flower seeds, and to replace and fill gaps in existing hedgerows that would be affected by the construction works.

v. Conclusion

It is considered that the environmental impacts of the proposal would be mostly restricted to the construction phase. During Construction, without mitigation, minor adverse effects would occur to Flora and Fauna and Land Use. In addition, moderate adverse impacts would occur to Human Beings, Air Quality, Water Quality, the Historic Environment and Traffic and Transport, if mitigation were not put in place.

The assessment of Landscape and Visual Amenity, without mitigation, has identified the potential for major adverse visual effects, during construction, on nine identified viewpoints. In addition, there would be moderate adverse effects on landscape elements and some aspects of visual amenity and landscape character. There would also be minor adverse effects on the remaining aspects of visual amenity and landscape character.

Following mitigation, the construction impacts on Human Beings and Traffic and Transport would be reduced to minor adverse; the impacts on the Historic Environment would be reduced to neutral; and the impacts on Water Quality would be reduced to not significant.

It is considered that during the operational phase, without mitigation in place, there would be a locally significant, moderate adverse effect on Land Use.

The assessment of Landscape and Visual Amenity has identified the potential for major adverse visual effects on visual amenity, during operation, at two identified viewpoints. In addition, there would be moderate adverse effects on landscape elements and some aspects of visual amenity and landscape character. There would also be minor adverse effects on the remaining aspects of visual amenity and landscape character.

A major beneficial operational impact on human beings would arise as a result of the proposed flood defences because the preferred option would protect 259 residential properties, 32 commercial properties and a hospital from a flood with a 0.5% chance of happening in any one year.

Following mitigation, the operational impacts on Land Use would be reduced to minor adverse. The residual impacts on Landscape and Visual Amenity, following mitigation, would be reduced to a major adverse effect on one identified viewpoint. The majority of effects on visual amenity would be reduced to minor adverse or not significant. The effects on landscape character would be minor adverse. The effects on some aspects of landscape elements would be reduced to minor adverse. However, there would still be a moderate adverse effect on landform. There would also be a minor beneficial effect on landscape elements, specifically vegetation.

Contents

1 Introduction

1.1 Environmental Impact Assessment

Whilst the proposed works will require planning permission, they do not require a statutory Environmental Impact Assessment (EIA). A request for a screening opinion was submitted to Hambleton District Council (HDC) (the local planning authority) in December 2010. On 12th January 2011, HDC confirmed that a statutory EIA under the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 is not required as the total length of the proposed scheme would be less that the 2km threshold for linear flood defences contained within Circular 02/99 (Department of Communities and Local Government, 1999). The EIA Regulations were updated in 2011, after this screening opinion was received (Town and Country Planning (EIA) Regulations 2011). However, it is considered that the amendments to the EIA Regulations do not change this screening opinion because those categories upon which screening is determined were retained.

Although the proposed scheme does not require a statutory EIA, we have carried out a non-statutory EIA in keeping with the Environment Agency's Management System.

As the design has developed, the details of the proposed flood alleviation scheme have been amended. More recent discussions with the local planning authority have confirmed that their original screening decision remains valid.

1.2 Key Contact

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1.3 Objectives of this Report

This Environmental Report sets out the findings of the non-statutory EIA that we have carried out for the proposed Northallerton Flood Alleviation Scheme (FAS).

The EIA has been structured around environmental topics relating to the environmental receptors that will potentially be affected by the proposed scheme. For each topic, the baseline environmental conditions have been identified and the potential impacts of the scheme have been assessed. Where adverse impacts have been predicted, mitigation measures have been identified to reduce those impacts, and the significance of any residual impact has been determined.

Included as an appendix to this Environmental Report is our project-specific Environmental Action Plan (EAP). We will use this plan to implement the project in line with the recommendations made in the main body of the Environmental Report, and hence minimise adverse impacts and maximise beneficial impacts.

1.4 Overall Approach to Assessment

We undertook an EIA 'Scoping' exercise that was completed in September 2010. This allowed us to identify where environmental impacts would be likely to occur with regard to specific environmental topics, such as human beings or flora and fauna. The Scoping exercise has allowed us to focus the EIA by identifying the topics to be considered in detail in this Environmental Report. The details of the Scoping exercise are provided in Section 5.3. Our design for the scheme has developed since the time that we wrote the scoping report, but the changes to the design have not been significant enough to alter the scope of the environmental assessment.

In order to gather the required information for this Environmental Report and to assess accurately the impacts of the project, we have collected relevant baseline information. This was undertaken by means of a desk study and review of various web-based sources of information in addition to site surveys. For certain topics, external third party organisations have been consulted to gather information on baseline conditions. National, regional and local plans and policies have also been reviewed in a separate Planning Supporting Statement, in order to set the project within its strategic and policy framework.

This is a non-statutory EIA, prepared in line with Environment Agency policy and good practice. The assessment has made reference to the *Town and Country Planning (Environmental Impact Assessment) Regulations 2011*, the Office of the Deputy Prime Minister's Environmental Impact Assessment Guide to Procedures (2000), professional experience and best practice principles. The detailed assessment methods are explained for each topic in Chapter 6.

1.5 Report Structure

The first part of this Environmental Report, covered in Sections 2, 3 and 4, explains the need for the proposed flood alleviation scheme, the options that we considered, the reasons for our selection of the preferred option, and the input that we have had from consultees during the development of the scheme.

The next section of the Environmental Report, covered in Sections 5 and 6, is the main body of the EIA. Here we explain how we carried out the EIA, identified the impacts that would arise, the mitigation measures that we would undertake, and the residual impacts that would remain following that mitigation. We have also considered whether it may be possible to deliver environmental enhancements as part of the scheme.

In Section 7 we have described any cumulative impacts on receptors that would experience more than one environmental impact.

A short conclusion is provided in Section 8.

2 Background

2.1 Nature and Background to the Project

Northallerton is a market town in the Hambleton district of North Yorkshire. The watercourse flowing north to south through Northallerton is known as Brompton, North and Willow Beck. This is a single watercourse that flows through Brompton (where it is known as Brompton Beck), Northallerton (North Beck) and Romanby (Willow Beck).

The main tributary to the watercourse is Sun Beck flowing east to west through a residential part of the town. Turker Beck also flows in from the east of the town, and converges with Sun Beck to the south of Friarage Hospital. The majority of the reaches of Turker Beck and Sun Beck are culverted through Northallerton.

Flooding has been a historical problem in and around Northallerton since the early 20th century. Recent flood events have occurred in March 1979, April 1986, autumn 2000, summer 2002, January 2008 and September 2008.

The proposed flood alleviation scheme would protect 259 residential properties, 32 commercial properties and a hospital against flooding during a flood event with a return period of 200 years (i.e. an event with a 0.5% chance of occurring in any given year).

2.2 Location and Site Description

Works at Turker Beck would comprise excavation of material from the fields on either side of the channel to provide additional flood storage upstream of the culvert entrance, and the provision of a modified inlet structure at the entrance to the culvert system.

At Sun Beck, we would create a similar flood storage area. However, this would not be along both sides of the existing open stream channel. Instead, it would replace a section of culvert along the western edge of the field, behind houses on Bankhead Road. There would be a new inlet structure into the culvert at the downstream end of the new open channel. The new open channel would be over-widened on the eastern side, to provide flood storage capacity.

Trash screens would also be improved in Bullamoor Park, on Turker Beck.

Figure 1 shows the location of the area of proposed works.

2.3 Strategic Context

We have produced a Catchment Flood Management Plan (CFMP), incorporating the study area, for the River Ouse (Environment Agency, 2010b). Northallerton is located within Sub-Area 3 (Wiske and Cod Beck). The CFMP recommends action is taken to reduce flood risk in areas of moderate to high flood risk *"this will involve reviewing and implementing flood alleviation schemes for … Northallerton"*. The CFMP states that a feasibility study will need to be developed for Northallerton that will "look to include upstream storage".

A Water Framework Directive (WFD) Level 1 assessment has been undertaken to ensure that the preferred option does not cause deterioration in WFD status, and mitigation

opportunities have been identified. The assessment has been summarised in Section 6.6 of this report.

2.4 Project Objectives

Flooding has been a historical problem in and around Northallerton. In autumn 2000, widespread flooding of residential properties in east Northallerton resulted from surcharging at Turker Beck and Sun Beck and the culvert inlets at the edge of the urban area. Surcharging of the culverts caused flows to back up and flow out-of-channel in Bullamoor Park to affect Bullamoor Road and the High Street. Damage was reported at the Friarage Hospital and to properties adjacent the High Street.

The project comprises works at three locations in and around Northallerton:

- Sun Beck (SE380938)
- Turker Beck (SE380945)
- Bullamoor Park (SE372942)

See Figure 1 for the location of the proposed work areas.

The agreed project objectives are to find a solution that:

- Can be delivered safely;
- Reduces flood risk;
- Is technically robust;
- Addresses the problems at Northallerton;
- Is economically viable;
- Minimises adverse impacts on the environment;
- Has engaged the local community;
- Is accepted by the local community;
- Identifies environmental enhancements that would contribute to local or national Biodiversity Action Plan (BAP) habitat targets; and,
- Improve the community's enjoyment of their environment.

We have also developed a set of environmental objectives for the project. These are:

- To ensure that the scheme fits with the local landscape character;
- To avoid adverse impacts on protected species and habitats;
- To avoid adverse impacts on water quality;
- To help to deliver the objectives of the Water Framework Directive;
- To include areas of BAP habitat creation as an integral part of the scheme design; and,
- To identify opportunities to improve public rights of way that cross the areas of our proposed works.

3 Consideration of Alternatives

3.1 Context to Selection of Alternatives

The River Ouse CFMP, in which Northallerton is located, recommends that action be taken to reduce flood risk in areas of moderate to high flood risk. The CFMP states that a feasibility study will need to be developed for Northallerton that will "look to include upstream storage".

3.2 Alternatives

Option identification for Northallerton was undertaken by the project team during an options workshop in June 2009. A list of 60 options was identified and subsequently grouped into five categories for assessment: flood storage; flood containment; flood diversion; improved conveyance; and maintenance and management.

We then needed to reduce the options to a short list of viable options to be considered further. We did this in three stages, as follows:

- Screening of options based upon their suitability to address the problem, manage flood risk effectively, and be safe for our staff and members of the public;
- Technical assessment of the options in the context of their location, methods of construction, ability to reduce flood risk, implications for operation and maintenance, and physical constraints; and,
- Comparison of the costs of the options.

Eleven options were on our short-list, and are described in Section 3.3 below.

3.3 Short-listed Options

The study area was divided into two independent flood cells: the Brompton / North / Willow Beck flood cell; and the Turker Beck and Sun Beck and flood cell. Each flood cell is a geographically distinct area, and the sources of flooding are different between flood cells. Options were selected that would address flooding issues in one or both of those flood cells. A total of 11 options were short-listed, including the do-nothing and do-minimum options.

Options 3 to 5 would provide protection to part or all of the Brompton / North / Willow Beck flood cell.

Options 6 to 9 would provide protection to the Turker Beck and Sun Beck flood cell. Only an option combining both Turker Beck and Sun Beck (Option 11) would provide protection to Northallerton High Street. Option 10 would involve flood resistance and resilience measures in Romanby.

Option 1 – Do Nothing

Do Nothing is the baseline option against which alternative options are assessed and compared. The consequences of this are an increased probability of flood damage due to flooding.

The effect of stopping maintenance activities would be that trash will accumulate on screens to cause blockages; vegetation along the watercourse margins would impair the flow in the channel; obstructions would accumulate at bridges creating blockages and structural damage; existing culverts, walls and embankments would not be routinely inspected, maintained or repaired so would have increased risk of failure; and siltation would continue to impair channel capacity and increase water levels. The collapse of culverts would result in increased flooding and would create a safety risk to the public.

In addition water levels in the watercourse would not be monitored, flood warnings would not be issued and operational response would not be provided in the event of rising water levels. In the longer term, it may be that large areas of Northallerton may become uninhabitable due to the risk of flooding, having additional social and economic impacts on the town.

Option 2 – Do Minimum

Do minimum was also considered, whereby all current maintenance activities and ad hoc reactionary activities that are currently undertaken continue. This includes the gradual repair, refurbishment or replacement of culvert sections. CCTV assessment had demonstrated that some sections are at high risk of failure.

Option 3 – Embankment storage area at Brompton Beck

An online storage area was considered upstream of Brompton on Brompton Beck. The works would consist of an embankment dam with outflows regulated by a control structure (hydrobrake or similar).

The flood storage area proposed was close to existing outbuildings at Bridge House Farm, the A684, and the Northallerton to Stockton railway line. Additional works would have been required in the locality in order to ensure that flood risk to these existing features did not increase. An overhead power line would need to be diverted to accommodate this option.

The agricultural land where flood storage was proposed is currently used for cattle grazing and the increased frequency of flooding would have a minor impact. The site offered a good opportunity to enhance the environment, and early consultation with the landowner did not identify any objections.

Option 4 – Lowering the right bank floodplain at Willow Beck

Lowering the floodplain on the right bank of Willow Beck, adjacent to the village of Romanby, would remove the restrictions of the existing channel and increase its capacity. This would be effective in reducing water levels in Romanby and reducing the risk of flooding.

These works would be carried out on agricultural land, opposite the properties at risk in Romanby. Works would involve the removal of five trees with Tree Preservation Orders and will have a minor impact on agricultural activity. The local farmer voiced objections to the works that would take place on his land.

Option 5 – Raised defences at Willow Beck

This option proposed the construction of a flood wall along the left bank of Willow Beck at Romanby, as there was insufficient space for an embankment. This would tie into an existing embankment to the south.

Bank-stability and sedimentation in the channel are known issues at Romanby. Local anecdotal evidence suggested that slippage has occurred on the left bank and the channel bed has become silted over the last decade. This indicated that the design of works here would require careful consideration. In addition, further work to identify and address the source of sediment or provision to implement periodical channel desilting would be necessary.

Option 6 – Embankment storage area at Turker Beck

This option was to create a flood storage area on Turker Beck upstream of the urban area. This area would be created by the construction of an embankment dam across the watercourse with a flow control device near the existing culvert inlet. The forward flows would be restricted by a hydrobrake.

The embankment dam would be located at the boundary of the urban area approximately two metres from the nearest property boundary. This location was selected to maximise the storage capacity. When operating, the flow control would restrict flow and cause floodwater to accumulate on arable land upstream of the embankment.

This option was proposed as part of the previous North Yorkshire County Council (NYCC) scheme. There was public opposition to this option at the time, due to security and safety fears. More recent public consultations held as part of this project found that there was still opposition to this option.

Option 7 – Widened channel storage at Turker Beck

Another option to create flood storage at Turker Beck would be to widen the channel of the existing watercourse, to enable storage below the existing ground level. This would extend upstream from the culvert entrance east of Northallerton. Reconstruction of the culvert inlet would be needed to provide improved operational access, a new trash screen, and to accommodate a flow control device.

Public consultation showed a high level of support for this option.

Option 8 – Embankment storage area at Sun Beck

This option was similar to Option 6 at Turker Beck, and was to create a flood storage area on Sun Beck upstream of the urban area. This storage area would be created by the construction of an embankment dam across the watercourse with a flow control device near the existing culvert inlet.

The embankment would be located at the boundary of the urban area approximately one metre from the nearest property boundary. This location was identified to maximise the storage capacity. When operating, the floodwater would be stored on arable agricultural land upstream of the embankment.

This option was proposed as part of the previous NYCC scheme. There was public opposition to this option at the time due to safety and security fears. More recent public consultations held as part of this project found that there is still opposition to this option.

Option 9 – Widened channel storage at Sun Beck

This option was similar to Option 7 at Turker Beck, and would create flood storage at Sun Beck by widening the channel of the existing watercourse, to enable storage of flood water below the existing ground level. This would extend upstream from the culvert entrance east of Northallerton. Reconstruction of the culvert inlet would be needed to provide improved operational access, a new trash screen, and to accommodate a flow control device.

Public consultation showed a high level of support for this option.

Option 10 – Flood resistance and resilience measures in Romanby

This option would involve flood resilient and / or flood resistant measures (e.g. purpose-built flood boards, air brick covers and non-return valves on drains and pipes). This would be recommended only for properties currently at risk of flooding in an event with a 1% probability of happening in any given year; these being eight households on Chantry Road (63, 65, 67, 69, 71, 71, 77, 79, 81), Romanby.

Combinations of Options

Having examined the above options individually, consideration was given to the combination of some of the above options. These options can be promoted for each of the individual flood cells or together to provide additional benefits.

Option 11 – Combination of works at Turker Beck and Sun Beck (including Bullamoor Park)

Hydraulic modelling showed how flows in Turker Beck and Sun Beck are hydraulically connected. Hence the benefit to the wider catchment of works on Sun Beck cannot be fully realised unless works on Turker Beck are also carried out. This option examined how the most suitable options for each watercourse interact.

Only by implementing works on both watercourses (options 6 or 7 plus 8 or 9) would benefit be provided to Northallerton High Street downstream of the Turker Beck and Sun Beck confluence.

Improved trash screens would also be installed at Bullamoor Park to prevent blockage of the culvert and reduce the flood risk for Friarage Hospital.

3.4 Key Environmental Impacts of Each Option

A comparison of the positive and negative environmental impacts of each option for each flood cell/benefit area is provided below in Table 3.1.

Table 3.1 - Positive and negative environmental impacts of options at Sun Beck & Turker Beck

Key Positive Impacts	Key Negative Impacts
Option 1 – Do Nothing	
• No operational or maintenance costs in the short term; and, • No disruption due to construction.	• Increase in flood risk for properties in Northallerton, Brompton and Romanby over time; • Costs of flood damage increase over time; and, • Disruption due to flooding increases over time.
Option 2 – Do Minimum	
• Minimum costs in the short term.	• No increase in standard of flood protection; • Costs of flood damage increase over time; and, • Disruption due to flooding increases over time.
Option 3 - Embankment storage area at Brompton Beck	
• Reduced flood risk for Brompton; • Possible opportunity for wetland habitat creation in the flood storage area, if some water is to be held back permanently. This may provide opportunities for Higher Level Environmental Stewardship; • Possible opportunity for diversion and improvement of public right of way away from area at risk of flooding; • Restoration of associated borrow pit may provide opportunities for habitat creation; • Hydrobrake to reduce scour within pipe through embankment, allowing natural river bed sediments to settle; or, • Orifice control on pipe inlet that does not limit fish movements.	• Periodic inundation of agricultural land; • Potential disturbance of unrecorded archaeological deposits; • Disruption to public right of way along Winton Beck during times of flood; • Impacts on visual amenity for a small number of residential receptors during both construction and operation; • Potential for excavated material to be contaminated (low risk); • Temporary disturbance to river channel and water quality; • Impact of borrow pit on agriculture; • Impacts on local landscape character • Potential impact on fish which may not pass safely through a hydrobrake in flood conditions; or, • Flow restriction causes scour, reducing the area of pipe within which natural bed sediments may settle
Option 4 – Lowering the right bank floodplain at Willow Beck	
• Reduced flood risk for properties in Romanby; • If the land is not returned to grazing, there may be opportunities for habitat creation; and, • Higher Level Environmental Stewardship	• Removal of riparian habitat; • Removal of mature trees which are covered by tree preservation orders; • Removal of small sections of hedgerow; • Potential for unrecorded archaeological remains to be disturbed during construction; • Excavated material to be disposed of; • Potential for excavated material to be contaminated (low risk); and, • Periodic inundation of agricultural land
Option 5 – Raised defences at Willow Beck	
• Reduced flood risk for properties in Romanby.	• Temporary disturbance to residents during construction; and, • Localised visual impacts.

Key Positive Impacts	Key Negative Impacts
Option 6 – Embankment storage area at Turker Beck	
• Reduced flood risk for properties in Northallerton; • Possible opportunity for wetland habitat creation behind the embankment, if some water is to be held back permanently. This may provide opportunities for Higher Level Environmental Stewardship; and, • Restoration of associated borrow pit may provide opportunities for habitat creation.	• Temporary disruption and disturbance to local residents, businesses, local roads; • Potential for unrecorded archaeological remains to be disturbed during construction; • Potential for excavated material to be contaminated (low risk); • Temporary disturbance to watercourse channel and water quality; • Impact of borrow pit on agriculture; • Periodic inundation of agricultural land; • Permanent loss of agricultural land beneath • Embankment; • Impacts on visual amenity of residential receptors during construction and operation; • Public concern in relation to raised water storage close to housing; • Impacts on local landscape character; and, • Impacts on visual amenity for users of footpath, during both construction and operation.
Option 7 – Widened channel storage at Turker Beck	
• Reduced flood risk for properties in Northallerton; • Opportunities for habitat creation and Higher Level Environmental Stewardship; and, • Possible opportunity for diversion and improvement of public right of way away from area at risk of flooding.	• Temporary disruption and disturbance to local residents, businesses, local roads and footpath; • Potential for unrecorded archaeological remains to be disturbed during construction; • Loss of riparian habitat, including trees; • Excavation of banks of watercourse and risk of reduction in water quality during construction; • Excavated material to be disposed of; • Potential for excavated material to be contaminated; • Permanent loss of agricultural land within excavated area; • Impacts on visual amenity of residential receptors during construction and operation; and, • Increased siltation likely.
Option 8 – Embankment storage area at Sun Beck	
• Reduced flood risk for properties in Northallerton; • Possible opportunity for wetland habitat creation behind the dam, if some water is to be held back permanently. This may provide opportunities for Environmental Stewardship; and, • Restoration of associated borrow pit may provide opportunities for habitat creation	• Temporary disruption and disturbance to local residents, businesses, local roads; • Potential for unrecorded archaeological remains to be disturbed during construction; • Potential for excavated material to be contaminated (low risk); • Temporary disturbance to river channel and water quality; • Impact of borrow pit on agriculture; • Periodic inundation of agricultural land; • Permanent loss of agricultural land beneath embankment; • Impacts on visual amenity of residential receptors during construction and operation; • Public concern in relation to raised water storage close to housing; and,

Key Positive Impacts	Key Negative Impacts
	• Impacts on local landscape character.
Option 9 – Widened channel storage at Sun Beck	
• Reduced flood risk for properties in Northallerton; • Opportunities for habitat creation and Higher Level Environmental Stewardship; and, • Potential to create additional footpath links along river corridor.	• Temporary disruption and disturbance to local residents, businesses, local roads; • Potential for unrecorded archaeological remains to be disturbed during construction • Loss of riparian habitat, including trees • Excavation of river banks and risk of reduction in water quality during construction; • Excavated material to be disposed of; • Potential for excavated material to be contaminated; • Permanent loss of agricultural land within excavated area; • Impacts on visual amenity of residential receptors during construction and operation; and, • Increased siltation likely.
Option 10 - Flood resistance and resilience measures in Romanby	
• Prevention of flooding at affected homes in Romanby; • Avoids adverse impacts on trees and riparian habitat; • Avoids earthworks and associated impacts relating to contaminated land or archaeological remains; • No change to the local landscape or visual amenity; and, • No impacts on land use.	• Continuing disruption during flood events; and, • Continuing risks to public health and welfare outside homes or due to isolation by floodwaters
Option 11 – Combination of works at Sun Beck and Turker Beck (including Bullamoor Park)	
• Reduced flood risk for properties in Northallerton including Friarage Hospital; • Opportunities for habitat creation and Higher Level Environmental Stewardship; and, • Potential to create additional footpath links along river corridor.	• Temporary disruption and disturbance to local residents, businesses, local roads and hospital; • Potential for unrecorded archaeological remains to be disturbed during construction • Loss of riparian habitat, including trees • Excavation of river banks and risk of reduction in water quality during construction; • Excavated material to be disposed of; • Potential for excavated material to be contaminated; • Permanent loss of agricultural land within excavated area; • Impacts on visual amenity of residential receptors during construction and operation; • Increased siltation likely; • Temporary impacts on recreation and • amenity due to construction works within Bullamoor Park park; and, • Possible removal of trees close to the culvert inlet at Bullamoor Park.

3.5 Options Not Selected

The decision about the preferred option was governed firstly by technical viability then by the economic case and environmental impacts. There were also other factors taken into account, including public opinion (see Section 4), health & safety, disruption, access and site constraints.

The following options were rejected:

- Option 1 – Do Nothing
- Option 2 – Do Minimum
- Option 4 – Lowering the right bank floodplain at Willow Beck
- Option 5 – Raised defences at Willow Beck
- Option 6 – Embankment storage area at Turker Beck
- Option 8 – Embankment storage area at Sun Beck
- Option 10 – Flood resistance and resilience measures in Romanby

Table 3.2 – Reason for rejection

Option	Reason for rejection
1 – Do Nothing	Increased probability of flood damage due to flooding.
2 – Do Minimum	No increase in standard of flood protection.
4 – Lowering the right bank floodplain at Willow Beck	Not economically viable due to low Benefit Cost Ratio.
5 – Raised defences at Willow Beck	Not economically viable due to low Benefit Cost Ratio.
6 – Embankment storage area at Turker Beck	Local population objected to the construction of embankment dams on grounds of risk of breach, safety issues and the security risk they felt it created.
8 – Embankment storage area at Sun Beck	Local population objected to the construction of embankment dams on grounds of risk of breach, safety issues and the security risk they felt it created.
10 – Flood resistance and resilience measures in Romanby	Not necessary as alternative option (Option 3) was assessed as being economically viable.

3.6 Preferred Option

Following the Option Appraisal and Comparison process outlined above, Options 3 and 11 were selected as preferred options. Option 11 is a combination of Option 7 and Option 9.

Since the selection of Option 3 as the preferred option for the Brompton / North / Willow Beck flood cell, plans have been put on hold. Although the Brompton plan has technical approval, it does not qualify as a priority for funding under the new criteria as its rating is very low. However, the scheme has not been abandoned and will be revived if £2.1 million can be found from other sources.

In the meantime, we are working with the community to determine the other options that may be available to individual property owners to reduce their flood risk.

In addition, HDC has received Property Level Flood Resilience Grant of £50,000 to fund property resilience measures at eight properties at risk of flooding in Romanby village. Option 11 has been selected as the preferred option for the Turker Beck and Sun Beck flood cell. Option 11 comprises works to Sun Beck and Turker Beck in addition to 'do minimum' work that includes the repair, refurbishment or replacement of culvert sections.

Option 11 is the subject of the environmental assessment in this report.

3.6.1 Project Description

Construction works at Turker Beck and Sun Beck would comprise excavation of material to provide capacity for the storage of flood water. At Turker Beck, the excavation would be on either side of the existing watercourse. At Sun Beck, the design has changed since the option selection stage, and the excavation would be to the south of the existing watercourse, rather than following the existing channel course. The new flood storage area would discharge into the culvert at the eastern end of the cul-de-sac known as Bramblefields. The flood storage area would be a wildflower meadow.

There would be a modified inlet structure (with hydrobrake flow control) to the culvert system.

There would be a slight embankment built at the top of the flood storage areas. The embankment is not intended to hold back floodwater, but is only to provide 'freeboard', meaning that any surface waves would wash against the embankment.

Construction access to Turker Beck would be from Bullamoor Road, and to Sun Beck would be from Scholla Lane.

The project is designed to protect against flood events with up to a 0.5% chance of happening in any one year (equal to 1 in 200 years).

Landscape planting is incorporated into the design as appropriate, and includes a small number of trees, improvements to hedgerows and wildflower seeding.

Trash screens on Turker Beck in Bullamoor Park would be improved. This would reduce the risk of blockage, and also offer improved safety for our maintenance staff and for members of the public in the park.

Trash screen clearance work would need to continue at Turker Beck, Sun Beck and Bullamoor Park both routinely and during flood events. Maintenance access tracks for Turker Beck, Sun Beck and Bullamoor Park will be the same as those used for construction access.

3.6.2 Construction Arrangements

The Indicative Landscape Plan (ILP) (Appendix 3) illustrates land use requirements and proposed access routes for construction.

A site compound would be located adjacent to an existing farm access track leading from Bullamoor Road. The farm track would be used for access to the compound and to the construction site.

A second site compound would be located north of Sun Beck. This compound would be accessed from Scholla Lane via a specially constructed 4.5m wide access road. This

road would remain following commission of the scheme to provide permanent access to the storage area for maintenance.

Topsoil would be removed from the surface of the area to be excavated, and would then be stockpiled in a designated area. We intend to spread the topsoil evenly over the fields adjacent to the works upon completion of the project. This would, therefore, reduce the numbers of HGV movements required to and from site during construction, whilst also allowing the topsoil to be used beneficially. We will liaise with our regulatory colleagues in the Environment Agency to determine whether or not an exemption is required for the reuse of this topsoil.

In addition to topsoil, large volumes of clay would be excavated during construction of the flood storage. The clay would have to be removed from site. We are currently in discussions with NYCC to find a scheme for which the clay could be used beneficially, in order to minimise waste. Excavated material would be removed from site by road to the east, rather than taking lorries through Northallerton.

At Bullamoor Park, a site compound would be created within the park, in an area of hard-standing to the north of the access from Forest Road.

The construction methodology would be developed further during detailed design in liaison with HDC, as appropriate.

The proposed scheme would be carried out within a period of nine weeks at Turker Beck, four weeks at Sun Beck and two weeks at Bullamoor Park. These works would be undertaken in parallel. There would also be a week of mobilisation prior to the construction works commencing. The works at Bullamoor Park would be carried out over a period of two weeks. These works would commence once the works at Turker Beck and Sun Beck have been completed. In order to excavate materials before the winter wet weather, we hope to carry out work at both sites concurrently. A team of approximately 15 operatives would access the site on a daily basis. All plant, accommodation and materials would be brought to site at the start of the construction period, and removed at the end.

4 Consultation

4.1 To date

We held two public consultation meetings, in September 2009 and February 2010, with key stakeholder organisations and local residents. We also held meetings with the local councils to share information and update them on our progress. In addition, we made the Scoping Consultation Document available to a number of statutory consultees and stakeholder organisations.

During the options review process and the development of the proposed scheme, we have consulted internally within the Environment Agency and externally with the following key stakeholders:

- Natural England;
- English Heritage;
- Hambleton District Council;
- North Yorkshire County Council;
- Northallerton Town Council;
- Romanby Parish Council;
- Brompton Town Council;
- River Wisk Internal Drainage Board;
- Yorkshire Water; and,
- Northallerton and Thirsk Local History Group.

At the scoping consultation stage, consultees were asked for their comments, opinions and suggestions, and any additional relevant information that they could provide, to help us to develop the flood alleviation scheme and to inform the Environmental Impact Assessment.

The comments received from external consultees are set out in the table 4.1 below, together with the actions that we have taken or plan to take to address them. It should be noted that some of these comments relate to the preferred option for the Brompton / North / Willow Beck flood cell that, as explained above in Section 3.2.4, has been put on hold.

Table 4.1 – Comments from Consultation

Consultee	Comment	Action / Response
English Heritage	Specialist staff have considered the information received, and do not wish to offer any comments on this occasion.	None required
Natural England	Overall, NE satisfied with the proposed survey effort. NE recommend that protected species data be obtained from the North and East Yorkshire Ecological Data Centre.	An updated ecology survey was carried out on 27th September 2011. Data was obtained in April 2012 from the North and East Yorkshire Ecological Data Centre.

Consultee	Comment	Action / Response
	NE welcome the recognition in the environmental objectives that any new habitats created should form part of a coherent network of habitats that either support the species that may be displaced by the scheme or are targeted towards priority habitats identified in the Hambleton Biodiversity Action Plan.	The opportunity to provide BAP habitat has been reduced since works at Brompton have been put on hold. However, we would still fill gaps in native hedgerows, introduce new sections of hedgerow where possible, and provide areas of wildflowers at both Sun and Turker Beck.
	There is a need to secure the management of the habitat creation areas for the longer term.	If we are able to create habitat areas, we will liaise with landowners to help to secure long-term management of them.
	NE welcomes the inclusion of a landscape and visual impact assessment within the EIA. NE wishes to understand what effort will be made to integrate new landscape features into the local landscape, as these areas may offer opportunities to enhance nature conservation in the area.	Ecologists and Landscape Architects have influenced the scheme design to help to achieve the environmental objectives.
	The EIA should recognise the importance of good soil management and refer to appropriate guidance.	Section 6.9 of this Environmental Report assesses the impacts of the scheme on soil resources.
	The EIA should consider ways of minimising severance of the public rights of way network.	Section 6.1 of this report considers impacts on human beings including impacts caused by potential severance.
	The EIA should consider possible impacts on actions being taken forward under the England Catchment Sensitive Farming Delivery Initiative.	Since the works at Brompton have been put on hold, the scheme is unlikely to affect actions relating to the England Catchment Sensitive Farming Delivery Initiative.
	NE would be happy to discuss this scheme in more detail to ensure that it integrates with the existing work of Natural England.	We will consult with Natural England as we progress with the design of the preferred option.
Hambleton District Council	The planning policy team supports the preferred approach.	Comments have been noted.
	Proposals should consider future land use through the proposed developments allocated within Hambleton's Local Development Framework Allocations document. Reference should be made to this in the narrative.	Sections 2.2.6, 2.2.11 and 5.1.11 of the Scoping Report were amended to refer to proposed development in North Northallerton.
	Inaccuracy in road numbering	The road numbering was corrected for the Scoping Report.
	The RSS has been revoked and no longer forms part of the planning policy context	References to the RSS was removed from the scoping report
Brompton Town Council	There is some concern as to the lack of costings in the document.	The scoping consultation document and the scoping report focused on the environmental issues of the scheme.
	The council believes that the 'do nothing' and 'do minimum' schemes are not really options that will do anything to improve the situation and should therefore be disregarded.	The do nothing and do minimum options were included for comparative purposes. These do not form part of our preferred option.
	Only options 1a and 1b are seen as being acceptable to Brompton Town Council	Comments have been noted

Consultee	Comment	Action / Response
Councillor Jack Dobson	Feels strongly that the raised embankment option at Sun and Turker Beck should not be progressed.	Comments have been noted. The consultation document did show that the preferred option at these locations was channel widening through excavation (see Section 4.3 of this report)
Yorkshire Water	Information provided on the location of Yorkshire Water infrastructure	Information has been noted and will be used to inform the design of the scheme.

4.2 Ongoing Consultation

We are liaising directly with affected landowners and with residents in the immediate area of the proposed scheme.

We are applying for planning permission to construct the proposed flood alleviation scheme. As part of the planning process, members of the public and interested organisations will be invited to comment on this Environmental Report.

5 Methodology

5.1 Approach to Environmental Impact Assessment

Although the proposed scheme does not require a statutory EIA, we have carried out a non-statutory EIA in keeping with the Environment Agency's Management System.

We have predicted the potential environmental impacts of both the construction and operation of the proposed scheme for each relevant EIA topic by going through the following stages:

- Determining the baseline conditions relevant to the topic area and identifying potential environmental receptors;
- Determining the sensitivity or importance of each receptor;
- Determine the magnitude of change to the receptor that is likely to occur;
- Using professional judgement to assess the significance of the predicted impact on the receptor;
- Identifying appropriate measures to mitigate, reduce or offset any significant adverse environmental impacts;
- Providing details of any residual environmental impacts that may be present even with mitigation in place; and
- Identify any enhancement measures additional to those required for mitigation.

We have carried out our assessment using professional judgement, with reference to relevant published guidance, where applicable, including the Institute of Ecology and Environmental Management guidelines for ecological impact assessment, and the Landscape Institute and Institute of Environmental Management and Assessment's guidance for landscape and visual impact assessment.

5.2 Definitions

5.2.1 Baseline Conditions

To identify the environmental impacts of the proposed scheme, we first have to understand the existing environment pre-construction – the 'baseline conditions'. By understanding the baseline, we are able to predict the changes potentially caused by the proposed scheme. The baseline environment is the environment as it exists immediately before an impact occurs.

We have gathered information on the baseline conditions from the following sources:

- Consultation with third party organisations,
- Desk-based studies, and
- Site surveys.

5.2.2 Construction and Operational Impacts

Construction impacts can include temporary impacts that would end as soon as construction is finished (for example the impacts of construction traffic). They can

also include permanent impacts, such as the loss of protected sites or landscape features.

Operational impacts are the impacts arising from the presence of the proposed scheme, and from its maintenance, throughout its operational life.

5.2.3 Significance of Impacts

We have identified the significance of environmental impacts based upon the sensitivity or importance of the environmental receptor and the magnitude or scale of the predicted impact. The sensitivity or importance of an environmental receptor was determined by considering its statutory or non-statutory protection, its vulnerability or rarity, consultees' responses, specialist expertise and professional judgement.

The magnitude of an impact was identified using professional judgement, based upon the scale of the change to the baseline receptor.

A typical matrix showing how the significance of impacts was determined is shown in Table 5.1. This matrix may be applied to both beneficial and adverse impacts.

Table 5.1 – Matrix for Assessing Significance of Impacts

	Sensitivity / Importance of Receptor			
Magnitude of Impact	**Very High**	**High**	**Medium**	**Low**
Major	Major	Major	Moderate	Minor
Moderate	Major	Moderate	Moderate	Minor
Minor	Moderate	Moderate	Minor	Minor
Negligible	Minor	Minor	Minor	No Significant Effects
No Change	No Significant Effects	No Significant Effects	No Significant Effects	No Significant Effects
	Significance of Impact			

Details of how the significance of environmental impacts has been assessed for each individual topic area are provided in Section 6 of this Environmental Report.

5.2.4 Mitigation Measures and Residual Impacts

Mitigation measures are the actions that we plan to take to reduce the significance of adverse environmental impacts that would be caused by the scheme, where this is possible. Residual impacts are the impacts that remain with mitigation measures in place.

5.3 Scoping

We produced a Scoping Report (SR) in September 2010. The SR presented the findings of a scoping exercise for the proposed scheme. During the scoping exercise, an initial environmental appraisal considered the nature of the baseline

environment and the potential impacts of the proposed scheme. Consultations were carried out during the scoping exercise, allowing statutory consultees and interested groups to make us aware of what issues they considered to be relevant.

The scoping exercise considered the following environmental topics during construction and operation:

- Human Beings;
- Flora and Fauna;
- Air Quality;
- Landscape and Visual Amenity;
- Land Use;
- Water Quality
- Historic Environment;
- Traffic and Transport;
- Soils and Geology; and,
- Planning Policy.

During the scoping exercise we scoped out only two of the environmental issues identified above. These are long-term or operational impacts on air quality and water quality. Air quality would not be affected in the long term as a result of the scheme. Adverse impacts of the scheme on long-term water quality issues are unlikely as the proposals will not alter the chemistry of the watercourses. The storage areas would be vegetated following construction and the design of the release of stored water would be controlled to minimise suspended material and the potential for siltation

All of the other environmental issues are scoped in to the assessment, as they have the potential to be affected by the scheme.

The remaining topics have been carried forward to the assessment stage, and the results of that assessment are presented in the following sections of this Environmental Report.

- Human Beings;
- Flora and Fauna;
- Air Quality (construction only);
- Landscape and Visual Amenity;
- Land Use
- Water Quality (construction only)
- Historic Environment;
- Traffic and Transport; and
- Soils and Geology.

In addition, planning policy is covered in the planning supporting statement, which forms part of the planning application.

6 Assessment and Evaluation

6.1 Human Beings

6.1.1 Methods

The assessment of the potential impacts of the proposed scheme on human beings is qualitative, and is based on the impacts of the proposals in terms of amenity, disruption and disturbance, including impacts associated with construction noise.

The methodology set out in Section 5.2 of this report was used for assessing the significance of impacts.

6.1.2 Baseline Information

The study area lies in the eastern part of Northallerton, comprising an urban area dominated by residential properties, extending to the eastern edge of the town, where it borders agricultural land. Residential properties are located close to the areas of proposed works and associated site compounds.

Earthworks along Turker Beck would extend behind properties along Turker Lane and Thorntree Road. Similarly, earthworks along Sun Beck would extend behind properties Bankhead Road. The proposed haul road from Scholla Lane to the compound area would pass across the field behind properties on Halstone Drive.

Bullamoor Park is located approximately 800m west of the flood storage works proposed at Turker Beck and Sun Beck. The park is bounded to the north and east by residential properties. Friarage Hospital abuts the western boundary of the park while Bullamoor Road passes along the southern extent of the park.

The residents that live adjacent to the area of proposed works are considered to be of **high sensitivity** to the potential impacts of construction activities.

A footpath currently follows the northern bank of Turker Beck. The users of this are also considered to be of **high sensitivity** for the purposes of this assessment.

6.1.3 Potential Impacts without Mitigation

6.1.3.1 Construction Impacts

Residents of some of the closest properties would be temporarily affected during construction, in relation to dust, noise and traffic and transport. The nearest sensitive receptors would be residents of properties along Halstone Drive, Bankhead Road, Turker Lane and Thorntree Road; and to a lesser extent (due to the smaller scope of works at Bullamoor Park) residents of properties along Forest Road and staff and patients at Friarage Hospital. It is expected that these impacts would be of **moderate magnitude** and therefore **moderate adverse significance** without mitigation.

The footpath that follows the northern bank of Turker Beck would be severed during excavation works to provide flood storage. Without mitigation this impact would be of **moderate magnitude** and therefore **moderate adverse significance**.

6.1.3.2 Operational Impacts

Our maintenance regime for the becks would be of a similar scale to that currently undertaken, with only a more formalised maintenance schedule. Therefore, the impact of disturbing local residents or businesses would be **negligible**.

The preferred option would protect 259 residential properties, 32 commercial properties and a hospital from a flood with a 0.5% chance of happening in any one year. The magnitude of this beneficial impact is considered to **major**, and therefore the impact is of **major beneficial significance**.

6.1.4 Mitigation

6.1.4.1 Construction

We plan to apply for consent to divert the footpath at Turker Beck around the construction works, allowing footpath users still to gain access to the land further to the east.

We would agree hours of work with HDC. We intend to avoid evening, Sunday and Public Holiday working, in order to keep disturbance of residents to a minimum. We would agree traffic management arrangements with NYCC. We will also follow good construction practices to minimise disturbance and noise, for example by turning engines off when machines are not in use.

The landowners who would be directly affected by the proposed scheme have been consulted throughout the development of the scheme, and therefore are aware of the nature of the proposed works. We are continuing to liaise with the landowners to mitigate the impacts that could potentially arise.

We will follow good environmental practices, and take measures to reduce the risk of dust causing a nuisance to the local community. For example:

- A high standard of housekeeping would be maintained on site;
- Dust arising from loaded wagons leaving the site would be kept to a minimum, using covered wagons and skips;
- Where appropriate, wheel-washing facilities would be established at exits onto public roads;
- Stockpiles and unmade haul roads would be dampened down when required; and,
- Road sweepers would be used to keep metalled haul roads clean.

6.1.4.2 Operation

The footpath at Turker Beck would be reinstated, along a slightly altered route through the flood storage area, to ensure that footpath users would continue to have access across the field to areas to the east. It is acknowledged that the footpath would flood during some flooding events.

6.1.4.3 Residual Impacts

During the construction period, with a footpath diversion in place, the significance of the impact on its users would be **negligible**.

With mitigation in place, in the form of construction best practice, there may be a temporary minor adverse impact on local residents during construction, as a result of noise and construction traffic close to their homes. However, we would continue to liaise with local residents throughout the construction period, to understand any concerns that they may have.

During operation, there would be major beneficial impacts on human beings as a result of the additional flood protection provided. The impact of the realigned footpath at Turker Beck would be **negligible**.

6.2 Flora and Fauna

6.2.1 Methods

On 14th September 2011, update ecology surveys were carried out at Turker Beck, Sun Beck and Bullamoor Park in Northallerton.

The update surveys were intended to assess changes, if any, since the previous Extended Phase 1 Habitat Survey undertaken in 2009. In addition, the scope of the survey was extended to include a combined water vole and otter survey of Turker Beck and Sun Beck and to assess the bat roosting potential of any trees or structures within the proposed in-line flood storage development footprints. An assessment of hedgerows either wholly or partly within the footprint of the proposed works was undertaken to determine if any would be considered an 'Important Hedgerow' under ecological criteria set out in The Hedgerow Regulations, 1997 (HMSO 1997).

Previous surveys of Turker Beck, Sun Beck were carried out between the 3rd and 4th of June 2009. Additional areas including the culverted section of Sun Beck at Friarage Hospital in Northallerton were surveyed on the 3rd of September 2009. The material findings contained within that report were confirmed as correct during the update surveys carried out on 14th September 2011.

The detailed methods used for the ecology surveys are set out in the ecology survey memo in Appendix 2.

6.2.2 Baseline Environment

Turker Beck and Sun Beck were, at the time of our surveys, densely vegetated with species including nettle and bramble. There was some flowing water, and areas with shallow pools of standing water. Turker Beck is considered to be suitable habitat for water vole, although no signs of their presence were found. Sun Beck is less suitable for water voles, because there is less in-channel vegetation. There were no signs of otter in either watercourse. Badger prints and claw marks were seen close to Turker Beck.

Trees at Turker Beck were considered to be unsuitable for bat roosts. One mature ash tree approximately 17m to the north of Sun Beck (the opposite side of the beck from where the works are proposed) does have features that could be used by bats.

At Bullamoor Park, a line of trees close to the works area was surveyed for bat roost potential. None of the trees are considered suitable for use by bats as roosts.

A survey was carried out of five hedgerows at Turker Beck and Sun Beck. None of the hedgerows surveyed would be determined as an 'Important Hedgerow', and therefore they are not protected.

A desk study was undertaken to obtain ecological information about the study area and surrounds. This study was designed to identify any statutory and non-statutory sites of nature conservation interest, to identify records of protected species/habitats and any other ecological information held by third parties, which may be of relevance to the project.

The following consultees and web resources were used to gather baseline information about the site:

- North & East Yorkshire Ecological Data Centre (NEYEDC) (www.neyedc.org.uk);
- The Multi-Agency Geographical Information for the Countryside website; (http://magic.defra.gov.uk/);
- Natural England 'Nature on the Map' (www.natureonthemap.org.uk/); and;
- National Biodiversity Network Gateway (www.nbn.org.uk).

No statutory sites designated for their nature conservation interest are located within 2km of the development site. Similarly no non-statutory/locally designated sites are located within 2km of the study area.

Information recorded from NEYEDC on protected species within 2km of the development site recorded since is presented in the Table 6.1.

Table 6.1 – NEYEDC data on protected species

Species	Date	Location (OS Grid Ref.)	Type of Record
Common Pipistrelle bat (*Pipistrellus pipistrellus sensu stricto*).	1985/86	SE39	Unknown
Brown long-eared bat (*Plecotus auritus*)	1985/87	SE3494	Unknown
Whiskered/brandt's bat **(***Myotis mystacinus/brandtii*)	1985	SE39	Unknown
Natterer's bat **(***Myotis nattereri*)	1985	SE39	Unknown
European Water Vole (*Arvicola Amphibious)*	1964	SE49 (Cod Beck, Osmotherly)	Unknown

A range of bird species have been recorded within 2km of the site including the UKBAP priority species such as; house sparrow (*Passer domesticus*), grey partridge (*Perdix perdix*) and lapwing (*Vanellus vanellus*).

Other UKBAP priority species recorded in the study area include common toad (*Bufo bufo*) and brown hare (*Lepus europaeus*).

6.2.3 Potential Impacts without mitigation

6.2.3.1 Construction Impacts

The scheme would have no impacts on otter, water vole or bats. Although badger prints were observed near to Turker Beck, there was no badger sett in the area of the proposed works, and therefore there would be **no impacts** on badger.

The scheme would have **no impacts** on 'important hedgerows'. There would be some loss of vegetation along the banks of Turker Beck, and to a lesser extent at Sun Beck, giving a minor adverse impact at a very local level.

It is an offence to damage or destroy the nest of any wild bird whilst it is in use or being built (including ground nesting birds). We have carried out some vegetation clearance prior to the submission of the planning application. This was to avoid disturbance to breeding birds during the spring and summer breeding season.

6.2.3.2 Operational Impacts

There would be no operational impacts on flora and fauna at Turker Beck. At Sun Beck, the removal of a section of culvert, and replacing it with a section of open channel, would provide **minor beneficial** ecological impacts in the immediate vicinity.

6.2.4 Mitigation

The mature ash of medium bat roosting potential does not require removal as it is several metres outside the works area at Turker Beck. However, tree protection fencing would be erected a suitable distance from this tree and site personnel would be briefed on its significance prior to works starting on site.

We plan to plant trees and shrubs along both Turker Beck and Sun Beck, both to replace vegetation removed prior to construction, and to fill gaps and thereby improve wildlife corridors. In addition, we plan to seed the gentle slopes of the flood storage areas with wild flower seeds, and to replace and fill gaps in existing hedgerows that would be affected by the construction works.

All areas selected for vegetation removal (in addition to that already carried out, as explained in section 6.2.3.1) will be surveyed for nesting birds, prior to removal.

Further details on environmental mitigation and enhancements are provided in Section 6.2.4 and the Indicative Landscape Plan, Appendix 3.

6.2.5 Residual Impacts

During the construction phase, there would be **minor adverse** impacts on ecology at a very local level.

With the mitigation measures in place, there would be **minor beneficial** ecological impacts in the study area once the construction works had been completed.

6.3 Air Quality (Construction Phase Only)

6.3.1 Methods

Operational air quality impacts have been scoped out of the assessment. The assessment of construction phase impacts is qualitative only, and is based on our experience of other, similar schemes.

6.3.2 Baseline Information

There are no Air Quality Management Areas (AQMAs) in Hambleton district. This indicates that there are no areas at risk of failing to meet national air quality objectives.

The proposed scheme is close to residential areas. There are no significant sources of air pollutants, such as strategic roads or industrial areas, close to our proposed scheme.

6.3.3 Potential Impacts without Mitigation

The creation of the two flood storage areas at Sun Beck and Turker Beck would involve excavation. These earthworks could lead to the generation of dust, particularly during dry weather, which may cause nuisance impacts for residents in the neighbouring properties. This impact would be temporary in nature and of **moderate adverse** significance.

6.3.4 Mitigation

We will use good site practice to minimise the generation of dust during the excavation period. Our contractor will implement an environmental action plan, which will include actions such as damping down soil during dry weather, using covers on lorries, and minimising the stock-piling of material on site. We will liaise with local residents throughout the construction period, and provide a system for them to raise any concerns or complaints, which we will then seek to resolve through discussion.

6.3.5 Residual Impacts

The nature of the works and the close proximity to residential properties means that some local residents may be affected by dust nuisance during the excavation of the flood storage zones. However, these impacts will be temporary in nature, and would cease at the end of the construction period. The temporary impacts would be **minor to moderate adverse** for each event.

6.4 Landscape and Visual Amenity

6.4.1 Methods

The landscape and visual assessment aims to identify the potential landscape and visual effects of the proposed flood alleviation schemes at Turker Beck and Sun Beck. The assessment first sets out the methodology used for identifying potential impacts which is in line with current guidance on the subject. This is followed by a description of the baseline conditions, which include a description of the site and surrounding area and the

locations from where the site is visible. Key characteristics of landscape character are also identified using previously undertaken landscape character assessments.

The potential impacts of the scheme and landscape and visual effects are considered, followed by a description of mitigation measures designed to avoid, reduce or offset any potential effects. The residual effects are then discussed which incorporate the effect of any proposed mitigation.

A detailed description of the proposals is outlined in Section 3 of the Environmental Report. A summary is provided below.

Turker and Sun Becks

Existing trees and hedgerows would be removed to accommodate a working area around each beck. At Turker Beck excavation would be carried out to increase the size of the channel storage area as well as modifications to the existing inlet structure. At Sun Beck the existing channel would be altered to replace a section of culvert behind the houses on Bankhead Road and increase the size of the storage area. A new inlet structure would be provided at the end of the new open channel.

The outline methodology for the impact assessment is contained within Section 5 of the Environmental Report. Below is a description of the methodology specific to the landscape and visual assessment.

The sources of information for the landscape and visual assessment are primarily:

- Northallerton Flood Alleviation Scoping Report, September 2010;
- 'Arboricultural Report' by Barnes and Associates;
- Aerial Photographs;
- Ordnance Survey Maps;
- Landscape Joint Character Area information from Natural England;
- Hambleton District Council Landscape Assessment (Woolerton Truscott, 1992);
- Hambleton District Council Local Development Framework (LDF) Landscape and Settlement Character Assessment (Landcare, 2008); and
- Site visits.

The assessment has considered:

- The existing landscape character;
- Existing landscape features;
- Existing visibility of the sites;
- Potential landscape and visual impacts;
- Mitigation proposals to address these potential impacts; and
- Residual impacts.

The assessment of landscape and visual impacts has been carried out with reference to the Guidelines for Landscape and Visual Impact Assessment (2nd Edition) by The Landscape Institute and Institute of Environmental Management and Assessment (2002) as well as the Environment Agency's 'Landscape and Environmental Design Guidance.'

The study area for the Landscape Impact Assessment has been governed by a desk-top survey and covers the whole of the scheme proposals in their wider landscape context. The study area for the Visual Impact Assessment has been defined by the extent of the

broad-scale visual envelope as informed by baseline research and confirmatory field survey work.

The landscape and visual amenity baseline has been described as that which exists at the time of desktop and field survey (December 2011) and the Landscape and Visual Impact Assessment has taken into account the effects of the proposed flood alleviation scheme only. The Landscape and Visual Impact Assessment summarises the key effects of the proposals in the year of Construction (2012), the year of Operation (2012) and in the Future year (2027). The Future year, fifteen years after completion of construction works, identifies residual effects of the development which would remain following the establishment of mitigation proposals. The assessments for each year will take any specific mitigation measures into account.

6.4.1.1 Assessment of Landscape and Visual Effects

The GLVIA states that *"Landscape effects derive from changes in the physical landscape, which may give rise to changes in its character and how this is experienced. This may in turn affect the perceived value ascribed to the landscape."*

It also states *"Visual effects relate to the changes that arise in the composition of available views as a result of changes to the landscape, to people's responses to the changes, and to the overall effects with respect to visual amenity."*

The two principal criteria determining the significance of effects are the *sensitivity* of the receptor and the *magnitude of impact* (i.e. change in the baseline conditions resulting from the development proposals). Furthermore, the GLVIA guidelines recommend the development of threshold criteria that should inform the determination of significance of effect on the landscape and visual resources. The proposed landscape and visual sensitivity, and magnitude of impact threshold criteria are summarised in tables 6.2, 6.3 and 6.4 below.

6.4.1.2 Sensitivity

The sensitivity of a landscape receptor is based on its ability to accommodate change, its importance in relation to national and local designations that may apply; its perceived value to local users and consultees; and any intrinsic aesthetic characteristics such as its contribution to local landscape quality or sense of place. Sensitivity is always based on a receptor's ability to accommodate the particular type of development that is being proposed.

The sensitivity of a visual receptor is based on the viewer's familiarity with the scene, the activity or occupation that brings them into contact with the view and the nature of the view, whether full or glimpsed, near or distant. It is also determined by the importance of the receptor, the importance of the view, the perceived quality of the view and its ability to accommodate change.

Table 6.2 – Sensitivity of Landscape Receptors

Sensitivity	Description
Very High	Landscape with highly important and rare components at international scale; of particularly high quality and distinctive character, and susceptible to relatively small changes with limited potential for substitution.
High	Landscape with highly important and rare components at national scale; of particularly high quality and distinctive

Sensitivity	Description
	character and susceptible to relatively small changes with limited potential for substitution.
Medium	Landscape with components of medium importance and rarity (regional scale); of good to ordinary quality and characteristics and reasonably tolerant of changes but with limited potential for substitution.
Low	Landscape with components of low or medium importance and rarity (local scale). A relatively poor quality landscape character, the nature of which is potentially tolerant of substantial change and substitutability.

Table 6.3 – Sensitivity of Visual Receptors

Sensitivity	Description
Very High	Open and direct views from highly important and rare buildings, public rights of way and open spaces of international importance and rarity including views towards the proposals from ground floor and first floor windows and/or residential properties and public rights of way within an existing high quality setting.
High	Residential properties with views towards the proposals from ground floor and first floor windows and open space areas of national importance and rarity and/or residential properties and public rights of way within an existing high quality setting. Public Rights of Way with open views of the scheme proposals.
Medium	Residential properties with limited views due to obstruction towards the proposed scheme. Public Rights of Way with restricted views towards the proposals and/or residential properties and public rights of way within an existing ordinary quality setting. Outdoor sporting and active / passive recreational facilities. Local side roads and lanes.
Low	Offices, commercial developments and industrial sites. Main roads.

Magnitude of Impact

The magnitude of impact on landscape according to GLVIA guidelines *"is generally based on the scale or degree of change to the landscape resource, the nature of effect and its duration"*. The magnitude of the visual impact is determined by the perceived contrast or integration with the existing scenic features and aesthetic character of the view in terms of its form, line, colour, texture and scale.

Table 6.4 – Magnitude of Landscape and Visual Impact

Magnitude of Impact	Description
Major	Very notable changes to views or large changes in landscape characteristics over an extensive area.
Moderate	Notable change to views, or changes to landscape characteristics over a large area, or severe effects in a more localised area
Minor	Slight change to views, or localised changes to landscape characteristics, or limited effects over a widespread area.
Negligible	Changes in the view that are difficult to perceive or small-scale,

Magnitude of Impact	Description
	localised changes to landscape components.
No Change	No perceptible change in view or any landscape components.

Significance of Effect

The significance of effect has been assessed using the matrix in Section 5 of the Environmental Report, with sensitivity of the receptor on one axis and magnitude of impact on the other. This matrix forms only a guide to the way that sensitivity and magnitude of impact give rise to a prediction of effects. The assessment of significance of effect relies upon common sense, experience and reasoned judgement, supported by substantiated evidence; and the predicted effect may not always fit with the matrix.

Mitigation

Mitigation (and where possible enhancement) proposals have been developed through consultation with the Client and the design team, focusing on measures to avoid, reduce and offset impacts. These mitigation measures have been incorporated into the design process and have been taken into account in the assessment. They are shown on the Landscape Masterplans (Appendix 3, Figures 5 and 6).

6.4.2 Baseline Information

6.4.2.1 Landscape Elements

The landscape around Northallerton is undulating, predominantly used for arable and pastoral agriculture, and supports little mature native vegetation other than hedgerows, hedgerow trees and small copses. There are no tree preservation orders in close proximity to the schemes.

Fields are predominantly of a medium size and regular in shape. Northallerton is the largest settlement in the local area with the agricultural fields interspersed by small hamlets and isolated farmhouses. The road network is fairly limited and minor in nature.

The topography rises to the east towards the boundary of the North York Moors National Park which lies approximately 5km to the east. A series of small streams run through the agricultural land, of which Turker and Sun Beck are two.

Turker Beck

The Turker Beck site is situated within rolling agricultural fields running eastwards perpendicularly from the urban edge of Northallerton. A public footpath runs along the south of Turker Beck which meets a second public footpath on the farm track to the east. The beck is lined with a series of small native trees the majority of which have been classed as ‘Low Quality’ trees in the Barnes and Associates Tree Survey. There are two ‘Medium Quality’ and one ‘High Quality’ trees close to the western end of the beck.

Sun Beck

The Sun Beck site is situated within rolling agricultural fields running south eastwards perpendicular to the urban edge of Northallerton. The beck is partially lined by a native hedgerow and a small clump of native trees classed as ‘Medium Quality’ in the Barnes and Associates Tree Survey. There is also a ‘Low Quality’ tree to the western end of the beck.

6.4.2.2 Landscape Character Assessments

National Character Assessment

Northallerton and the surrounding countryside lie within Natural England's National Character Area (NCA) 24 Vale of Mowbray. The key characteristics of the area include:

- Low-lying agricultural landscape contained by the escarpment of the North Yorkshire;
- Moors to the east;
- Fertile agricultural land used for arable crops and permanent grassland;
- Fields of a medium scale enclosed by low hedgerows with scattered, small areas of woodland and some parkland;
- Low-lying river valleys meandering through flood plains which become broader to the south where they traverse flat, glacial, lake deposits;
- Villages situated on higher ground, often with a linear form along a wide main street, and churches providing local landmarks;
- Buildings generally of brick of varying colour with pantiles for roofs; and,
- Influence of military installations and major transport routes especially the A1, the A19 and the York to Edinburgh main railway line.

NCA 24 identifies agricultural intensification and hedgerow loss as a pressure on the existing landscape as well as development for housing and industry around towns and along main road corridors. Opportunities for enhancement include sympathetic river management, the comprehensive management of small woods, hedgerow restoration and planting to strengthen landscape structure and the reversal of the loss of grassland to arable.

The Turker and Sun Beck sites are characteristic of this character area as they are made up of low lying agricultural land used for arable crops and permanent grassland with hedgerow field boundaries.

6.4.2.3 Regional and Local Character Assessment

At a local level, both sites lie within the following landscape character types in the Hambleton District Council Landscape Assessment (Woolerton Truscott, 1992). The landscape character types and other landscape features are illustrated on Figures 1 and 2, Appendix 3. The majority of the Turker and Sun Beck sites lie within the following character type:

Type 5c Intensively Farmed Lowland (Simple Topography) – Open

The key characteristics of this character type are:

- Essentially flat or gently rolling modern landscape valuable to agriculture;
- Inter-visibility is reduced only by intervening vegetation made up of minor areas of woodland, shelterbelts and isolated trees;
- Where hedgerows are present they are often fragmented and discontinuous with hedgerows completely absent in some areas; and
- Open, exposed, large landscape which is highly managed, has a monotonous uniform appearance and lacks variety.

Pressures and detractors in the landscape include:

- Further loss of natural elements;
- Loss of field pattern;
- Soil erosion;
- Intrusive human developments; and
- Large scale structures.

The Turker and Sun Beck sites are very characteristic of this character type as they are made up of fairly open, rolling agricultural fields with hedgerow field boundaries and isolated trees.

The rest of the Turker and Sun Beck sites lie within the following character type:

Type 4b Intensively Farmed Lowland (Varied Topography) – Intermediate Enclosure

The key characteristics of this character type are:

- Generally below 100m AOD and intensively farmed, predominantly arable crops or permanent pasture;
- Topography is distinct, varied and noticeable as a landscape element with the majority rolling or undulating;
- Deciduous woodland, coniferous plantations, tree clumps and hedgerow trees are present and significant in views;
- Hedgerow field boundaries or agricultural fencing where hedgerows have failed; and,
- Medium in scale and enclosure and sufficiently varied to be both interesting and pleasant.

Pressures and detractors in the landscape include:

- Removal of woodland;
- Increase in coniferous woodland;
- Hedgerow or tree removal to increase field size and reduce enclosure;
- Decline in level of management; and,
- Intrusive man-made structures.

The Turker and Sun Beck sites are more characteristic of the 5c character type. However, it is noticeable to the edge of the sites that the landscape character becomes more varied in topography with a greater presence of woodland blocks and tree clumps characteristic of type 4b.

The HDC LDF Landscape and Settlement Character Assessment (Landcare, 2008) draws on the 1992 assessment and suggests a range of approaches to mitigation for development(s) proposed in the LDF.

The 2008 assessment identifies linear planted boundaries and well-maintained hedgerows with mature hedgerow trees as characteristic of all landscape character types and therefore that they are a suitable approach to mitigation for most types of development. Other generic mitigation proposals include:

- Careful siting in relation to landform;
- The retention of healthy mature trees and hedgerows where possible; and
- Native tree and shrub planting, where possible involving advance planting in character with the surrounding landscape.

Specific mitigation for Type 4b of the HDC Landscape Assessment includes:

- 'Densely planted mixed coniferous and deciduous native tree and shrub shelter belts on any margin including roadsides';
- 'Dense native hedgerows with groups and isolated tree specimens'; and
- 'Large development may be subdivided and interspersed with specimens and groups of native trees'.

Specific mitigation for Type 5c of the HDC Landscape Assessment includes:

- 'Boundary planting to open countryside restricted to native hedgerows with occasional specimen trees'; and
- 'Similar internal planting incorporated to break up the mass of new buildings'.

NYCC is in the process of producing a Historic Landscape Characterisation for the county which has yet to be published.

6.4.2.4 Visual Envelope

Turker & Sun Beck

Views from the west beyond the urban edge of Northallerton towards the two becks are limited as the built form screens views from further west. Views are more extensive from the north, east and south due to the countryside being more open and reasonably sparse in terms of vegetation. The topography also rises to the east which provides receptors in this area with more distant views, but limits views from further afield. Hedgerows and small tree clumps also serve to filter views in places.

6.4.2.5 Potential Visual Receptors

The following visual receptors are illustrated on Figures 3 and 4, Appendix 3.

Turker Beck

VP1	Houses on Turker Lane
VP2	Houses on Thorntree Road
VP3	Houses on Lewis Road
VP4	Bullamoor Road
VP5	Footpath to south of Turker Beck
VP6	Footpath on farm track to east of Turker Beck
VP7	Footpath from Turker Beck to Bullamoor
VP8	Harrogate House
VP9	Houses on Bullamoor Road
VP10	Houses on Scholla Lane
VP11	Newsham Grange
VP12	House on Banks Road

Sun Beck

VP9	Houses on Bullamoor Road
VP13	Scholla Lane
VP14	Potters Close
VP15	Prospect House
VP16	Bank Close Farm
VP17	Houses on Hailstone Drive
VP18	Houses on Bankhead Road

6.4.3 Potential Impacts without Mitigation

6.4.3.1 Construction Impacts

Construction activities at both Turker Beck and Sun Beck which would have the potential to impact landscape elements, landscape character and visual amenity include:

- Presence and movement of large construction vehicles;
- Creation of site access tracks;
- Presence of temporary site compounds at each site;
- Clearance of vegetation on site; and,
- Extraction of material and either its removal or its temporary storage and re-spreading on site in the case of topsoil.

Landscape elements

There would be **moderate adverse** effects to local landform during the construction period due to the extraction of material and resulting landform. The loss of sections of hedgerows and trees during the construction period would also lead to a **moderate adverse** effect on vegetation. The loss of sections of the boundary hedgerows and the creation of the flood defence features and construction compounds would also result in a **moderate adverse** effect on landscape pattern.

Visual amenity

Construction activity would be clearly visible within the immediate area, but longer range views are screened by topography, built form and vegetation.

In the absence of mitigation works, construction would result in the following 9 **major adverse** visual effects:

VP1-Houses on Turker Lane;
VP5-Footpath to south of Turker Beck;
VP6-Footpath on farm track to east of Turker Beck;
VP7-Footpath from Turker Beck to Bullamoor;
VP8-Harrogate House;
VP9-Houses on Bullamoor Road;
VP13-Scholla Lane;
VP17-Houses on Hailstone Drive; and
VP18-Houses on Bankhead Road.

There would be 6 **moderate adverse** visual effects:
VP2-Houses on Thorntree Road;
VP3-Houses on Lewis Road;
VP10-Houses on Scholla Lane;
VP14-Potters Close;
VP15-Prospect House; and
VP16-Bank Close Farm.

3 Minor adverse visual effects would be felt at:
VP4-Bullamoor Road;
VP11-Newsham Grange; and
VP12-House on Banks Road.

Landscape character

Two character areas would be affected by the proposed works at Turker and Sun Becks. These are Type 5c-Intensively Farmed Lowland (Simple Topography) and Type 4b-Intensively Farmed Lowland (Varied Topography). The two sites lie mostly within the area of Type 5c and construction activity would lead to a **moderate adverse** effect on the character of that area due to the creation of the earthworks, loss of boundary vegetation and construction activity. There would also be a **minor adverse** effect on Area 4b, which would be mainly due to construction access routes and site compounds at Turker Beck, and the proximity of the works themselves.

6.4.3.2 Operational Impacts

Upon completion of construction works, the infrastructure necessary for construction would be removed, leaving the following permanent features:

- Access track at Sun Beck;
- Excavated and subsoiled flood retention features;
- Water inlet structures;
- Spread of topsoil in surrounding field areas;
- Planting of hedgerows and trees;
- Wildflower and grass mix seeding of subsoiled areas; and,
- Realigned footpath at Turker Beck.

Landscape elements

The permanent nature of the earthworks would result in a permanent **moderate adverse** effect on landform. In the absence of mitigation the loss of mature trees and hedgerows would cause a permanent **moderate adverse** effect. The result of the permanent change in landform and the loss of vegetation would also combine to result in a **moderate adverse** effect on landscape pattern in the long term.

Visual amenity

Removal of the construction compounds and activities would significantly reduce the visual impact of the scheme and result in the following visual effects:

2 **Major adverse** visual effects at:

VP5-Footpath to south of Turker Beck; and
VP6-Footpath on farm track to east of Turker Beck.

9 **Moderate adverse** visual effects would occur at the following receptors:

VP1-Houses on Turker Lane;
VP2-Houses on Thorntree Road;
VP3-Houses on Lewis Road;
VP7-Footpath from Turker Beck to Bullamoor;
VP8-Harrogate House;
VP9-Houses on Bullamoor Road;
VP15-Prospect House;
VP17-Houses on Hailstone Drive; and
VP18-Houses on Bankhead Road.

5 **Minor adverse** visual effects at:

VP4-Bullamoor Road;
VP10-Houses on Scholla Lane;
VP13-Scholla Lane;
VP14-Potters Close; and
VP16-Bank Close Farm.

2 **Negligible adverse** effects would occur at:

VP11-Newsham Grange; and
VP12-House on Banks Road.

Landscape character

The removal of construction activity would also reduce the level of impact upon local landscape character. However, in the absence of mitigation planting and seeding, there would remain a **moderate adverse** effect on Type 5c and a **minor adverse** effect on Type 4b. The landforms would continue to contrast with the surrounding fields and would be more evident with a lack of seeding. The absence of removed trees and stretches of hedgerow would add to the depletion of field boundaries in the local area.

6.4.4 Mitigation

Mitigation measures and enhancements are shown on the Landscape Masterplans (Appendix 3, Figures 5 and 6) and described on the Indicative Landscape Plans (Appendix 3, Figures 7 and 8).

The HDC LDF Landscape and Settlement Character Assessment (Landcare, 2008) recommends the following measures to enhance local landscape character:

- linear planted boundaries and well-maintained hedgerows with mature hedgerow trees;
- retention of mature vegetation; and,
- native planting in local character.

The measures employed in the proposed scheme include:

At both sites:

- Minimise removal of existing vegetation;
- Retention and protection of hedgerows and trees during construction in accordance with BS5837:2012 (Trees in relation to design, demolition and construction);
- Wildflower and grass seeding to flood retention area and other disturbed areas to reduce visual impact and provide biodiversity;
- Reinstate sections of hedgerow where removed to allow construction activities; and,
- Planting hedgerow trees.

In addition at Turker Beck:

- Realignment of the footpath;

- Shrub planting to either side of footpath at entrance to field to provide screening, biodiversity and discourage pedestrian movement behind the houses on Turker Lane; and,
- Additional planting to hedgerows near site compound and south of Turker Beck.

These measures seek to address the impact of the scheme on landscape and visual receptors in line with the guidance within the HDC LDF.

6.4.5 Residual Impacts

Residual impacts are those that would remain after implementation of the above mitigation proposals. The residual effects have been considered in the future year following the establishment of the mitigation proposals.

Landscape elements

The proposed mitigation measures would not reduce the permanent **moderate adverse** effect on landform, as the shape of the landform is required for it to function for flood retention. However, the planting and seeding works would provide a long-term **minor beneficial** effect on vegetation and reduce the impact on landscape pattern to being minor adverse. Certain gaps in existing hedgerows would be filled and hedgerows and trees lost during construction would be replaced or substituted with appropriate native species.

Visual amenity

The level of visual impact resulting from the proposals at Turker and Sun Becks would continue to reduce as mitigation planting and seeding establishes and matures. The grassland would soften the presence of the extraction areas and the hedgerow and tree planting would mature to fill gaps and restore field boundaries. Fifteen years after construction the visual impact of the scheme would reduce to:

1 **major adverse** effect at:

VP5-Footpath to south of Turker Beck.

1 **moderate adverse** effect at:

VP6-Footpath on farm track to east of Turker Beck.

10 **minor adverse** visual effects at:

VP1-Houses on Turker Lane;
VP2-Houses on Thorntree Road;
VP3-Houses on Lewis Road;
VP7-Footpath from Turker Beck to Bullamoor;
VP8-Harrogate House;
VP9-Houses on Bullamoor Road;
VP10 -Houses on Scholla Lane;
VP15-Prospect House;
VP17-Houses on Hailstone Drive; and
VP18-Houses on Bankhead Road.

No significant effects would be experienced at the following 6 receptors:

VP4-Bullamoor Road;
VP11-Newsham Grange;
VP12-House on Banks Road;
VP13-Scholla Lane;
VP14-Potters Close; and,
VP16-Bank Close Farm.

Landscape character

The permanent changes to the landform at both sites would continue to conflict with local landscape character. However, the establishment of the wildflower grassland and tree and hedge planting would reduce the impact of the new landforms. The growth of tree and hedgerow planting would also serve to replace those lost during the construction phase and strengthen landscape vegetation and pattern, both of which would benefit landscape character. As a result, there would be **minor adverse** effects to the landscape character of both Types 5c and 4b, mainly due to the continuing presence of the altered landforms.

6.5 Land Use

6.5.1 Methods

We have assessed the potential impacts of the proposed scheme on existing and future use of land in the area. The assessment covered the use of private property and land used by the community. For the purposes of this assessment, we have considered properties and land adjacent to the construction area and within the footprint of the proposed scheme.

Existing private property, community land and agricultural land were identified through a desk study and site visits. These are identified on the Indicative Landscape Plan in Appendix 3.

The impacts on Public Rights of Way are considered in Section 6.1, and are not repeated here.

6.5.2 Baseline Information

Turker Beck and Sun Beck are generally culverted beneath the built up area of Northallerton. The open channels of Turker Beck and Sun Beck to the east of the town are situated in an area used for arable farming.

The soil adjacent to Turker Beck is Grade 2 and 3 (very good quality and good to moderate), according to the Agricultural Land Classification system. Grades 1, 2 and 3a are considered to be the 'best and most versatile' and therefore of national importance.

Some of the agricultural land in the study area is managed under the Environmental Stewardship Agreement as 'Entry Level'. Environmental Stewardship is an agri-environment scheme which provides funding to farmers and other land managers in England who deliver effective environmental management on their land. Its primary objectives are to:

- Conserve wildlife (biodiversity);
- Maintain and enhance landscape quality and character;
- Protect the historic environment and natural resources; and,
- Promote public access and understanding of the countryside.

Within the primary objectives, it also has the secondary objectives of:

- Genetic conservation; and,
- Flood management.

Bullamoor Park is a public open space comprising a grassed area, a children's play area and two areas of hardstanding.

6.5.3 Potential Impacts without Mitigation

6.5.3.1 Construction Impacts

As stated in Section 3.3.2, the temporary construction compounds, temporary haul routes and topsoil stockpile would temporarily prevent an area of arable land from being farmed. This impact would be temporary in nature, and very localised. The significance of this impact is therefore considered to be **minor adverse**.

During construction, public access to some parts of Bullamoor Park would be restricted, for reasons of safety and to provide space for our site compound and construction works. We do not expect to close the park to the public. The impact on users of the park would be temporary, lasting only for the duration of the construction period, and are considered to **minor adverse**.

6.5.3.2 Operational Impacts

The scheme would directly result in the loss of approximately 2.65ha of Grade 2 and 3 agricultural land. This constitutes 1.89Ha at Turker Beck and 0.76Ha Sun Beck. The access track at Turker Beck is existing, so land will not be affected as a result of this; however, the access track at Sun Beck is to be constructed and will affect agricultural land. These figures account for the access track at Sun Beck.

This impact is considered to be of minor magnitude, and therefore of **moderate adverse significance**.

There would be no impacts at Bullamoor Park during the operation of the scheme.

6.5.4 Mitigation

The land take by temporary construction works would be kept to a minimum.

Following construction, topsoil would be spread over the agricultural land, allowing it to be returned to agriculture. There would be a permanent loss of 2.65ha of agricultural land as a result of the excavation. Appropriate compensation would be agreed with the landowner.

6.5.5 Residual Impacts

The residual construction impacts would be of **minor adverse significance**. The residual operational impact on agricultural land would be **minor adverse**. There would be no permanent impacts on community land or private property.

6.6 Water Quality

6.6.1 Methods

Adverse impacts of the scheme on long-term water quality issues are unlikely. The proposals would not alter the chemistry of the watercourses. The release of stored water would be controlled to minimise suspended material and the potential for siltation.

Therefore, this assessment considers potential impacts during construction only.

6.6.2 Baseline

We have identified the Willow Beck Catchment, including Turker Beck, as a waterbody under the Water Framework Directive (WFD). It is a heavily modified waterbody with moderate ecological potential.

The groundwater beneath Northallerton and the surrounding area is identified as the SUNO Mercia Mudstone and Redcar Mudstone waterbody under the WFD. It is of good quality, both in terms of chemical quality and quantitative quality.

The area is designated as a Nitrate Vulnerable Zone (NVZ), meaning that the land drains to water bodies that are affected by nitrate pollution. Farmers within the NVZ must take action to help prevent such pollution, which may be linked to fertiliser use.

The area is not within a groundwater source protection zone.

The surface watercourses are considered to be of **medium sensitivity**, and the groundwater is of **low sensitivity**.

A Water Framework Directive Level 1 Hydromorphology Assessment has been completed for the project. The assessment found that direct alterations to the Willow Beck Catchment water body would occur in the Turker Beck Storage Area. These potential changes would consist of direct modifications associated with channel engineering, and consequential changes in flow and sediment transport.

The impacts of these modifications on the Willow Beck Catchment water body have been assessed and are not considered to represent significant changes to the hydromorphology of the water body from that existing at present due to the following reasons:

- The existing channel modifications mean many of the additional channel modifications proposed do not lead to significant changes from the existing situation;
- Adverse impacts on the hydromorphology of the Willow Beck Catchment water body are restricted to an increased potential for channel siltation caused by flow impoundment along 125m at Turker Beck (1% of the water body);
- The modifications to Sun Beck do not lead to any knock on impact on the Willow Beck Catchment water body, and culvert decommissioning/open channel design would be seen as a beneficial measure for hydromorphology; and,
- Mitigation Options were recommended for Detailed Design to reduce the impact of each option.

It is therefore considered that no further detailed hydromorphological assessment is necessary.

A Water Framework Directive Level 1 Assessment Report was carried out based on the findings of the Hydromorphology Assessment (see Appendix 8) and concluded that the scheme was very unlikely to cause deterioration in status of any WFD water body.

6.6.3 Potential Impacts during construction without Mitigation

If mitigation measures were not to be put in place, construction activities in or near water would have the potential to cause pollution from discharge of fuels, chemicals or disturbance of sediments. The impact on the quality of the water in the becks could be of **major magnitude**. The significance of the impact could be **moderate adverse**.

6.6.4 Mitigation

Our contractors would follow good environmental site practice, along with our Pollution Prevention Guidance (PPG), and in this way the risk to water quality (both surface water and groundwater) would be managed. For example, PPG 5 covers construction and maintenance works in, near or liable to affect surface waters and groundwaters.

6.6.5 Residual Impacts

Through good environmental site practice, we would cause **no significant adverse** residual impacts on the water environment.

6.7 Historic Environment

The Historic Environment is acknowledged to comprise:

"All aspects of the environment resulting from the interaction between people and places through time, including all surviving physical remains of past human activity, whether visible, buried or submerged, and landscaped and planted or managed flora" (DCLG 2012, 52).

Those elements of the historic environment which are considered to hold significance are called heritage assets. This chapter provides an assessment of potential impacts of the proposed works on heritage assets, comprising:

- Archaeological remains;
- Historic buildings; and,
- The historic landscape.

The purpose of this chapter is to assess the significance of the heritage assets identified within the study areas, assess the potential impacts of the scheme on these assets, and to make recommendations for further assessment or mitigation measures where appropriate.

6.7.1 Methods

Our outline methodology for the impact assessment is contained within Chapter 5 of the Environmental Report. A description of the methodology we have employed for the heritage assessment is provided below.

Study areas were defined as a 200m buffer around the footprint of each of the three flood alleviation works. The heritage assessment for these areas was based on the results of two desk based surveys:

- An Archaeological Desk-Based Study of the Bullamoor Park site (Jacobs 2012) (presented as Appendix 6); and,
- An Archaeological Desk-Based Assessment of the Northallerton Flood Alleviation Scheme (Sun Beck and Turker Beck) undertaken by Archaeological Services Durham University (2012) (presented as Appendix 7).

Two assets located outside the study areas were included in the baseline (Assets 31 and 32) due to their contribution to the understanding of the archaeological potential of the Sun Beck study area.

Please refer to these appendices for detailed baseline information and a full list of the sources consulted.

For this assessment, we employed the methodology for the assessment of heritage value, magnitude and significance of impact provided in Volume 11, Section 3, Part 2 of the Design Manual for Roads and Bridges (DMRB 208/07) as this provides a robust methodology for the assessment and impacts on heritage assets.

An assessment of the value of each heritage asset was made on a six-point scale of Very High, High, Medium, Low, Negligible and Unknown, using professional judgement guided by the criteria provided by DMRB Volume 11, Section 3 Part 2 (HA 208/07), as detailed in Tables 6.5 – 6.7 below.

Table 6.5 - Criteria to Assess the Value of Archaeological Remains

Value	Criteria
Very High	World Heritage Sites (including nominated sites). Assets of acknowledged international importance. Assets that can contribute significantly to acknowledged international research objectives.
High	Scheduled Monuments (including proposed sites). Undesignated assets of schedulable quality and importance. Assets that can contribute significantly to acknowledged national research objectives.
Medium	Designated or undesignated assets that contribute to regional research objectives.
Low	Designated and undesignated assets of local importance. Assets compromised by poor preservation and/or poor survival of contextual associations. Assets of limited value, but with potential to contribute to local research objectives.
Negligible	Assets with very little or no surviving archaeological interest.

Table 6.6 - Criteria to Assess the Value of Historic Buildings

Value	Criteria

Value	Criteria
Very High	• Structures inscribed as of universal importance as World Heritage Sites. • Other buildings of recognised international importance.
High	• Scheduled Monuments with standing remains. • Grade I and II* Listed Buildings. • Other listed buildings that can be shown to have exceptional qualities in their fabric or historical associations not adequately reflected in the listing grade. • Conservation areas containing very important buildings. • Undesignated structures of clear national importance.
Medium	• Grade II Listed Buildings. • Historic (unlisted) buildings that can be shown to have exceptional qualities in their fabric or historical associations. • Conservation areas containing buildings that contribute significantly to its historic character. • Historic Townscape or built-up areas with important historic integrity in their buildings, or built settings (e.g. including street furniture and other structures).
Low	• 'Locally listed' buildings. • Historic (unlisted) buildings of modest quality in their fabric or historical association. • Historic Townscape or built-up areas of limited historic integrity in their buildings, or built settings (e.g. including street furniture and other structures).
Negligible	• Buildings of no architectural or historical note; buildings of an intrusive character.
Unknown	• Buildings with some hidden (i.e. inaccessible) potential for historic significance.

Table 6.7 - Criteria to Assess the Value of the Historic Landscape

Value	Criteria
Very High	• World Heritage Sites inscribed for their historic landscape qualities. • Historic landscapes of international value, whether designated or not. • Extremely well preserved historic landscapes with exceptional coherence, time-depth, or other critical factor(s).
High	• Designated historic landscapes of outstanding interest. • Undesignated landscapes of outstanding interest. • Undesignated landscapes of high quality and importance, and of demonstrable national value. • Well preserved historic landscapes, exhibiting considerable coherence, time-depth or other critical factor(s).
Medium	• Designated special historic landscapes. • Undesignated historic landscapes that would justify special historic landscape designation, landscapes of regional value. • Averagely well-preserved historic landscapes with reasonable coherence, time-depth or other critical factor(s).
Low	• Robust undesignated historic landscapes. • Historic landscapes with importance to local interest groups. • Historic landscapes whose value is limited by poor preservation and/or poor survival of contextual associations.
Negligible	• Landscapes with little or no significant historical interest.
Unknown	• World Heritage Sites inscribed for their historic landscape qualities. • Historic landscapes of international value, whether designated or not. • Extremely well preserved historic landscapes with exceptional coherence, time-depth, or other critical factor(s).

The magnitude of impact is the degree of change that would be experienced by an asset and its setting if the scheme was completed, as compared with a 'do nothing' situation. Magnitude of impact is assessed without reference to the value of the receptor, and may include physical impacts upon the asset, or impacts upon setting or amenity value. Assessment of magnitude of impact was assessed using professional judgement guided by the criteria for the assessment of the magnitude of impact provided in DMRB, as set out in Tables 6.8, 6.9 and 6.10 below.

Table 6.8 - Criteria to Assess the Magnitude of Impact on Archaeological Remains

Magnitude	Criteria
Major	• Change to most or all key archaeological materials, such that the resource is totally altered. • Comprehensive changes to setting.
Moderate	• Changes to many key archaeological materials, such that the resource is clearly modified. • Considerable changes to setting that affect the character of the asset.
Minor	• Changes to key archaeological materials, such that the asset is slightly altered. • Slight changes to setting.
Negligible	• Very minor changes to archaeological materials, or setting.
No Change	• No change.

Table 6.9 - Criteria to Assess Magnitude of Impact on Historic Buildings

Magnitude	Criteria
Major	• Change to key historic building elements, such that the resource is totally altered. • Comprehensive changes to the setting.
Moderate	• Change to many key historic building elements, such that the resource is significantly modified. • Changes to the setting of an historic building, such that it is significantly modified.
Minor	• Change to key historic building elements, such that the asset is slightly different. • Change to the setting of an historic building, such that it is noticeably changed.
Negligible	• Slight changes to historic building elements or setting that hardly affect it.
No Change	• No change to fabric or setting.

Table 6.10 - Criteria to Assess Magnitude of Impact on the Historic Landscape

Magnitude	Criteria
Major	• Change to most or all key historic landscape elements, parcels or components; extreme visual effects; gross change of noise or change to sound quality; fundamental changes to use or access; resulting in total change to historic landscape character unit.
Moderate	• Changes to many key historic landscape elements, parcels or components, visual change to many key aspects of the historic landscape, noticeable differences in noise or sound quality, considerable changes to use or access; resulting in moderate changes to historic landscape character.

Magnitude	Criteria
Minor	• Changes to few key historic landscape elements, parcels or components, slight visual changes to few key aspects of historic landscape, limited changes to noise levels or sound quality; slight changes to use or access: resulting in limited changes to historic landscape character.
Negligible	• Very minor changes to key historic landscape elements, parcels or components, virtually unchanged visual effects, very slight changes in noise levels or sound quality; very slight changes to use or access; resulting in a very small change to historic landscape character.
No Change	• No change to elements, parcels or components; no visual or audible changes; no changes arising from amenity or community factors.

For all subtopics, the significance of effect is determined as a combination of the value of the asset and the magnitude of impact. This is achieved using professional judgement guided by the matrix illustrated below in Table 6.11. Five levels of significance of impact were defined which apply equally to Adverse and Beneficial impacts.

Table 6.11 - Matrix to Assess the Significance of Impacts on Cultural Heritage Assets

	Magnitude of Impact				
Value	**No Change**	**Negligible**	**Minor**	**Moderate**	**Major**
Very High	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large
High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
Medium	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
Negligible	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight

6.7.2 Baseline Information

A total of 35 heritage assets were identified within the three study areas, comprising 32 archaeological and historic building assets, and three historic landscape character types. No designated assets were identified within the study areas. These assets are shown on Figures 2 and 3, and listed in Table 6.12 below, along with an assessment of their value. A gazetteer of assets is provided in Appendix 5.

Table 6.12 – Baseline cultural heritage assets: archaeological remains and historic buildings

Asset Number	Asset Name	Designation	Value	Study Area
1	Building (site of)	None	Negligible	Turker Beck
2	Building (site of)	None	Low	Turker Beck
3	Building (site of)	None	Negligible	Turker Beck
4	Building (site of)	None	Negligible	Sun Beck
5	Building (site of)	None	Negligible	Sun Beck
6	Building (site of)	None	Low	Sun Beck
7	Prospect Cottages	None	Low	Sun Beck
8	Building (site of)	None	Negligible	Sun Beck

Asset Number	Asset Name	Designation	Value	Study Area
9	Rifle range (site of)	None	Negligible	Sun Beck
10	Building (site of)	None	Negligible	Bullamoor Park
11	Building (site of)	None	Negligible	Bullamoor Park
12	Building (site of)	None	Negligible	Bullamoor Park
13	Building (site of)	None	Negligible	Bullamoor Park
14	Building (site of)	None	Negligible	Bullamoor Park
15	Building (site of)	None	Negligible	Bullamoor Park
16	Carmelite Friary (site of)	None	Medium	Bullamoor Park
17	Northallerton Union Workhouse	None	Low	Bullamoor Park
18	Friarage Hospital	None	Low	Bullamoor Park
19	Horse Pond	None	Negligible	Bullamoor Park
20	Building (site of)	None	Low	Bullamoor Park
21	Victorian houses, Bullamoor Road	None	Low	Bullamoor Park
22	Building (site of)	None	Negligible	Bullamoor Park
23	Building (site of)	None	Low	Bullamoor Park
24	Former field boundary	None	Negligible	Turker Beck
25	Ridge and furrow area 1	None	Negligible	Turker Beck
26	Ridge and furrow area 2	None	Negligible	Turker Beck
27	Ridge and furrow area 3	None	Negligible	Sun Beck
28	Geophysical anomalies	None	Low	Sun Beck
29	Ridge and furrow area 4	None	Negligible	Sun Beck
30	Ridge and furrow area 5	None	Negligible	Sun Beck
31	Field system	None	Medium	Sun Beck
32	Possible ring ditch	None	Medium	Sun Beck

6.7.3 Archaeological remains

Asset 16, located immediately to the west of the Bullamoor Park study area, is the site of the Carmelite Friary established around the mid-14th century, following grants of land from a London merchant and a licence from Edward III in 1356. The site of the friary extended from the current hospital to the High Street and between Bullamoor Lane and Turker Beck Lane (Riordan 1990, 11). Following the dissolution of the monasteries between 1536 and 1539, the Friary was demolished and the land returned to agriculture. By the mid-19th century no evidence of the friary was said to survive, save reused stonework in a wall on Brompton Road (Riordan 1990, 11). Gravel working to the north of the friarage site in the 19th century is said to have revealed evidence including substantial amounts of human bone and a large stone wall (Riordan 1990, 12). Today, the site of the friarage has been extensively developed, both with suburban buildings and the Friarage Hospital (Asset 18). Archaeological investigations to the west of Brompton Road identified the east side of the cloister, a possible domestic building and a number of burials; however, there has been no archaeological investigation within the proposed development site. The geographical extents of the former friary are unclear from currently available information and it is possible that the asset extended into the area of Bullamoor Park. The Carmelite Friary (Asset 16) has been assessed to be of **Medium importance** due to its historic interest and archaeological potential.

A possible ring ditch and relict field system have been identified by geophysical survey to the south of the Sun Beck study area (Asset 31 and 32). The field system was defined by ditched boundaries to small enclosed fields, one of which contained the possible ring ditch and had a clavicular entrance on its northern side. The value of these assets has been assessed to be **Medium**.

Geophysical survey also identified a series of anomalies within the Sun Beck study area comprising a series of extremely weak, arctuate positive magnetic anomalies (Asset 28) which may represent scant remains of former ditches or gullies. The value of this asset has been assessed to be **Low**.

Assets 2, 5, 6, 20 and 23 are the sites of buildings identified from the historic mapping. Of these, assets 2, 5 and 6 are shown as stand-alone buildings within fields and may represent field barns, whilst assets 20 and 23 are shown to have been located along the roadside on the eastern edge of Northallerton. These assets are all now demolished. Due to the potential for associated archaeological remains to survive, the value of these assets has been assessed to be **Low**.

Asset 9 is located within the Sun Beck study area, and is the site of a rifle range shown on historic maps from the late 19th century (refer to Figure 5 of the Durham University desk-based assessment, presented as Appendix 7). The site is now in agricultural use and no surface trace of its former function is visible. Asset 9 has been assessed to be of **Negligible** value.

Asset 19 is located within the Bullamoor Park study area. This asset comprises the site of the horse pond shown on historic maps from the late 18th century (refer to Figure 3 of the Bullamoor Park desk-based assessment, presented as Appendix 6) which was used to water and wash stage coach horses. The pond was removed by construction of the workhouse (Asset 17) in the mid-19th century. The asset has therefore been assessed to be of **Negligible** value.

Geophysical survey carried out around the Turker Beck and Sun Beck study areas has identified archaeological evidence including ploughed out Ridge and Furrow (Assets 25, 26, 27, 29 and 30) and a former field boundary (Asset 24). In consideration of their poor state of preservation these assets have been assessed to be of **Negligible significance**.

The most numerous asset identified within the three study areas are the sites of buildings shown on historic mapping from the mid-19th to early 20th centuries, comprising eleven assets in total (Assets 1, 3, 4, 8, 10, 11, 12, 13, 14, 15 and 22). These are all depicted as small, stand-alone structures located within fields, and may represent field barns. All have now been demolished and redeveloped with modern housing. The value of these assets has been assessed to be **Negligible**.

6.7.3.1 Potential for unknown archaeological remains

Whilst no evidence for prehistoric and Roman activity has been identified within the three study areas, evidence is known from the surrounding area, including a field system and ring ditch identified *c.*0.12km to the southeast of the Turker Beck study area (Assets 31 and 32). The potential for archaeological evidence dating from these periods to be present within the study areas has been assessed to be **Moderate**.

Geophysical surveys undertaken in the vicinity of the proposed construction sites at Turker Beck and Sun Beck have identified evidence of medieval and post-medieval agriculture, including traces of ridge and furrow ploughing and ditched trackways (Assets 24-31). More information on these sites is provided in Appendix 7. The potential for evidence of medieval and post-medieval agriculture to be present within the proposed construction sites at Turker and Sun Becks has therefore been assessed to be **High**.

While ground levelling works and re-grading of the banks of Turker Beck may have removed or truncated archaeological remains within the Bullamoor Park study area, the potential for archaeological remains associated with the Carmelite Friary to extend into this area (Asset 16) has been assessed to be **Moderate**.

6.7.3.2 Historic Buildings

Prospect Cottages, located within the Sun Beck study area, comprises a pair of brick-built, two-storey cottages dating from the early 20th century (Asset 7). The building has been subject to extension and alteration, and is now surrounded by modern residential development to the west and large agricultural fields to the east. In consideration of their limited historic and architectural interest, Prospect Cottages have been assessed to be of **Negligible** value.

The remaining three historic building assets are located within the Bullamoor Park study area.

The Northallerton Union Workhouse (Asset 17) was established in 1857 to replace an earlier workhouse located within the former 15th century Guild Hall on High Street. The workhouse comprises a single-storey entrance block to the west, with central gabled entrance and protecting outer blocks with hipped roofs. To the east of this is the two-storey brick block which held the male and female wings and, to the east again, is another two-storey block which held the infirmary. The workhouse is now incorporated into the Friarage Hospital (Asset 18) and has been assessed to be of **Low** value.

The Friarage Hospital (Asset 18) was established in 1939 as an emergency hospital, to cater for anticipated civilian casualties from bombing in Teeside. The hospital was established at the workhouse (Asset 17) with the construction of hutted accommodation north of the existing buildings (ASUD, 2007, 8), and expanded throughout the war. It was adopted as an RAF hospital in 1943 and was taken into the National Health Service in 1948. Whilst the hospital has been considerably extended and improved over the last two decades, a number of structures dating from the establishment of the hospital in World War 2 survive today, including a water tower to the west of the site and a single-storey E-plan building located on the east side of the hospital. The Friarage Hospital has been assessed to be of **Low** value due to its limited architectural and historic interest.

Asset 21 comprises a pair of late Victorian houses, located to the south of Bullamoor Road. The houses are constructed of red brick with painted stone dressings, with bay windows to the outer bays, and paired doorways towards the centre of the elevation. The houses are well-maintained and, despite some loss of original glazing, retain much of their historic character. Asset 21 has therefore been assessed to be of **Low** value.

6.7.3.3 Historic Landscape

A total of three historic landscape types have been identified within the study areas. These are shown on Figure 3 and listed in Table 6.13.

Table 6.13 – Baseline cultural heritage assets: historic landscape

HLC Type Number	HLC Type Name	Period	Value	Study Area

HLC Type Number	HLC Type Name	Period	Value	Study Area
1	Planned residential estate	Modern	Negligible	Turker Beck, Sun Beck and Bullamoor Park
2	Modern improved fields	20th century	Negligible	Turker Beck & Sun Beck
3	Strip fields	Medieval	Low	Sun Beck

The Planned Residential Estate type (HLC Type 1) dominates the eastern edge of Northallerton, and results from the development of suburban and council housing in the second half of the 20th century. To the east of the Turker Beck and Sun Beck study areas is an area of Modern Improved Fields (HLC Type 2), characterised by large, irregularly-shaped fields, created by the removal of field boundaries to create larger units in the 20th century. Both HLC Type 1 and HLC Type 2 have been assessed to be of **Negligible** value.

To the north of the Sun Beck study area is an area of strip fields (HLC Type 3) defined by characteristic S-curved hedgerows. Originating in the medieval period, these fields are likely to have formed part of a more extensive field system which has been eroded by suburban expansion of Northallerton and amalgamation of smaller fields to create larger units to accommodate modern agricultural practices. This type has been assessed to be of **Low** value.

6.7.4 Potential Impacts without Mitigation

6.7.4.1 Construction Impacts

Construction works at Turker Beck and Sun Beck include the excavation of areas for the storage of floodwater. These areas would have an outlet structure controlling flow out of the storage area.

Construction of the storage areas would require the creation of site compounds, haul roads and stockpile areas. Two methods are proposed to be used for construction of the haul roads: stripping and storage of the topsoil to allow vehicles to run on the subsoil; and excavation to 300m in depth and installation of 150mm depth of aggregate or crushed brick. The construction compounds would also require excavation in advance of their establishment.

Construction of the storage area at Turker Beck would physically impact on Ridge and Furrow Area 1 (Asset 25), resulting in the removal of any archaeological evidence within the scheme footprint. This constitutes c.5% of the total area surveyed; however the geographical extent of the ridge and furrow is not currently known. The geophysical survey identified evidence of the ridge and furrow to be located predominantly to the north of the survey area, with very limited evidence identified within the area of the scheme footprint. The magnitude of impact on Asset 25 has therefore been assessed to be Negligible and the significance of impact has been assessed to be **Neutral**.

Construction of the haul road to provide access to the Sun Beck work area would have a physical impact on Asset 5, the site of a building shown on historic mapping from the late 19th century. The topsoil along the haul road will be removed to allow the construction plant to run on the subsoil. This has the potential to result in damage and compression of any archaeological remains associated with this asset. The magnitude of this impact has

been assessed to be Major adverse and the significance of impact has been assessed to be **Moderate**.

While no impacts are predicted on the remaining known heritage assets within the Turker Beck and Sun Beck study areas, there is some potential for the presence of unknown archaeological remains within the study area on which the proposed development may have an impact. The results of the desk-based survey indicate that the archaeological remains are likely to comprise medieval and Post Medieval archaeological remains of Negligible to Low importance. However in the wider study area more important archaeological remains have been identified, for example Asset 31, a possible ring ditch. Taking the potential for such sites to be present, the significance of the impact on unknown archaeological remains that may be present has been assessed to be **Moderate**.

Replacement of the headwalls and trash screens in Bullamoor Park would require the demolition of the existing structures, excavation of a level foundation for the new structure, and construction of the new concrete headwalls. The construction compound within the park will be established on the existing hard standing.

In consideration of the previous grading of the banks to the beck and construction of the existing headwalls and culverts, it is considered highly unlikely that the replacement of the headwalls and trash screens would impact on any *in situ* archaeological remains.

No impacts on historic buildings or their settings are predicted to result from the works within Bullamoor Park.

Construction of the proposed flood alleviation works would not result in the loss of any historic landscape elements or detract from legibility of the historic landscape character types within the study areas. No impact is therefore predicted on the Historic Landscape for all three study areas.

6.7.4.2 Operational Impacts

There would be **no impact** on Archaeological Remains, Historic Buildings or the Historic Landscape as a result of operation of the flood alleviation works.

6.7.5 Mitigation & Residual Impacts

In a letter of 02/05/12 (Reference 2110 LH CNY11287) Lucie Hawkins, the North Yorkshire Development Management Archaeologist, stated that archaeological evaluation would be required prior to the determination of the planning application.

The following measures are therefore proposed to evaluate the potential for unknown archaeological remains:

- A geophysical survey of the footprint of the proposed development within the Turker and Sun Beck study areas to test for the presence or absence, character and extent of archaeological remains;
- A geophysical survey of haul/access roads and construction compounds in the Turker Beck and Sun Beck study areas to test for the presence or absence, character and extent of archaeological remains. This will include Asset 5, the site of a building identified from historic mapping; and,

- Evaluation by trial trenching based on the results of the proposed geophysical survey, to establish the date, character, quality and state of preservation of any archaeological remains identified.

The evaluation works will be undertaken during the determination period for the planning application and the results provided to the North Yorkshire Development Management Archaeologist.

The nature scope and scale of mitigation required will be based on the results of evaluation and agreed with the North Yorkshire Development Management Archaeologist. Mitigation measures may include some or all of following:

- No further action;
- Archaeological excavation; or
- Archaeological monitoring during construction, e.g. strip, map and sample, or an archaeological watching brief.

The results of the evaluation will also identify the need of further works at Asset 5 and Asset 25. However based on what is currently known on these sites it is highly likely that the mitigation measures described above would effectively mitigate any impacts on these remains. The residual impact has therefore been assessed to be **Neutral**.

The archaeological potential of the Turker Beck and Sun Beck flood alleviation areas has been assessed to be low for prehistoric and Roman activity, and high for evidence of medieval and post-medieval agriculture. The mitigation measures described above would effectively mitigate any impacts on such remains within the scheme footprint. The residual impact has therefore been assessed to be **Neutral**.

The works proposed within Bullamoor Park are located within areas which have been previously disturbed by the construction of the existing headwalls. It is unlikely that the works will expose *in situ* archaeological remains. No mitigation works are therefore proposed for the replacement of the headwalls and trash screens within Bullamoor Park.

6.8 Traffic and Transport

6.8.1 Methods

A desk study and site visits have been used to develop our understanding of the local transport network that could potentially be affected by the construction of the Northallerton FAS.

We are working with our Early Contractor Involvement (ECI) contractor to understand how our design would be constructed, and this includes how materials and staff would travel to and from the construction site, and the routes that we believe are suitable for them to use.

6.8.2 Baseline Information

Several major strategic roads and residential roads in Northallerton were affected by the flooding event of 2000 and are at a continual risk from future flooding.

Close to our proposed construction works, Bullamoor Road leads out of Northalleton to the east; passing approximately 200m south of Turker Beck as it does so. At the rural-urban fringe, Scholla Lane forks off to the south-east from Bullamoor Road. Scholla Lane

passes approximately 200m north of the area of proposed works at Sun Beck. Bullamoor Road and Scholla Lane are both relatively narrow, making overtaking difficult.

The roads in the study area are considered to be of **medium sensitivity**.

6.8.3 Potential Impacts without Mitigation

6.8.3.1 Construction Impacts

The most significant impacts on traffic and transport would be associated with the lorries taking excavated material from Turker Beck and Sun Beck off site for re-use or disposal. We need to excavate 14,500m^3 from Turker Beck and 1,400m^3 from Sun Beck. Each lorry would come to site empty, and leave with a load of 8m^3. We would expect to have 25 return lorry movements to Turker Beck each day (50 one-way movements), and the same to Sun Beck. There is a requirement to provide 50m^3 of fill to Sun Beck and 30m^3 of fill to Turker Beck.

At this rate, we could remove all the material from Turker Beck in 72 days, and all the material from Sun Beck in seven working days. If our programme allowed for excavation at both Turker Beck and Sun Beck at the same time, there could potentially be 50 return lorry movements (100 one-way movements) to our sites for a peak period of activity of 8 days, then lowering to 25 return lorry movements (50 one-way movements) for the remaining time, until both sites were cleared of excavated material.

We would expect to take the material away from site by road to the east of Northallerton. Without mitigation measures in place, traffic movements could cause congestion on the narrow lanes in that rural area.

There would also be lorries bringing machinery, tools, materials, site cabins, etc. to site at the start of the construction period, and taking it away at the end. On a daily basis, we expect approximately 15 staff to travel to our construction site, probably by car or van.

Without mitigation in place, the impacts of our vehicle movements on local traffic and transport could be of **moderate magnitude**.

6.8.3.2 Operational Impacts

The maintenance of the becks would be of a similar scale to the current maintenance works, but with a more formalised maintenance schedule. Therefore, the scheme would not result in any operational impacts on traffic and transport.

6.8.3.3 Mitigation

We would agree our lorry routes with HDC before the construction started. We expect that the agreement will include measures such as avoiding lorry movements during rush hours, installing signs to warn other traffic, and possibly providing passing places, if required. We intend to use routes to the east of Northallerton, thereby avoiding causing any disruption to traffic in the town centre.

6.8.3.4 Residual Impacts

With mitigation measures in place, the impacts on traffic and transport would be **minor adverse** during the construction period. The impacts would be temporary in nature, and would affect only the roads leading from the sites away from Northallerton to the east.

There would be no residual impacts during operation.

6.9 Soils and Geology

6.9.1 Methods

Data sources include a geotechnical desk study carried out in January 2010 for this project, Defra's MAGIC website, the Environment Agency's website, and the British Geological Survey's geological mapping.

An intrusive ground investigation was undertaken within part of the site mostly along the alignment of a previous embankment option. Further ground investigation will be carried out prior to re-grading, particularly to characterise the material for re-use or off-site disposal. A separate Materials Management Plan will be prepared following further investigation.

6.9.2 Baseline Information

Based on the geological map of the region (sheet 42, scale 1:50 000), the site is shown to be underlain by Glacial Till with Lacustrine Deposits identified on either side of Turker Beck and overlying undivided Mercia Mudstone of the Triassic period.

The Environment Agency's mapping shows that the bedrock in the area is classified as a Secondary B aquifer, meaning that the bedrock is of low permeability, but may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.

There are no geological Sites of Special Scientific Interest within the study area, and the site is not in an area affected by coal mining.

There are no apparent sources of contamination that could potentially affect the site.

6.9.3 Potential Impacts without Mitigation

6.9.3.1 Construction Impacts

Impacts on soils and geology would be very localised, and would be limited to the excavation of material for the storage area and the creation of access tracks. There would be no impacts on the underlying bedrock or on the aquifer. During construction, there would be **no significant effect**.

6.9.3.2 Operational Impacts

The scheme would not result in any operational impacts on Soils and Geology.

6.9.4 Mitigation

Further ground investigation will be undertaken for the area that would be disturbed during the excavation works, particularly to characterise the material for re-use or off-site disposal and to classify any waste material that needs to be taken off-site (initial waste characterisation).

As noted in the land use section of this report (Section xx), excavated topsoil would be spread on farmland where possible. Any excess would be removed from site for re-use rather than disposal.

6.9.5 Residual Impacts

With mitigation measures in place, there would be **no significant impacts** on soils and geology.

7 Cumulative Effects

The purpose of the flood alleviation scheme is to provide beneficial impacts to residents and businesses in Northallerton, through increased protection from flooding.

During the construction period, residents closest to the construction works would experience a number of the different impacts identified in Section 6 of this environmental report, whilst residents elsewhere in the town would experience no impacts as a result of construction.

The cumulative effects that would be felt by residents closest to the construction works would relate to construction traffic, noise, dust and landscape and visual amenity. In combination, the effects on the residents with properties backing on to the worksites at Turker Beck and Sun Beck would be moderate adverse. We would minimise these impacts through good site practice, and through liaison with the residents.

There would be no permanent adverse effects as a result of the scheme.

8 Conclusions

8.1 Summary of Key Impacts

8.1.1 During Construction

Without mitigation, minor adverse effects would occur to the following environmental receptors:

- Flora and Fauna;
- Land Use.

Moderate adverse impacts would occur to Human Beings, Air Quality, Water Quality, the Historic Environment and Traffic and Transport, if mitigation were not put in place.

The assessment of Landscape and Visual Amenity has identified the potential for major adverse visual effects on nine identified viewpoints. In addition, there would be moderate adverse effects on landscape elements, visual amenity and landscape character. There would also be minor adverse effects on visual amenity and landscape character.

Following mitigation, the construction impacts on Human Beings and Traffic and Transport would be reduced to minor adverse; the impacts on the Historic Environment would be reduced to neutral; and the impacts on Water Quality would be reduced to not significant.

8.1.2 During Operation

During the operational phase, without mitigation in place, there would be a locally significant, moderate adverse effect on Land Use.

The assessment of Landscape and Visual Amenity has identified the potential for major adverse visual effects on visual amenity at two identified viewpoints. In addition, there would be moderate adverse effects on landscape elements, visual amenity and landscape character. There would also be minor adverse effects on visual amenity and landscape character.

A major beneficial operational impact on human beings would arise as a result of the proposed flood defences because the preferred option would protect 259 residential properties, 32 commercial properties and a hospital from a flood with a 0.5% chance of happening in any one year.

8.2 Mitigation

Mitigation measures have been identified to manage the potentially adverse impacts during both construction and operation phases of the scheme. These measures are summarised below:

Mitigation of Construction Impacts:

- We plan to divert the footpath at Turker Beck around the construction works, ensuring footpath users continue to gain access to the land further to the east.

- We will agree hours of work and traffic management arrangements with Hambleton District Council, prior to construction starting.
- The landowners who would be directly affected by the proposed scheme have been consulted throughout the development of the scheme, and therefore are aware of the nature of the proposed works. We are continuing to liaise with the landowners to mitigate the impacts that could potentially arise.
- Our contractors would follow good environmental site practice, audited by an environmental Clerk of Works (ECW).
- We will adhere to our Pollution Prevention Guidelines and storage away from watercourses to minimise risk of pollution incident to water (in particular PPG 5).
- We will minimise the removal of existing vegetation and we will reinstate those sections of hedgerow that are removed to allow for construction activities. We will also plant trees along Turker Beck and Sun Beck and within Bullamore Park.
- We will retain and protect identified hedgerows and trees in accordance with BS5837:2012 (Trees in relation to design, demolition and construction), for example tree protection fencing around the mature Ash tree near the works area at Turker Beck.
- We will sow grass and wildflower seed within the flood retention area and other disturbed areas to reduce visual impact and provide biodiversity.
- Topsoil to be spread across adjacent agricultural land, allowing it to be returned to agriculture in addition to appropriate compensation for the landowner for the permanent loss of agricultural land associated with the scheme.
- We will undertake a geophysical survey of the footprint of the proposed development within the Turker and Sun Beck study areas to test for the presence or absence, character and extent of archaeological remains. We will also carry out a geophysical survey of haul/access roads and construction compounds to test for the presence or absence, character and extent of archaeological remains. This will include Asset 5, the site of a building identified from historic mapping.
- We will, if appropriate, carry out evaluation by trial trenching based on the results of the proposed geophysical survey, to establish the date, character, quality and state of preservation of any archaeological remains identified; and, mitigate the impacts to any archaeological remains identified through preservation where possible, or an agreed programme of investigation and recording.
- We will undertake further ground investigation in the area that requires ground investigation to characterise the material for re-use or off-site disposal.

Mitigation of Operational Impacts

- Reinstatement of the footpath at Turker Beck along a slightly altered route through the flood storage area.

8.3 Residual Impacts

With the proposed mitigation measures in place, the impacts of the proposed works during construction and operation may be summarised as follows:

Environmental Receptor	Residual Impacts During Construction	Residual Impacts During Operation
Human Beings	Negligible / Temporary Minor Adverse	Major beneficial impact
Flora and Fauna	Minor adverse	No significant effect (minor beneficial impact to be achieved through enhancement)

Air Quality	Moderate adverse	No Significant effect
Water Quality	No significant effect	No significant effect
Land Use	Minor adverse	Minor adverse
Traffic and Transport	Minor adverse	No significant effect
Landscape & Visual Amenity	Minor / Moderate / Major adverse (dependent on receptor)	Minor Beneficial (to be achieved partially through enhancement), not significant and Minor / Moderate / Major adverse (dependent on receptor)
Historic Environment	Neutral	No significant effect
Soils and Geology	No significant effect	No significant effect

8.4 Use of Environmental Action Plan

The Environmental Action Plan (EAP) in Appendix 1 of this Environmental Report is to be included in the contract information to ensure that the project is implemented in line with the recommendations made elsewhere in the Environmental Report, to minimise adverse impacts and maximise beneficial impacts.

Glossary of terms

Environmental Impact Assessment	A process and technique for assessing the potentially significant environmental effects of a project.
Left Bank	The bank to the left hand side of a watercourse, when viewed facing in the direction of flow
Right Bank	The bank on the right hand side of a watercourse, when viewed facing in the direction of flow

List of abbreviations

AMS	Agency Management System
AOD	Above Ordnance Datum
ASUD	Archaeological Services University of Durham
BAP	Biodiversity Action Plan
CFMP	Catchment Flood Management Plan
DMRB	Design Manual for Roads and Bridges
EAP	Environmental Action Plan
ECI	Early Contractor Involvement
ECW	Environmental Clerk of Works
EIA	Environmental Impact Assessment
FAS	Flood Alleviation Scheme
GEP	Good Ecological Potential
GLVIA	Guidelines for Landscape and Visual Impact Assessment
HDC	Hambleton District Council
HLC	Historic Landscape Character
IEEM	Institute of Ecology and Environmental Management
ILP	Indicative Landscape Plan
LDF	Local Development Framework
LVIA	Landscape and Visual Impact Assessment
NCA	National Character Area
NEAS	National Environmental Assessment Service
NEYEDC	North and East Yorkshire Ecological Data Centre
NYCC	North Yorkshire County Council
NVZ	Nitrate Vulnerable Zone
OS	Ordnance Survey
PPG	Planning Policy Guidance
SR	Scoping Report
WFD	Water Framework Directive

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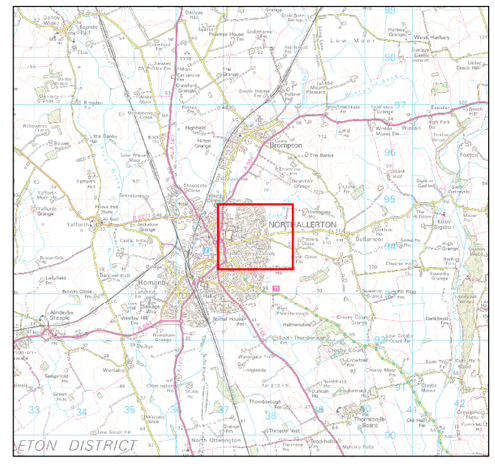
Figures

FIGURE 1

Legend

- Indicative Area of Works
- Proposed Site Compounds
- Ash Tree with Bat Roosting Potential
- Public Right of Way
- Open Channel
- Culverted Channel



Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	MAY 12	Initial Issue	AD	SW	SW	AP

Environment Agency

Project: NORTHALLERTON FAS

Drawing Title: NORTHALLERTON SITE LOCATION PLAN

Drawing Status:

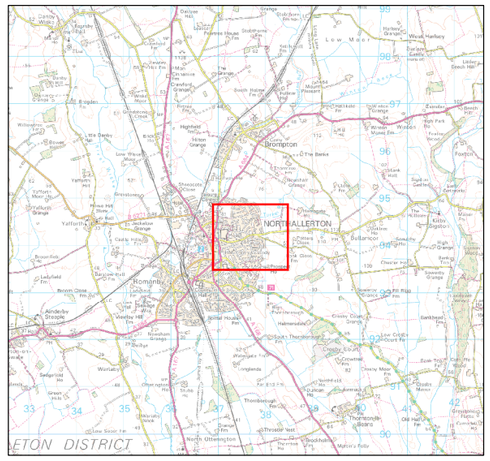
Scale @ A3	1:5,000	DO NOT SCALE
Jacobs No.	B1756400	
Client No.		

Drawing No.: B1756400_E_01

FIGURE 2

Legend

- 200m Study Area
- Location of Headwalls Proposed for Replacement
- Development Footprint
- Undesignated Cultural Heritage Asset
- Open Channel
- Culverted Channel



Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	MAY 12	Initial Issue	AD	SH	SW	AP

Environment Agency

Project: NORTHALLERTON FAS

Drawing Title: CULTURAL HERITAGE ASSETS

Drawing Status:

Scale @ A3	1:5,000	DO NOT SCALE
Jacobs No.	B1756400	
Client No.		

Drawing No. B1756400_CHE_02

FIGURE 3

BULLAMOOR PARK STUDY AREA

TURKER BECK STUDY AREA

SUN BECK STUDY AREA

NORTHALLERTON CP

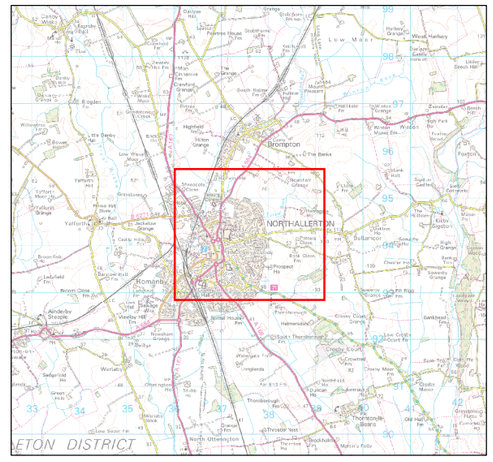
NORTHALLERTON

Legend

- 200m Study Area
- Location of Headwalls Proposed for Replacement
- Development Footprint

Historic Landscape Character Types

- Modern Improved Fields
- Planned Estate
- Strip Fields



Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	MAY 12	Initial Issue	AD	SH	SW	AP

Environment Agency

Project: NORTHALLERTON FAS

Drawing Title: HISTORIC LANDSCAPE

Drawing Status

Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	B1756400	
Client No.		

Drawing No. B1756400_CHE_03

Appendix 1:
Environmental Action Plan

Environmental Action Plan

1.1 Introduction

The preparation of this Environmental Action Plan (EAP) has been based on the standard Environment Agency template, which is considered to be comprehensive and an example of best practice. The EAP summarises the actions required to implement the project in accordance with the non-statutory Environmental Report (ER). The EAP sets out specific objectives and actions defining the way in which we wish the ER and its findings to be addressed during the implementation phase of the project (e.g. detailed design, construction and post-construction phases). It also details the roles and responsibilities of those involved in the proposal and refers to all temporary and permanent works.

The EAP covers all issues that are specific to the project and the site. It does not necessarily cover issues relating to general good site practice, as these issues should already be addressed by the contractor undertaking the works. The EAP will therefore be incorporated into the specification and / or works documents. The EAP is a working document that will be regularly reviewed and updated throughout the detailed design and construction phases.

For each topic addressed by the ER an objective and action, or actions where required, have been developed and presented in the EAP table below. An additional topic has also been included to address waste.

1.2 New environmentally significant changes

Any potential change in design, work process or implementation must be communicated to the Senior Project Environmental Co-ordinator immediately. The Senior Project Environmental Co-ordinator will assess the significance and decide whether consultation and / or an EAP Addendum is required. If changes to the scheme are proposed during the construction of the project, the following procedures must be followed:

- Communicate, as early as possible, with all who need to know that a change is proposed;
- Identify who has requested the change and the reasons why it has been requested;
- Establish the environmental implications of the change;
- If adverse environmental implications are identified, consider alternatives to the proposed change; and
- Seek approval from the Project Manager.

1.3 Roles and Responsibilities

The Environment Agency (EA) Project Manager will specify roles, competencies and staff to carry out environmental responsibilities that relate to this project. This will also involve developing an appropriate audit programme. The EA Project Manager will be responsible for communicating the EAP to the implementation team. It is likely that an Environmental Clerk of Works (ECW) will be appointed.

1.4 Environmental Incident Reporting System

An Environmental Incident is defined as a failure of an environmental constraint target or the occurrence of an environmental impact that was not identified in the ER. Failures must be reported by the Contractor to the EA Project Manager or Environmental Clerk of Works

(ECW) who, if necessary, will advise on appropriate measures to limit impact. Appendix A details the reporting system.

1.5 General Good Practice Measures

This EAP lists the project and site specific measures that are required to ensure that this project has the least environment impact possible. It is assumed that the construction method developed by the contractor will contain measures relating to good site practice; these are therefore not addressed in detail within this EAP. The following are general measures of good practice that must be adhered to and generally relate to the construction process:

- All machinery used on site must be maintained in accordance with the manufacturer's instructions and there should be no excessive exhaust smoke. Engines should be switched off during periods of prolonged inactivity;
- BS5228-1: Code of Practice for Noise and Vibration Control on Construction and Open Sites (Noise) should be adhered to where appropriate; and
- Works that generate noise should be restricted and agreed with Hambleton District Council.

The works should be carried out in accordance with 'Best Practice Means' as defined in Section 72 of the Control of Pollution Act (COPA 1974). To achieve this, the following mitigation measures should be undertaken, as necessary during the construction of the project:

- Where applicable, the use of electrical plant and equipment in preference to diesel powered plant will be investigated and used where appropriate;
- All plant and machinery will be maintained in a good state of repair and conform to the manufacturers and legislative emissions standards; and
- Prevention of plant and machinery running unnecessarily.

Appropriate dust control measures should also be implemented, including some or all of the following measures:

- Programmes for clearing and damping down of roadways and other areas on site, particularly during dry and windy weather conditions;
- Programmes to ensure that all signage in the vicinity of the construction is checked and cleaned regularly;
- Programmes of off site road sweeping/washing if required;
- Provisions will be made for the screening, enclosure, spraying (or other dust controls methods) of uncontaminated spoil stockpiles, rubble or construction materials close to sensitive receptors;
- Prohibition of the burning of any materials on site;
- Taking account of prevailing winds when siting stockpiles to minimise effects on receptors where possible, particularly with regard to the stockpiling of sand; and
- Sheeting of lorries carrying materials or waste to and from the constructions areas and site compound.

1.6 Northallerton Flood Alleviation Scheme: Construction Method Statement

This EAP covers the specific issues relating to the site and project. A construction method statement will be devised by the contractor that should address the following issues:

- Minimise any health and safety risks associated with the works with regard to the local residents, farmers, footpath users etc (Human Beings);
- Minimise disturbance to ecologically sensitive areas (Flora & Fauna);
- Minimise disruption to recreation and rights of way (Human Beings);
- Minimise disturbance to local residents, their properties and the local community (Human Beings);
- Minimise risk of a pollution event (The Water Environment);
- Minimise potential adverse health effects, with particular regard to air quality and noise effects attributable to the construction process (Human Beings);
- Minimise impacts on Archaeology (Historic Environment), and
- Minimise adverse effects on the local landscape character, landscape features, and visual amenity and receptors (Landscape Character and Visual Amenity).

The construction method statement is an essential document that will be prepared by the contractor, and which should be audited to ensure that it all of the above concerns are addressed.

ENVIRONMENTAL ACTION PLAN: NORTHALLERTON FAS								
Ref. No.	**Objective**	**Area of Works**	**Action**	**Target**	**Responsibility**	**Further Information**	**Any non-conformances identified and target date for corrective action**	**Completed? (Confirm date completed)**
Table 1: Pre-Construction								
General								
A1.1	Ensure that works are undertaken in line with the requirements of this EAP with minimum environmental impact	All sites and along transport routes and access tracks	(1) Ensure Contractor / ECW have been briefed on the EAP and have the capabilities to deliver the actions. (2) ECW to deliver Toolbox Talk to relevant site staff. (3) EA PM and ECW to agree process to review/audit the EAP and the communication arrangements (e.g. meetings, calls or e-mail).	Works conform to the requirements of this EAP. Works have minimum environmental impact.	Andrew Gee, Project Manger			
A1.2	Gain landowner agreement for access to each location	All sites	Notify respective landowners and gain agreement for access to locations.	Access arrangements agreed with landowners	Andrew Gee, Project Manger			
A1.3	Obtain Land Drainage Consent	All sites	Apply to EA for Land Drainage Consent.	Land Drainage Consent in place prior to start of works	Andrew Gee, Project Manger			
Waste								
A2.1	Compliance with Environmental Permitting (EP) Regulations (April 2008) and with Duty of Care (under Section 34 of the Environmental Protection Act 1990 and the Site Waste Management Plans 2008)	All sites and site compounds	(1) Identify all potential waste streams that could arise from works. (2) Develop a Site Waste Management Plan (SWMP) to minimise production of waste by maximising the principles of avoid, reduce, reuse and recycle with regards resource use and waste generation.	Minimise waste generation. All paper work is in place and waste is handled appropriately.	Andrew Gee, Project Manger	Include producers, holders and possibly carriers of waste.		
Human Beings								
A3.1	Minimise disturbance to users of public rights of way	Works along Turker Beck that are in the vicinity of the public footpath	(1) Consult and agree way forward with Hambleton District Council. (2) Apply for temporary closure and diversion of the public footpath that runs along the northern bank of Turker Beck for the duration of the works. (3) Erect clearly visible closure and/or diversion notices at both ends of the affected stretches of footpaths or bridleways. State notice period in advance of closures. (4) Pedestrian management will be required for the works access; erect suitable site fencing to prevent the public from accessing the work site.	Ensure public safety and address all access issues	Andrew Gee, Project Manger			
A3.2	Minimise disturbance to local residents, their properties and the local community (including businesses)	All sites	(1) Provide information about proposed works (nature, location, time and duration of works, road closure periods and footpath diversions) to local residents and businesses through a letter drop, information boards and signs where appropriate. (2) Report any complaint about the works to the Supervisor. (3) Contractor to inform EA PM of any complaint within 48 hours. (4) Complaint to be investigated.	All affected parties to be notified of the proposed works. No complaints, however, if a complaint is received then this must be responded to within 5 working days.	Contractor / Andrew Gee, Project Manger			
A3.3	Minimise noise disruption to local residents	All sites	Consult Hambleton District Council's Environmental Health Department to agree working hours at all locations.	No complaints	Andrew Gee, Project Manger			
Flora, Fauna and Biodiversity								
A4.1	Avoid any disturbance or damage to potential roosting bats	Mature ash tree in vicinity of Turker Beck	Ensure protective fencing is in place around the mature Ash tree to ensure no harm occurs to the tree during the construction period.	Ensure no harm or disturbance to roosting bats (compliance with regulations as all British bats and their roosts/resting/sheltering places are legally protected under the Wildlife and Countryside Act 1981; the Countryside and Rights of Way Act 2000 and the Conservation of Habitats and Species Regulations 2010, as amended).	Andrew Gee, Project Manger			

ENVIRONMENTAL ACTION PLAN: NORTHALLERTON FAS								
Ref. No.	**Objective**	**Area of Works**	**Action**	**Target**	**Responsibility**	**Further Information**	**Any non-conformances identified and target date for corrective action**	**Completed? (Confirm date completed)**
Table 1: Pre-Construction								
A4.2	Protection of water voles	All sites (but a particular focus on Turker Beck)	(1) If the time between the most recent water vole survey and construction exceeds a period of 12 months then further surveys for water vole must be undertaken at each of the locations.	No impact on water voles	Andrew Gee, Project Manger and Consultant	Liaise with FRB as necessary. Turker Beck is considered to be suitable habitat for water vole, although no signs of their presence were found. Sun Beck is less suitable for water voles, because there is less in-channel vegetation.		
A4.3	Protection of otters	All sites	(1) If the time between the most recent otter survey and construction exceeds a period of 12 months then further surveys for otter must be undertaken at each of the locations.	No impact on otters	Andrew Gee, Project Manger and Consultant	The update ecology survey did not find any evidence that otters are using these becks.		
Landscape, Land Use and Visual Amenity								
A5.1	Identify whether there are any trees in close proximity to the proposed sites, or access to them, which could be affected by the works	All sites and site access routes	Incorporate in method statements need to erect temporary fencing in accordance with BS5837:2012 (Trees in relation to design, demolition and construction).	No damage to trees or their Root Protection Zone during works	Andrew Gee, Project Manger and Contractor			
A5.2	Agree land access arrangements	All sites, site compounds and site access routes	Gain agreement from land owners for the temporary use of their land during construction	Agreement reached with all landowners	EA Estates			
Water								
A6.1	Minimise risk of a pollution event within watercourse and consequent damage to flora and fauna	All activities within and adjacent to river channel	(1) Review riverside working methods and pollution prevention measures. (2) Implement appropriate pollution prevention guidance (PPGs). (3) Review pollution response plan, referring to Schedule of Risk Assessments and Method Statements.	Working method and pollution prevention measures agreed with EA PM	Contractor			
Traffic and Transport								
A7.1	Minimise disruption to local transport routes and users of local roads	All sites	(1) Consult DCC's Highways Division on traffic issues. (2) Notify landowners of planned start dates and obtain agreements for transport and access arrangements for works traffic. (3) Prepare a traffic management control procedure. (4) Erect an advanced notice of works and potential traffic disruption on both sides of the approach to all locations to inform road users. (5) Immediately prior to start of works, erect clearly visible warning notices on all access routes.	All affected parties to be notified of the proposed works. Obtain land access agreements. No valid complaints.	Andrew Gee, Project Manger, Contractor and EA Estates			
Soils and Geology								
A8.1	Avoid the release of contaminated materials during works	Areas that would be disturbed during excavation (all sites)	Carry out further contamination testing during future ground investigations.	Completion of SI. If required, identification of appropriate controls or alternative working methods (with advice sought from EA contaminated land specialist).	Consultant and Andrew Gee, Project Manger			
A8.2	Protect topsoil during storage	All sites	Storage area for topsoil is to be agreed with the EA PM. Where feasible, topsoil storage should be outside of the area that is at risk of flooding.	Identification of storage areas on plans prior to the commencement of works	Contractor / Andrew Gee, Project Manger			
Historic Environment								
A9.1	Avoid affecting unknown archaeological remains.	All sites and access roads.	(1) Undertake a geophysical survey of the footprint of the proposed development, the haul/access roads and the construction compounds to test for the presence or absence, character and extent of archaeological remains. (2) Undertake trial trenching based on the results of the proposed geophysical survey, to establish the date, character, quality and state of preservation of any archaeological remains identified.	No damage to unknown archaeological remains.	Andrew Gee, Project Manger	Liaise with NEAS archaeologist as necessary.		
Air Quality								

ENVIRONMENTAL ACTION PLAN: NORTHALLERTON FAS								
Ref. No.	**Objective**	**Area of Works**	**Action**	**Target**	**Responsibility**	**Further Information**	**Any non-conformances identified and target date for corrective action**	**Completed? (Confirm date completed)**
Table 1: Pre-Construction								
A10.1			No actions identified for this topic at this stage.					

NORTHALLERTON FAS ENVIRONMENTAL ACTION PLAN SIGN OFF		
Key Personnel	**Signature**	**Date**
EA PM		
ECW		
Contractor		
FRB		

ENVIRONMENTAL ACTION PLAN: NORTHALLERTON FAS								
Ref. No.	**Objective**	**Area of Works**	**Action**	**Target**	**Responsibility**	**Further Information**	**Any non-conformances identified and target date for corrective action**	**Completed? (Confirm date completed)**
Table 2: During Construction								
General								
B1.1	Ensure that construction works are undertaken in line with the requirements of this EAP and with minimum environmental impact	All areas where construction works will take place and along transport routes and access tracks	(1) Implement and maintain EAP. (2) EAP reviewed and audited periodically, at intervals determined by the EA PM. (2) Staff to be reminded about the importance of the EAP during tool box talks. (3) New staff are to be briefed on the EAP during site induction.	Ensure continued adherence to EAP throughout works	ECW, Andrew Gee, Project Manger and Contractor			
Waste								
B2.1	Compliance with Environmental Permitting (EP) Regulations (April 2008) and with Duty of Care (under Section 34 of the Environmental Protection Act 1990 and the Site Waste Management Plans 2008)	All sites and site compounds	Implement and maintain SWMP.	Continue to minimise waste generation. All paper work is in place and waste is handled appropriately.	Contractor	Include producers, holders and possibly carriers of waste.		
Human Beings								
B3.1	Minimise disturbance to users of public rights of way	Turker Beck	Maintain clearly visible closure and/or diversion notices at both ends of the affected stretches of footpaths.	Ensure public safety and address all access issues	Contractor			
B3.2	Minimise disturbance to local residents, their properties and the local community (including businesses)	All sites	Give > 24 hours notice (preferably 1 week) to local residents of works likely to cause disturbance.	No complaints. However, complaints, if received are to be responded to within 5 working days.	Andrew Gee, Project Manger			
B3.3	Minimise noise disruption by complying with agreed working hours	All sites	(1) Adhere to working hours agreed with Hambleton District Council. (2) Develop working methods to control noise emissions, including the use of appropriate site hoardings; switching off machinery when not in use; adherence to BS5228, Noise and Vibration Control on Construction and Open sites; and maintain all machinery in accordance with manufacturer's instructions. (3) Inform EA PM immediately if any complaints are received. (4) Compile complaints register.	No complaints	Andrew Gee, Project Manger and Contractor			
B3.4	Maintain existing levels of flood protection to ensure safety of public and site staff	All sites that have existing flood protection	If any existing flood defences are to be breached temporarily during construction, ensure that measures are in place, such as sandbagging, in case of flood warnings.	Flood protection levels maintained during works	Contractor			
B3.5	Minimise health and safety risks	All sites	Use site hoardings and signage to inform the general public of the construction areas.	No health and safety incidents involving the general public	Contractor			
Flora, Fauna and Biodiversity								
B4.1	Avoid any disturbance or damage to bats	Mature ash tree in vicinity of Turker Beck	(1) If bat presence is detected or suspected in any structure or tree during works, work must cease until Natural England have been contacted and agreed mitigations are implemented. (2) Tree protection fencing is to be erected around the mature ash tree that has been identified as having medium bat roosting potential.	Ensure no harm or disturbance to roosting bats (compliance with regulations as all British bats and their roosts/resting/ sheltering places are legally protected under the Wildlife and Countryside Act 1981; the Countryside and Rights of Way Act 2000 and the Conservation of Habitats and Species Regulations 2010, as amended).	Contractor			
B4.2	Avoid impacts on breeding birds	All sites	If any active nests are found, set up a working perimeter around them to prevent disturbance.	No impact on breeding birds	Contractor			

ENVIRONMENTAL ACTION PLAN: NORTHALLERTON FAS								
Ref. No.	**Objective**	**Area of Works**	**Action**	**Target**	**Responsibility**	**Further Information**	**Any non-conformances identified and target date for corrective action**	**Completed? (Confirm date completed)**
Table 2: During Construction								
B4.3	Enhance local habitat	All sites	(1) Plant trees and shrubs along Turker Beck and Sun Beck to replace vegetation removed prior to construction, and to fill gaps and thereby improve wildlife corridors. (2) Seed the gentle slopes of the flood storage areas with wild flower seeds.	Provide benefits to local wildlife	Contractor			
Landscape, Land Use and Visual Amenity								
B5.1	Avoid affecting hedgerows and trees in close proximity to sites, or access to them	All sites and site access routes	(1) Retention and protection of hedgerows and trees during construction in accordance with BS5837:2012 (Trees in relation to design, demolition and construction). (2) No removal or surgery of trees unless this has been specified prior to works.	No damage to trees or their Root Protection Zones	Contractor			
B5.2	Minimise visual impacts by maintaining an acceptable site appearance during construction	All sites	(1) The working area is to be fenced off. Fencing is to be maintained for the duration of the works. (2) Keep site compound tidy at all times.	No unnecessary damage or extension into areas outside of the agreed works area	Contractor			
B5.3	Minimise visual impact of scheme	All sites	Sow grass seed along flood retention area to reduce visual impact.	Reduce visual impact of scheme.	Contractor			
B5.4	Minimise visual impact of scheme	Turker Beck	(1) Shrub planting to either side of footpath at entrance to field to provide screening. (2) Additional planting to hedgerows near site compound and south of Turker Beck.	Reduce visual impact of scheme.	Contractor			
B5.5	Minimise disruption to land owners	All sites	(1) Maintain communication with land owners throughout scheme. (2) Maintain complaints register.	No valid complaints from land owners	Contractor, Andrew Gee, Project Manger and EA Estates			
Water								
B6.1	Minimise risk of a pollution event within watercourse and consequent damage to flora and fauna	All sites	(1) Ensure all site staff are operating in adherence to Riverside Working Methods and Environment Agency Pollution Prevention Guidelines to prevent any pollution to watercourse and soils. (2) Ensure all site staff are aware that these are in addition to generic pollution prevention measures unless otherwise stated.	No pollution incidents	Contractor			
Traffic and Transport								
B7.1	Minimise disruption by construction vehicles to local transport routes and users of local roads	All sites	(1) Access to properties and/or businesses is to be maintained at all times. (2) Ensure transport movements adhere to an agreed traffic management control procedure.	No valid complaints. All affected parties to be notified of the proposed works.	Contractor			
Soils and Geology								
B8.1	Avoid the release of contaminated materials during works	All sites	If any evidence of contaminated soil is identified during site work, stop work in that area and inform the EA PM.	No release of contaminated materials during works	Contractor			
B8.2	Protect topsoil during storage	All sites, and particularly site compounds	Maintain topsoil storage in accordance with agreed methods. Storage areas to follow those identified prior to the commencement of works.	No loss or contamination of topsoil	Contractor			
B8.3	Minimise damage to soil structure through compression by site machinery	All sites	Provide temporary surface on those access tracks that cross farmland.	Minimal damage to soil structure	Contractor			
Historic Environment								
B9.1	Minimise impacts on unknown archaeology	All sites	(1) The nature, scope and scale of the actions required will be dependent on the results of the geophysical surveys and trial trenching and will be agreed with the Environment Agency and the North Yorkshire Development Management Archaeologist. Actions may involve archaeological excavation or archaeological monitoring. (2) If the works uncover remains of possible archaeological interest, all work (including operation of machinery) within 25m of the discovery shall cease immediately. (3) Environment Agency archaeologist to inform County Archaeologist and EA PM as soon as possible, and agree any measures required before the works may resume.	Potential impacts on archaeological remains avoided or mitigated as appropriate	Contractor and EA archaeologist			

ENVIRONMENTAL ACTION PLAN: NORTHALLERTON FAS								
Ref. No.	**Objective**	**Area of Works**	**Action**	**Target**	**Responsibility**	**Further Information**	**Any non-conformances identified and target date for corrective action**	**Completed? (Confirm date completed)**
Table 2: During Construction								
Air Quality								
B10.1	Minimise dust generation	All sites	Suppress dust by damping down work areas, soil stockpiles and haul roads as necessary during dry weather.	Dust generation avoided. No valid complaints.	Contractor			
B10.2	Protect air quality	All sites	Turn off vehicles and machinery when not in use.	Reduce emissions from vehicles and machinery	Contractor			
B10.3	Minimise deposition of mud on highways	All sites	Appropriate measures (such as road sweeping, wheel washing) to be employed as required to reduce dirtying or muddying of public roads by site vehicles or plant.	Public roads to be kept clear of dirt and mud as much as possible. No valid complaints.	Contractor			

NORTHALLERTON FAS ENVIRONMENTAL ACTION PLAN SIGN OFF		
Organisation / Role	**Signature**	**Date**
EA PM		
ECW		
Contractor		
FRB		

ENVIRONMENTAL ACTION PLAN : NORTHALLERTON FAS								
Ref. No.	**Objective**	**Area of Works**	**Action**	**Target**	**Responsibility**	**Further Information**	**Any non-conformances identified and target date for corrective action**	**Completed? (Confirm date completed)**
Table 3: Post-Construction								
General								
C1.			No actions identified for this topic at this stage					
Waste								
C2.1	To comply with EA Waste Management and recycling targets	All sites and site compounds	SWMP to be reviewed with ECW upon completion of the works.	SWMP completed	Andrew Gee, Project Manger, Contractor and ECW			
C2.2	To comply with EA best practice	All sites and site compounds	Complete carbon calculator.	Carbon calculator completed	Andrew Gee, Project Manger and Contractor	Use EA carbon calculator template.		
Human Beings								
C3.1	Restore diverted footpath	Public footpath that travels along the northern bank of Turker Beck	Remove temporary diversions upon completion of construction. Reinstate the footpath at Turker Beck along a slightly altered route through the flood storage area. Take photographic evidence post restoration.	No valid complaints	Contractor			
Flora, Fauna and Biodiversity								
C4.1			No actions identified for this topic at this stage					
Landscape, Land Use and Visual Amenity								
C5.1	Avoid affecting hedgerows and trees in close proximity to sites, or access to them	All sites and site access routes	Reinstate sections of hedgerow that were removed to allow for construction activities.	No loss of hedgerow cover.	Contractor			
C5.2	Ensure site is left in a tidy condition on completion of the works	All sites	All protective fencing and temporary fixtures to be removed from site. All waste materials removed from site and appropriately disposed of.	No waste or material left on site upon completion of works. No valid complaints.	Contractor			
C5.3	Minimise adverse impacts on land use	All sites	Return land to owners in the condition that it was prior to construction, or as agreed by compensation negotiations.	Land use returned in appropriate condition	Contractor			
Water								
C6.1			No actions identified for this topic at this stage					
Traffic and Transport								
C7.1			No actions identified for this topic at this stage					
Soils and Geology								
C8.1			No actions identified for this topic at this stage					
Historic Environment								
C9.1	Accurately record any archaeological findings	All sites where archaeological remains uncovered	Record any archaeological findings from construction.	Accurate recordings of findings to contribute to knowledge base	Andrew Gee, Project Manger	Liaise with NEAS archaeologist as necessary.		
Air Quality								
C10.1			No actions identified for this topic at this stage.					

NORTHALLERTON FAS ENVIRONMENTAL ACTION PLAN SIGN OFF		
Organisation / Role	**Signature**	**Date**
EA PM		
ECW		
Contractor		
FRB		

APPENDIX A
Environmental Incident Reporting Procedure

Notice for Contractors Environmental Incident Reporting Procedure

What do I do?

Pollution incident occurs at or from the site

Call the Incident Hotline immediately 0800 80 70 60

What do I say?

Call the Environment Agency Project Manager immediately after that:

Name: Andrew Gee

Tel: 0113 213 4797

Make sure you give the following info:

- Your name & number
- State that it relates to an Agency site
- Principle Contractor Name
- Name of the site/project including the name of the watercourse
- Describe the incident:
  - Date/time first noticed
  - What is the pollutant?
  - How serious is it?
- Ask for & note the incident number

What happens then?

You will be contacted by a local Environment Agency Pollution Incident Officer

What is an environmental incident?

- Damage to the natural environment
- Pollution
- Risks to wildlife
- Fish in distress

Appendix 2:
Ecology Survey Memo

JACOBS

Memorandum

1 City Walk
Leeds, West Yorkshire, UK
LS11 9DX
+44.(0)113.242.6771 Fax +44.(0)113.389.1389

Date **27th September 2011**

To Alistair Robinson, Jacobs

From Matthew Robson, Jacobs

Subject Phase 1, Hedgerow and Ditch Re-survey at Northallerton.

Dear Alistair,

The following memo contains the results of the re-surveys carried out at Turker Beck, Sun Beck and within the parkland to the rear of Friarage Hospital, Northallerton on the 14th September 2011. The surveys ware carried out by Jacobs' ecologist Matthew Robson in conjunction with yourself. Surveys were intended to assess changes, if any, since the previous Extended Phase 1 Habitat Survey (Jacobs 2009) and to extend the scope to include combined water vole and otter surveys of Turker Beck and Sun Beck and to assess the bat roosting potential of any trees or structures within the proposed in-line storage development footprints. Previous surveys of Turker Beck, Sun Beck were carried out between the 3rd and 4th of June 2009 by Jacobs ecologists. Additional areas including the culverted section of Sun Beck at Friarage Hospital in Northallerton were surveyed on the 3rd of September 2009. The material findings contained within that report were confirmed as correct during the survey of 14th September 2011. However, a brief summary of the re-surveys is presented below for clarity.

Water vole survey

The survey comprised a search for the following field signs as described in the Water Vole Conservation Handbook (Strachan and Moorhouse, 2006):

- droppings and latrines;
- burrows;
- grazed lawns around burrows;
- runs through vegetation and other tracks;
- feeding remains; and
- sightings of individuals.

The area surveyed included both banks of the watercourses.

Otter Survey

Otter surveys were conducted in accordance with the guidance outlined by English Nature (Chanin, 2003). Water bodies were surveyed for signs indicative of the presence of otter, including:

- Spraint, recorded as fresh recent or old;
- Sign heaps, piles of earth in prominent places used by otters (often with spraint on the top);

- Footprints/pad marks;
- Holts and natal dens;
- Feeding remains (half eaten fish or fish bones etc.);
- Couches or hovers, and;
- Mammal pathways within 10m of the riverbanks.

Bat Suitability Survey

An assessment for bat potential of the trees within the works development was carried out with regard to the guidelines outlined by the Bat Conservation Trust Bat surveys: good practice guidelines (2007). Each potential roost site was categorised in accordance with the above guidelines and descriptions given below in Table 1.

Table 1 – Potential Roost Site Assessment

Main Category	Sub Category	Category Description	Indicators
1 (Roost)	A	Direct evidence of current use by bats.	• Sighting/hearing of bats (including emergence). OR • Presence of fresh droppings/staining.
	B	Evidence of recent use by bats.	• Small numbers of old droppings/old staining, smoothing and/or scratch marks and lack of cobwebs. OR • Anecdotal record of bat roost (e.g. from land owner).
2 (Potential Roost)	A	High potential to support bat roost(s).	• Trees: Presence of cracks, splits, knot holes, loose bark, woodpecker holes, snag ends and other hollows etc. • Buildings: Presence of gaps, cracks, loose tiles, holes in roof, loose boards and potential access points. • Un-obstructed flyways. • Low disturbance levels. • Situated within or near to woodland, parkland or next to water bodies, buildings (i.e. potential foraging and roosting habitat). • Well connected to wider landscape through presence of continuous linear features such as hedgerows, watercourses, farm-tracks etc.
	B	Moderate potential to support bat roost(s).	Some of the above features but considered to be less suitable on account of age, location and disturbance levels.
3 (No/Low Roost Potential)	n/a	No or low potential to support bat roost(s).	• Limited suitable roosting features: • Exposed roosting features (e.g. open to wind/rain). • High levels of regular disturbance (e.g. from lighting).

			• Isolated from suitable foraging habitat & commuting features.

Turker Beck

The beck was found to be densely vegetated with common nettle (*Urtica dioica*) and bramble (*Rubus fruticosus*). All sections of the beck that could be accessed were however surveyed from within the watercourse. Water flow was present in the western half of the surveyed section of the beck with shallow pools of standing water in the remainder.

Although the bank substrate and vegetation would be considered suitable for water vole, no field signs such as burrows, latrines, droppings, feeding remains or runs were noted and the paucity of water would render the habitat as sub optimal. Potential burrows identified during the last survey were revealed on closer inspection to be shallow depressions in the bank. Two footprints attributable to brown rat (Photograph 1) were noted on one side of the bank and numerous mammal paths were present, one displaying badger prints and claw marks. No evidence of otter was noted during the survey.

None of the trees within the development footprint were considered to offer bat roosting potential due to insufficient size and/or an absence of suitable features.

Sun Beck

Sun Beck was found to be similarly densely vegetated with common nettle, bramble, great willowherb (*Epilobium hirsutum*), soft rush (*Juncus effusus*) and self-set ash (*Fraxinus excelsior*). Where possible, the beck was surveyed from within the watercourse. Water flow was limited to a shallow trickle at the western culvert end with shallow and muddy standing water in the remainder.

No field signs such as burrows, latrines, droppings, feeding remains or runs were noted. Instream vegetation was reduced in abundance compared to Turker Beck with a similar lack of water. The beck would therefore be assessed as sub optimal. Occasional mammal paths were present on the bank tops but no crossings were noted. No evidence of otter was noted during the survey.

Trees within or close to, the development footprint were assessed for their bat roosting potential. A mature ash noted within Hedgerow 2 (Photograph 2) was assessed as being of medium bat roosting potential containing numerous rot pockets, crevices and snagged limbs. This ash is located approximately 17m from the beck. Although it is therefore outside the buffer zone of the development, the works may overlap the tree root protection zone (typically 12 times the diameter of the tree at 1.5m height). If works are likely to result in damage to or death of the tree, a bat survey would be advised prior to works commencing.

Trees at Sun Beck culvert within Bullamoor Park (Rear of Friarage Hospital)

A line of immature elm (*Ulmus sp.*) and one mature Sycamore (*Acer pseudoplatanus;* Photograph 3) lining a culverted section of Turker Beck were included in the re-survey. These were assessed as being of negligible bat roosting potential due to a general lack of size and/or an absence of suitable features.

Hedgerows

A survey was carried out of the five hedgerows which were found to be either wholly or partly within the footprint of the proposed works footprint at Turker Beck and Sun Beck, Northallerton.

Hedgerow 1 lies at a tangent to Turker Beck in a north-south direction at approximate grid reference SE 380 945.

Hedgerow 2 lies at a tangent to Sun Beck in a north-south direction from approximate grid reference SE 381 938.

Hedgerow 3 borders the northern side of Carr Drain in an east-west direction from approximate grid reference SE 381 938.

Hedgerow 4 lies at a tangent to Sun Beck in a north-south direction from approximate grid reference SE 380 938.

Hedgerow 5 borders the northern side of Sun Beck in an east-west direction from approximate grid reference SE 379 939.

The general condition of the hedgerows was assessed following guidelines in the Hedgerow Survey Handbook (Defra 2007) from both sides with regard to the following parameters:

- Size
- Continuity
- Adjacent land use
- Number of connecting hedgerows
- Associated features (i.e. fence, bank, verge, ditch)
- Hedgerow management (trimmed, untrimmed, tall, laid)
- Number and type of woody species
- Number and species of hedgerow trees
- Nutrient enrichment indicators
- Species in the associated ground flora

Survey findings

Hedgerow 1 (Photograph 4)

Size: generally, the hedge has a cross-sectional area of approximately 5.5m^2. An average width of 2m was noted with an average canopy height (excluding standard trees) of 2.7m.

Continuity: the hedge can be regarded as continuous as less than 10% of its length (excluding entrances) is occupied by gaps.

Adjacent land use: the land to the west and west is arable land.

Number of connecting hedgerows: three. One hedgerow adjoins the northern end of the hedgerow approximately 280m to the north of Turker Beck.

Associated features: no other associated features were noted.

Hedgerow management: the hedgerow shows some signs of past management appearing uniform in profile, although is presently untrimmed.

Number and type of woody species: there was one woody species noted within the surveyed section of hedgerow, namely hawthorn (*Crataegus monogyna*)

Species of hedgerow trees: there were no hedgerow trees present.

Nutrient enrichment indicators: the ground flora contained a number of species indicative of nutrient enrichment such as occasional dock (*Rumex sp*) and common nettle,

Ground flora species: these were dominated by grass species including perennial ryegrass (*Lolium perenne*), barren brome (*Anisantha sterilis*), cock's-foot (*Dactylis glomerata*) and false oat-grass (*Arrhenatherum elatius*). Other species were limited but included common field speedwell (*Veronica persicara*), creeping buttercup (*Ranunculus repens*), rape (*Brassica napus*) and common chickweed (*Stellaria media*).

Hedgerow 2 (Photograph 5)

Size: generally, the hedge had a cross-sectional area of approximately 2.5m^2. An average width of 1.5m was noted with an average canopy height (excluding standard trees) of 1.5m.

Continuity: the hedge can be regarded as continuous as less than 10% of its length (excluding entrances) is occupied by gaps.

Adjacent land use: the land to the east and west comprises arable land.

Number of connecting hedgerows: very limited. The northern end of the hedge connects to the hedgerow that borders Scholla Lane whilst the southern end of the hedge connects to Hedge 3 that borders Sun Beck.

.

Associated features: there were no associated features.

Hedgerow management: there was no sign of recent trimming or flailing to the hedge itself.

Number and type of woody species: there were three woody species noted within the surveyed section of hedgerow: ash, elder (*Sambucus nigra*), dogwood (*Cornus sanguinea*) and hawthorn.

Species of hedgerow trees: hedgerow trees were limited to ash.

Nutrient enrichment indicators: the ground flora contained species indicative of nutrient enrichment such as common nettle and occasional dock.

Ground flora species: these were very limited, consisting of common species such as bramble, spear thistle (*Cirsium vulgare*), creeping buttercup, cock's-foot, Yorkshire fog (*Holcus lanatus*) and perennial ryegrass.

Hedgerow 3 (Photograph 6)

Size: generally, the hedge had a cross-sectional area of at least 6m^2. An average width of between 2m was noted with an average canopy height (excluding standard trees) of 3m.

Continuity: the hedge can be regarded as continuous as less than 10% of its length (excluding entrances) is occupied by gaps.

Adjacent land use: the land to the north and south comprises arable land.

Number of connecting hedgerows: the western end of the hedgerow attaches to the southern end of hedgerow 2.

Associated features: an external ditch (Sun Beck) of variable depth was noted to the south of the hedgerow. This was overgrown in many places and partially dry at the time of survey.

Hedgerow management: management of the hedge is consistent along its length with no sign of recent trimming or flailing to the north side of the hedge but with evidence of rough flailing to the south resulting in an asymmetrical profile.

Number and type of woody species: there were three woody species noted within the hedgerow: ash, elder and hawthorn.

Species of hedgerow trees: hedgerow trees were limited to ash.

Nutrient enrichment indicators: the ground flora contained a number of species indicative of nutrient enrichment such as common nettle and dock.

Ground flora species: these were limited to common grasses dominated by cock's-foot, and perennial ryegrass. Additional species included nettle, dock, great willowherb and creeping buttercup.

Hedgerow 4 (Photograph 7)

Size: generally, the hedge had a cross-sectional area of 3m^2. An average width of 1.5m was noted with an average canopy height (excluding standard trees) of 2m.

Continuity: the hedge can be regarded as continuous as less than 10% of its length (excluding entrances) is occupied by gaps.

Adjacent land use: the land to the east and west comprises arable land.

Number of connecting hedgerows: the northern end of the hedge connects to the hedgerow that borders Scholla Lane whilst the southern end of the hedge connects to Hedge 5 that borders Sun Beck.

Associated features: there were no associated features.

Hedgerow management: management of the hedge is consistent along its length with no sign of recent trimming or flailing to the hedge.

Number and type of woody species: there were three woody species noted within the hedgerow: ash, hawthorn and field rose.

Species of hedgerow trees: hedgerow trees were limited to ash.

Nutrient enrichment indicators: the ground flora contained nettle; a species indicative of nutrient enrichment.

Ground flora species: these were limited to common species of grass such as cock's-foot, annual meadow-grass (*Poa annua*) and perennial ryegrass. Ground flora included additional common species such as colt's-foot (*Tussilago farfara*), nettle and teasel (*Dipsacus fullonum*).

Hedgerow 5 (Photograph 8)

Size: generally, the hedge had a cross-sectional area of at least 6m^2. An average width of between 2m was noted with an average canopy height (excluding standard trees) of 3m.

Continuity: the hedge can be regarded as discontinuous as more than 10% of its length (excluding entrances) is occupied by gaps.

Adjacent land use: the land to the north and south comprises arable land.

Number of connecting hedgerows: very limited. The southern end of the hedge connects to Hedgerow 4.

Associated features: an external ditch (Sun Beck) of variable depth was noted to the south of the hedgerow. This was overgrown in many places and had negligible flow at the time of survey.

Hedgerow management: management of the hedge is consistent along its length with no sign of recent trimming or flailing to the north side of the hedge but with evidence of rough flailing to the south resulting in an asymmetrical profile.

Number and type of woody species: there were three woody species noted within the hedgerow: elder, hawthorn and field rose.

Species of hedgerow trees: there were no hedgerow trees.

Nutrient enrichment indicators: the ground flora contained a number of species indicative of nutrient enrichment such as common nettle and creeping thistle.

Ground flora species: these were limited to common species such as common nettle, garlic mustard (*Alliaria petiolata*), hogweed (*Heracleum sphondylium*), cock's-foot tall oat grass and goat's-beard (*Tragopogon pratensis agg*).

Conclusions

None of the hedgerows would be determined as an 'Important Hedgerow' under ecological criteria set out in The Hedgerow Regulations, 1997 (HMSO 1997) and are therefore not protected.

Nonetheless, it is an offence to damage or destroy the nest of any wild bird whilst it is in use or being built (including ground nesting birds). Therefore excavation, construction and/or vegetation removal should avoid, where possible, the bird breeding season which typically runs from 1st March to 31st August inclusive. If excavations or other construction works during the bird nesting season cannot be avoided, precautionary nesting bird surveys will be required. This would involve ecologists monitoring any trees, species poor hedgerows, shrubs and arable land affected by the excavation works to determine whether they are being used by nesting birds. If nesting birds are discovered in any of these locations, works may have to be postponed until all the young have fledged or the nest is abandoned; depending on the proximity of the birds to the proposed works. The requirement for these measures should be determined by an appropriately qualified ecologist. In such cases, an exclusion zone would need to be set up around any active nest to limit disturbance, e.g. it would not be acceptable to excavate a trench immediately adjacent to an active nest.

Should future construction work reveal additional habitation by water vole, work should cease and appropriate ecological advice sought.

In order to minimise the likelihood of unforeseen adverse effects on protected species, it is accepted good practice for wildlife surveys to be repeated, should the works be deferred for over 12 months from the date of the initial field survey.

No evidence of other species of conservation concern was noted during the survey.

Yours sincerely,

Dr Matthew Robson. BSc (Hons), PGCE, MIEEM.
Ecologist

References:

Chanin, P. (2003). Monitoring the Otter Lutra lutra. Conserving Natura 2000 Rivers Ecology Series No. 10. English Nature, Peterborough.

Defra (2007). *Hedgerow Survey Handbook*. A standard procedure for local surveys in the UK. Defra, London.

HMSO (1997). The Hedgerow Regulations 1997. http://www.legislation.gov.uk/uksi/1997/1160/contents/made. Accessed 08/04/11.

Mitchell-Jones, A.J. (2004) Bat Mitigation Guidelines. English Nature, Peterborough.

Strachan, R. & Moorhouse, T. (2006). Water Vole Conservation Handbook (Second Edition). Environment Agency/English Nature/WildCRU. Oxford, UK.

Photograph 1: Brown rat footprint within Turker Beck

Photograph 2: Ash with bat roosting potential close to Sun Beck.

Photograph 3: Trees behind Friarage Hospital (at Bullamoor Park)

Photograph 4: Hedgerow 1 running perpendicular to Turker Beck

Photograph 5: Hedgerow 2 running perpendicular to Sun Beck

Photograph 6: Hedgerow 3 running parallel to Sun Beck – looking east

Photograph 7: Hedgerow 4 running perpendicular to Sun Beck – looking south

Photograph 8: Hedgerow 5 running parallel to Sun Beck – looking south

Legislation

The following paragraphs summarise legislative status and protection measures. The official texts should be consulted for more comprehensive information and exact wording.

Otters are fully protected under The Conservation of Habitat and Species Regulations 2010. Under the regulations it is an offence:

- Deliberately capture, injure or kill an otter;
- deliberately disturb any otter in such a way as to be likely significantly to affect;

  (i) the ability of any significant group of otters to survive, breed, or rear or nurture their young; or

  (ii) the local distribution or abundance; or
- damage or destroy a breeding site or resting place of an otter.

Otters are also protected under the Wildlife and Countryside Act 1981 (as amended), under which the following are illegal:

- intentional killing, injuring, taking an otter;
- possession or control (live or dead animal, part or derivative);
- damage to, destruction of, obstruction of access to any structure or place used by a scheduled animal for shelter or protection;
- disturbance of animal occupying such a structure or place;
- selling, offering for sale, possessing or transporting for the purpose of sale (live or dead animal, part or derivative); and
- advertising for buying or selling such things.

The water vole is protected under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). The Act and Regulations make it illegal to:

- Intentionally or recklessly damage, destroy or obstruct access to any structure or place used for shelter or protection;
- Intentionally or recklessly disturb water voles whilst occupying a structure or place used for that purpose;
- Intentionally kill, injure or take water voles;
- Possess or control live or dead water voles or derivatives;
- Sell, barter, exchange or transport for sale, a water vole, or parts of a water vole; and
- Publish or cause to be published any advertisement which conveys the buying or selling of water voles.

The water vole is protected under Schedule 5 of the Wildlife and Countryside Act 1981 (As amended). The Act and Regulations make it illegal to:

- Intentionally or recklessly damage, destroy or obstruct access to any structure or place used for shelter or protection;

- Intentionally or recklessly disturb water voles whilst occupying a structure or place used for that purpose;
- Intentionally kill, injure or take water voles;
- Possess or control live or dead water voles or derivatives;
- Sell, barter, exchange or transport for sale, a water vole, or parts of a water vole;
- Publish or cause to be published any advertisement which conveys the buying or selling of water voles.

In addition to the above legislation, the UK Biodiversity Action Plan has defined water vole as an action plan species due to dramatic and significant recent declines (JNCC, Feb 2004).

All species of bat and their breeding sites or resting places (roosts) are protected under The Wildlife and Countryside Act 1981 (as amended) and The Conservation of Habitat and Species Regulations 2010. Taken together this legislation makes it an offence to:

- deliberately capture, injure or kill a bat;
- deliberately disturb bats in such a way as to be likely:
  - *to impair their ability:*
    i) to survive, to breed or reproduce, or to rear or nurture their young; or
    ii) in the case of animals of a hibernating or migratory species, to hibernate or migrate; or
  - *to affect significantly the local distribution or abundance of the species to which they belong;*
- damage or destroy a bat roosting place (even if bats are not occupying the roost at the time), and;
- obstruct access to a bat roost.

Appendix 3:
Indicative Landscape Plans

0 100 200 300 400 500 m

SCALE 1 : 5000

N

BANK HOUSE FARM

NEWSHAM GRANGE

BANKS ROAD

HARROGATE HOUSE

TURKER BECK

BULLAMOOR ROAD

GREENWAYS

MEADOWFIELDS

HILL VIEW

THE BYRE

BANK FOOT BED AND BREAKFAST

POTTERS CLOSE

SCHOLLA LANE

LEWIS ROAD

DROPTREE ROAD

DROPPER LANE

FIGURE 1

- Watercourse
- Area of works
- Significant vegetation
- Hedgerow
- Vegetation recently removed
- Public right of way
- Public open space
- Environmental stewardship area
- Tree preservation order
- Landscape Character Area 5c - Intensely Farmed Lowland (Simple Topography)
- Landscape Character Area 4b - Intensely Farmed Lowland (Varied Topography)

Rev.	Date	Purpose of Revision	Drawn	Check'd	Rev'd	App'd
0	MAY 12	FINAL	HP	DB	DB	AP

Client: Environment Agency

Project: NORTHALLERTON DETAILED DESIGN

File Reference No.: LANDSCAPE FEATURES - TURKER BECK

Drawing Status: FINAL

Scale @A3	1:5000	DO NOT SCALE
Jacobs No.	B1756400	
Client No.		

Drawing No.: B1756400_LF_001

0 100 200 300 400 500 m

SCALE 1 : 5000

N

BULLAMOOR ROAD
GREENWAYS
MEADOWFIELDS
HILL VIEW
THE BYRE
BANK FOOT BED AND BREAKFAST
POTTERS CLOSE
SCHOLLA LANE
HAILSTONE DRIVE
BANKHEAD ROAD
BANK CLOSE FARM
SUN BECK
PROSPECT HOUSE

FIGURE 2

- Watercourse
- Area of works
- Significant vegetation
- Hedgerow
- Public right of way
- Public open space
- Environmental stewardship area
- Landscape Character Area 5c - Intensely Farmed Lowland (Simple Topography)
- Landscape Character Area 4b - Intensely Farmed Lowland (Varied Topography)

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File Reference No.: LANDSCAPE FEATURES - SUN BECK

Drawing Status: FINAL

Scale @A3	1:5000	DO NOT SCALE
Jacobs No.	B1756400	
Client No.		

Drawing No.: B1756400_LF_002

0 100 200 300 400 500 m

SCALE 1 : 5000

N

FIGURE 3

Existing watercourse

Area of works

Public right of way

① Potential visual receptor

Potential visual receptors

1. Houses on Turker Lane
2. Houses on Thorntree Road
3. Houses on Lewis Road
4. Bullamoor Road
5. Footpath to south of Turker Beck
6. Footpath on farm track to east of Turker Beck
7. Footpath from Turker Beck to Bullamoor
8. Harrogate House
9. Houses on Bullamoor Road
10. Houses on Scholla Lane
11. Newsham Grange
12. House on Banks Road

BANK HOUSE FARM

NEWSHAM GRANGE

BANKS ROAD

THORNTREE ROAD

TURKER LANE

LEWIS ROAD

TURKER BECK

HARROGATE HOUSE

BULLAMOOR ROAD

GREENWAYS

MEADOWFIELDS

BANK FOOT BED AND BREAKFAST

HILL VIEW

THE BYRE

SCHOLLA LANE

POTTERS CLOSE

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Client: Environment Agency

Project: NORTHALLERTON DETAILED DESIGN

File Reference No.: POTENTIAL VISUAL RECEPTORS - TURKER BECK

Drawing Status: FINAL

Scale @A3	1:5000	DO NOT SCALE
Jacobs No.	B1756400	
Client No.		

Drawing No.: B1756400_VR_001

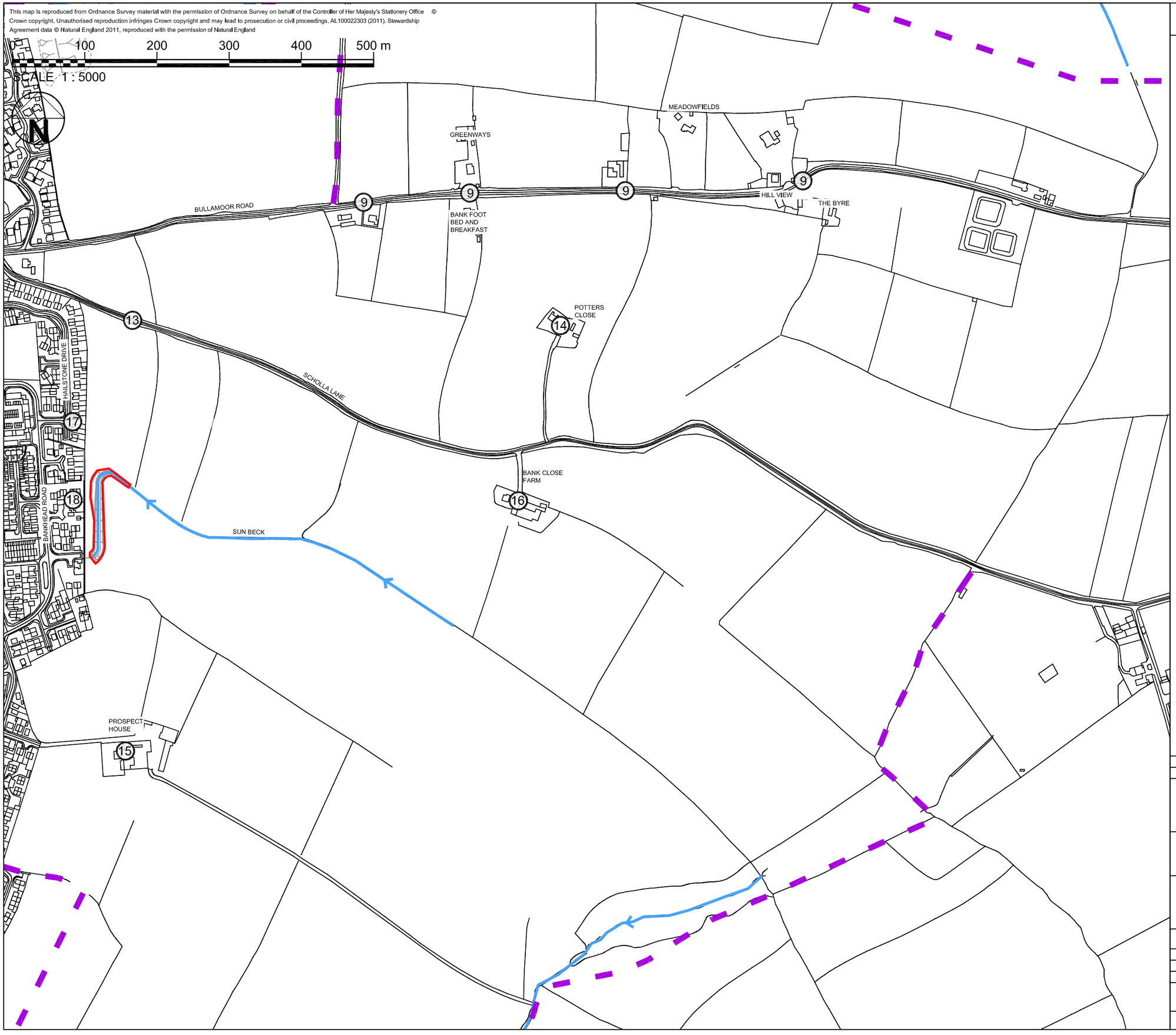

FIGURE 4

Existing watercourse

Area of works

Public right of way

① Potential visual receptor

Potential visual receptors

9. Houses on Bullamoor Road
13. Scholla Lane
14. Potters Close
15. Prospect House
16. Bank Close Farm
17. Properties on Hailstone Drive
18. Properties on Bankhead Road

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Project: NORTHALLERTON DETAILED DESIGN

File Reference No.: POTENTIAL VISUAL RECEPTORS - SUN BECK

Drawing Status: FINAL

Scale @A3	1:5000	DO NOT SCALE
Jacobs No.	B1756400	
Client No.		

Drawing No.: B1756400_VR_002

0 50 100 150 200 m

SCALE 1 : 2000

N

FIGURE 5

Wildflower and grass margin mixes to be sown on subsoil.

Thorny native shrub planting to footpath entrance to deter antisocial behaviour. Final location and extent to be agreed with adjacent residential properties

Temporary footpath diversion required

Permanent footpath diversion required

3no. Prunus padus

2no. Sorbus aucuparia

1no. Betula pendula

1no. Betula pendula

2no. Salix caprea

3no. Acer campestre

NH/01 NH/02 NH/03 NH/04 NH/05 NH/06

NS/01 NS/02

G1/01 G1/02 G2/01

TURKER BECK

BULLAMOOR ROAD

All hedgerows and trees adjacent to the site access road are to be retained and protected in accordance with BS5837:2012

Permanent grass margin seeded for maintenance access and footpath

Topsoil to be stripped from work area prior to works and stored on site to the west of the farm track. Disturbed land to be decompacted and spread with topsoil prior to being handed back to landowner

Excess excavated topsoil to be spread within adjacent agricultural fields on completion of the works. All other excess excavated material to be disposed of off site

Topsoil to be stripped from turning area, site compound and access road prior to works and stored on site to the west of the farm track. Disturbed land to be decompacted and spread with topsoil prior to being handed back to landowner

Existing footpath and farm track undisturbed during works due to access track being built in adjacent field

Existing hedgerow to be removed in order to provide site access. Hedgerow to be reinstated on completion of the works. All surrounding hedgerows and trees to be retained and protected in accordance with BS5837:2012

Vehicular route out of Northallerton

NATIVE HEDGEROW

Hedgerow to be planted at 300mm centres in a double staggered row. Crataegus monogyna to be distibuted evenly throughout the hedgerow with remaining plants postioned in a random mix. Hedgerow trees to be planted along the centre line of the hedge, prior to shrub planting.

Plot Number	NH 01	NH 02	NH 03	NH 04	NH 05	NH 06
Length	*206*	*22*	*26*	*14*	*9*	*10*
Centres	0.3	0.3	0.3	0.3	0.3	0.3
Number of plants	1373	147	173	93	60	67

%	Name	Form	Age	Height (cm)	Root Zone	Breaks	Total Number					
5%	*Acer campestre*	T	1+1	40-60	B	-	96	69	7	9	5	3	3
5%	*Corylus avellana*	T	1+1	40-60	B	2	96	69	7	9	5	3	3
75%	*Crataegus monogyna*	T	1+1	40-60	B	-	1435	1030	110	130	70	45	50
3%	*Ilex aquifolium*	Bu	3L	40-60	C	3	57	41	4	5	3	2	2
5%	*Prunus spinosa*	T	1+1	40-60	B	2	0	0	0	0	0	0	0
5%	*Rosa canina*	T	1+0	40-60	B	-	96	69	7	9	5	3	3
2%	*Viburnum opulus*	T	1+1	40-60	B	2	38	27	3	3	2	1	1
100%						TOTAL	1818						

MEADOW WILDFLOWER MIX G2

TOTAL AREA (m^2) 12794	G2/01 12794
Emorsgate EM 8 Meadow Mixture for Wetlands or similar approved. Seeding rate: 4g/m²	
Achillea millefolium (0.5%)	
Centaurea nigra (1%)	
Filipendula ulmaria (0.3%)	
Galium verum (1.8%)	
Leucanthemum vulgare (1.5%)	
Lotus pedunculatus (0.5%)	
Lychnis flos-cuculi (0.3%)	
Plantago lanceolata (1%)	
Primula veris (1%)	
Prunella vulgaris (2%)	
Ranunculus acris (3%)	
Rhianthus minor (1.6%)	
Rumex acetosa (1.2%)	
Sanguisorba officinalis (0.5%)	
Silaum silaus (1%)	
Stachys officinalis (0.4%)	
Succisa pratensis (0.4%)	
Vicia cracca (2%)	
Agrostis capillaris (12%)	
Alopecurus pratensis (5%)	
Anthoxanthum odoratum (1%)	
Cynosurus cristatus (36%)	
Deschampsia caespitosa (1%)	
Festuca rubra (25%)	

GRASS MARGIN MIX G1

TOTAL AREA (m^2) 1768	G1/01 1047	G1/02 721
Emorsgate ESG2 Fine Grassland Mixture or similar approved. Seeding rate: 2g/m²		
Agrostis capillaris (5%)		
Cynosurus cristatus (20%)		
Festuca ovina (15%)		
Festuca rubra (20%)		
Festuca rubra ssp commutata (15%)		
Phleum bertolonii (5%)		
Poa pratensis (20%)		

NATIVE SHRUBS

Native shrubs to be planted at 1m centres in the areas shown on the plan.

Plot Number	NS 01	NS 02
Area	*865*	*1017*
Centres	1	1
Number of plants	865	1192

%	Name	Form	Age	Height (cm)	Root Zone	Breaks	Total Number		
25%	*Crataegus monogyna*	T	1+1	40-60	B	-	514	216	298
25%	*Ilex aquifolium*	Bu	3L	40-60	C	3	514	216	298
25%	*Prunus spinosa*	T	1+1	40-60	B	2	514	216	298
25%	*Rosa canina*	T	1+0	40-60	B	-	514	216	298
100%						TOTAL	2057		

SELECTED STANDARD TREE

Name	Form	Age	Girth (cm)	Height (cm)	Stem	Root	Breaks	Total Number
Acer campestre	SS	2x	10-12	300-350	min 200cm clear stem	B	4	3
Betula pendula	SS	2x	10-12	300-350	clear stem 175-200cm	RB	4	2
Prunus padus	SS	2x	10-12	300-350	clear stem 175-200cm	B	4	3
Salix caprea	SS	2x	10-12	300-350	clear stem 175-200cm	B	4	2
Sorbus aucuparia	SS	2x	10-12	300-350	clear stem 175-200cm	B	4	2
							TOTAL	12

Selected Standard Trees

Trees to be pit planted in the locations shown on the drawing. Hedgerow trees to be positioned in the hedgerow prior to hedgerow planting. Pits to be 900 x 900 x 600mm minimum size with horizontal bases and vertical sides. Pit bottom to be broken up to a depth of 200mm and shaped with a slightly raised centre. Pit sides to be scarified. Backfilling material to be a 50:50 mix of topsoil to peat free compost to PAS100 with the addition of slow release fertiliser. Each tree to be supplied with an irrigation pipe, gravel drainage layer to base of pit and short single stakes. Trees to be watered thoroughly and a 500mm radius around each tree mulched with 75mm depth of amenity grade bark mulch.

Tree maintenance to include maintaining a weed free circle around each tree by ensuring a full thickness of mulch and handweeding, checking of tree stakes and refirming of trees as necessary, watering to ensure the continued survival of the trees, pruning to remove dead, dying or diseased wood and to maintain the natural shape of the trees and the replacement of failing trees.

Hedgerow and Native Shrub Planting

Hedgerow plants to be planted within a trench in the locations shown on the drawing. Trench to be large enough to take full spread of roots with backfilling material a 50:50 mix of topsoil to peat free compost to PAS100 with the addition of slow release fertiliser. Setting out of plants in the hedgerow as per plant schedule. Each hedgerow plant (except Ilex aquifolium) to be supplied with round green tree shelters with a single timber stake. Ilex aquifolium to be supplied with round green treeguard mesh. Hedgerow plants to be watered thoroughly and the full width of the trench mulched with 75mm depth of amenity grade bark mulch.

Native shrub planting as above but planted in pits 300 x 300 x 300mm at 1m centres. 500mm radius below each shrub to be mulched to a depth of 75mm.

Hedgerow and native shrub maintenance to include maintaining a weed free trench/ plant circle by ensuring a full thickness of mulch and handweeding, checking of tree shelters and refirming of plants as necessary, watering to ensure the continued survival of the plants, pruning to remove dead, dying or diseased wood and to maintain the natural shape of the plants and the replacement of failing plants

Grass Margin and Wildflower Seeding

Works to include subsoil preparation to relieve compaction, subsoil cultivation, herbicide spray, grading and preparation of the subsoil surface and seeding with a fine grassland mix such as Emorsgate Mix ESG2 'Fine Grassland Mixture' (or similar approved) or a wildflower mix such as Emorsgate Mix EM8 'Meadow Mixture for Wetlands' (or similar approved).

The first cut of grass areas to take place when the grass reaches a height of 150mm and cut to a height of 50mm. Maintenance in the first year to include cutting every 2 months or when the sward reaches 150mm, watering to ensure the continued thriving of the wildflowers, spot treatment with herbicide and the replacement of failing areas. In subsequent years cutting to take place twice yearly in spring and late summer. All arisings from grass/ wildflower cutting to be removed.

- Watercourse
- Improvements to inlet
- Significant vegetation to be retained in accordance with BS5837:2012
- Hedgerow to be retained
- Vegetation recently removed
- Public right of way
- Temporary footpath diversion
- Permanent footpath diversion
- Site access and working area
- Temporary site compound, turning area and soil storage area
- Proposed tree
- Proposed wildflower grass seeding
- Proposed field margin grass seeding
- Proposed native hedgerow
- Proposed native shrub block
- Proposed timber fence around inlet structure

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0	MAY 12	FOR PLANNING	HP	DB	DB	AP

Client: Environment Agency

Project: NORTHALLERTON DETAILED DESIGN

File Reference No.: LANDSCAPE MASTERPLAN - TURKER BECK

Drawing Status: FOR PLANNING

Scale @A3: 1:2000 DO NOT SCALE

Jacobs No.: B1756400

Client No.:

Drawing No.: B1756400_LM_001

FIGURE 6

SELECTED STANDARD TREE

Name	Form	Age	Girth (cm)	Height (cm)	Stem	Root	Breaks	Total Number
Betula pendula	SS	2x	10-12	300-350	clear stem 175-200cm	RB	4	1
Fraxinus excelsior	SS	2x	10-12	300-350	clear stem 175-200cm	B	4	1
							TOTAL	2

NATIVE HEDGEROW

Hedgerow to be planted at 300mm centres in a double staggered row. Crataegus monogyna to be distibuted evenly throughout the hedgerow with remaining plants postioned in a random mix. Hedgerow trees to be planted along the centre line of the hedge, prior to shrub planting. Approximate positions as shown on plan

Plot Number	NH 01	NH 02
Length	*33*	*50*
Centres	0.3	0.3
Number of plants	220	333

%	Name	Form	Age	Height (cm)	Root Zone	Breaks	Total Number		
5%	*Acer campestre*	T	1+1	40-60	B	-	28	11	17
5%	*Corylus avellana*	T	1+1	40-60	B	2	28	11	17
75%	*Crataegus monogyna*	T	1+1	40-60	B	-	415	165	250
3%	*Ilex aquifolium*	Bu	3L	40-60	C	3	17	7	10
5%	*Prunus spinosa*	T	1+1	40-60	B	2	0	0	0
5%	*Rosa canina*	T	1+0	40-60	B	-	28	11	17
2%	*Viburnum opulus*	T	1+1	40-60	B	2	11	4	7
100%						TOTAL	526		

GRASS MARGIN MIX G1	G1/01	G1/02
TOTAL AREA (m^2) 411	*35*	*376*
Emorsgate ESG2 Fine Grassland Mixture or similar approved. Seeding rate: 2g/m²		
Agrostis capillaris (5%)		
Cynosurus cristatus (20%)		
Festuca ovina (15%)		
Festuca rubra (20%)		
Festuca rubra ssp commutata (15%)		
Phleum bertolonii (5%)		
Poa pratensis (20%)		

WETLAND WILDFLOWER MIX G2	G2/01
TOTAL AREA (m^2) 1795	*1795*
Emorsgate EM8 Meadow Mixture for Wetlands or similar approved. Seeding rate: 4g/m².	
Achillea millefolium (0.5%)	
Centaurea nigra (1%)	
Filipendula ulmaria (0.3%)	
Galium verum (1.8%)	
Leucanthemum vulgare (1.5%)	
Lotus pedunculatus (0.5%)	
Lychnis flos-cuculi (0.3%)	
Plantago lanceolata (1%)	
Primula veris (1%)	
Prunella vulgaris (2%)	
Ranunculus acris (3%)	
Rhianthus minor (1.6%)	
Rumex acetosa (1.2%)	
Sanguisorba officinalis (0.5%)	
Silaum silaus (1%)	
Stachys officinalis (0.4%)	
Succisa pratensis (0.4%)	
Vicia cracca (2%)	
Agrostis capillaris (12%)	
Alopecurus pratensis (5%)	
Anthoxanthum odoratum (1%)	
Cynosurus cristatus (36%)	
Deschampsia caespitosa (1%)	
Festuca rubra (25%)	

GENERAL WILDFLOWER MIX G3	G3/01
TOTAL AREA (m^2) 1373	*1373*
Emorsgate EM2 Standard General Purpose Meadow Mixture or similar approved. Seeding rate: 4g/m².	
Achillea millefolium (0.5%)	
Centaurea nigra (0.3%)	
Daucus carota (1%)	
Galium verum (2.5%)	
Knautia arvensis (1%)	
Leucanthemum vulgare (2%)	
Lotus corniculatus (0.3%)	
Plantago lanceolata (1%)	
Primula veris (1.6%)	
Prunella vulgaris (2.5%)	
Ranunculus acris (3%)	
Ranunculus bulbosus (2%)	
Rhianthus minor (1.5%)	
Rumex acetosa (0.8%)	
Agrostis capillaris (8%)	
Cynosurus cristatus (40%)	
Festuca rubra (28%)	
Phleum bertolonii (4%)	

0 10 20 30 40 50 60 70 80 90 100 m

SCALE 1 : 1250

N

BANKHEAD ROAD

HAILSTONE DRIVE

Vehicular route out of Northallerton via Bullamoor Road

Topsoil to be stripped from turning area, site compound and access road prior to works and stored on site to the south of Scholla Lane. Disturbed land to be decompacted and spread with topsoil prior to being handed back to landowner

Wildflower and grass margin mixes to be sown on subsoil.

G3/01

1no. Betula pendula

NH01

NH02

1no. Fraxinus excelsior

G1/01

G2/01

G1/02

Permanent hardcore access track constructed for maintenance access

Existing hedgerow to be removed in order to provide site access. All surrounding hedgerows and trees to be retained and protected in accordance with BS5837:2012

All hedgerows and trees adjacent to the site access road are to be retained and protected in accordance with BS5837:2012

Excess excavated topsoil to be spread within adjacent agricultural fields on completion of the works. All other excess excavated material to be disposed of off site

Topsoil to be stripped from work area prior to works and stored on site to the south of Scholla Lane. Disturbed land to be decompacted and spread with topsoil prior to being handed back to landowner

SUN BECK

SCHOLLA LANE

- Watercourse
- New inlet structure
- Watercourse to be filled in
- Existing inlet structure to be broken out
- Significant vegetation to be retained in accordance with BS5837:2012
- Hedgerow to be retained
- Vegetation to be removed
- Public open space
- Environmental stewardship area
- Temporary site access and working area
- Temporary site compound, turning area and soil storage area
- Proposed tree
- Proposed wetland wildflower grass seeding
- Proposed general wildflower grass seeding
- Proposed field margin grass seeding
- Proposed native hedgerow
- Proposed permanent hardcore maintenance access track

Selected Standard Trees

Trees to be pit planted in the locations shown on the drawing. Hedgerow trees to be positioned in the hedgerow prior to hedgerow planting. Pits to be 900 x 900 x 600mm minimum size with horizontal bases and vertical sides. Pit bottom to be broken up to a depth of 200mm and shaped with a slightly raised centre. Pit sides to be scarified. Backfilling material to be a 50:50 mix of topsoil to peat free compost to PAS100 with the addition of slow release fertiliser. Each tree to be supplied with an irrigation pipe, gravel drainage layer to base of pit and short single stakes. Trees to be watered thoroughly and a 500mm radius around each tree mulched with 75mm depth of amenity grade bark mulch.

Tree maintenance to include maintaining a weed free circle around each tree by ensuring a full thickness of mulch and handweeding, checking of tree stakes and refirming of trees as necessary, watering to ensure the continued survival of the trees, pruning to remove dead, dying or diseased wood and to maintain the natural shape of the trees and the replacement of failing trees.

Hedgerow Planting

Hedgerow plants to be planted within a trench in the locations shown on the drawing. Trench to be large enough to take full spread of roots with backfilling material a 50:50 mix of topsoil to peat free compost to PAS100 with the addition of slow release fertiliser. Setting out of plants in the hedgerow as per plant schedule. Each hedgerow plant (except Ilex aquifolium) to be supplied with round green tree shelters with a single timber stake. Ilex aquifolium to be supplied with round green treeguard mesh. Hedgerow plants to be watered thoroughly and the full width of the trench mulched with 75mm depth of amenity grade bark mulch.

Hedgerow maintenance to include maintaining a weed free trench by ensuring a full thickness of mulch and handweeding, checking of tree shelters and refirming of plants as necessary, watering to ensure the continued survival of the plants, pruning to remove dead, dying or diseased wood and to maintain the natural shape of the plants and the replacement of failing plants.

Grass Margin and Wildflower Seeding

Works to include subsoil preparation to relieve compaction, subsoil cultivation, herbicide spray, grading and preparation of the subsoil surface and seeding with a fine grassland mix such as Emorsgate Mix ESG2 'Fine Grassland Mixture' (or similar approved) or wildflower mixes such as Emorsgate Mix EM8 'Meadow Mixture for Wetlands' (or similar approved) or Emorsgate Mix EM2 'Standard General Purpose Meadow' (or similar approved). The first cut of grass areas to take place when the grass reaches a height of 150mm and cut to a height of 50mm. Maintenance in the first year to include cutting every 2 months or when the sward reaches 150mm, watering to ensure the continued thriving of the wildflowers, spot treatment with herbicide and the replacement of failing areas. In subsequent years cutting to take place twice yearly in spring and late summer. All arisings from grass/ wildflower cutting to be removed.

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Client: Environment Agency

Project: NORTHALLERTON DETAILED DESIGN

File Reference No.: LANDSCAPE MASTERPLAN - SUN BECK

Drawing Status: FOR PLANNING

Scale @A3	1:1250	DO NOT SCALE
Jacobs No.	B1756400	
Client No.		

Drawing No.: B1756400_LM_002

FIGURE 7

N

0 100 200 300 400 500 m

SCALE 1:5000

NEWSHAM GRANGE

POTENTIAL VISUAL IMPACTS FROM VEGETATION LOSS AND CONSTRUCTION COMPOUND AND WORKING AREA

NATIVE HEDGEROW AND HEDGEROW TREE PLANTING TO SOUTH SIDE OF BECK (SEE INSET A), REINSTATEMENT OF DISTURBED GRASS AREAS

ADDITIONAL PLANTING TO GAPS IN EXISTING HEDGEROW ALONG TURKER BECK

HARROGATE HOUSE

POTENTIAL VISUAL IMPACTS FROM VEGETATION LOSS AND CHANNEL WORKS

NATIVE HEDGEROW AND HEDGEROW TREE PLANTING TO SOUTH SIDE OF BECK (SEE INSET A), REINSTATEMENT OF DISTURBED GRASS AREAS

POTENTIAL LOSS OF/ DAMAGE TO EXISTING HEDGEROWS DUE TO WORKS

REINSTATE SECTION OF HEDGEROW REMOVED TO NORTH OF BECK (SEE INSET A), RETAIN AND PROTECT EXISTING TREES AND HEDGEROWS IN LINE WITH BS5837:2005

ADDITIONAL PLANTING TO GAPS IN EXISTING HEDGEROW TO THE SOUTH OF TURKER BECK

TURKER LANE

TURKER BECK

INSET A

POTENTIAL VISUAL IMPACTS FROM VEGETATION LOSS AND CHANNEL WORKS

NATIVE HEDGEROW AND HEDGEROW TREE PLANTING TO SOUTH SIDE OF BECK (SEE INSET A), REINSTATEMENT OF DISTURBED GRASS AREAS

POTENTIAL VISUAL IMPACTS FROM VEGETATION LOSS AND CHANNEL WORKS. DIRECT VIEWS OF SITE COMPOUND AND WORKING AREA.

NATIVE HEDGEROW AND HEDGEROW TREE PLANTING TO SOUTH SIDE OF BECK (SEE INSET A), REINSTATEMENT OF DISTURBED GRASS AREAS

ADDITIONAL PLANTING TO GAPS IN EXISTING HEDGEROW ALONG TURKER BECK

PUBLIC FOOTPATH KEPT OPEN DURING THE WORKS

CONSTRUCTION ACCESS TRACK TO SIDE OF FARM TRACK/ FOOTPATH

VEHICULAR ROUTE OUT OF NORTHALLERTON

BULLAMOOR ROAD

LOSS OF EXISTING HEDGEROW SECTION ALONG BULLAMOOR ROAD AT ACCESS ROAD ENTRANCE

RETAIN AS MUCH HEDGEROW AS POSSIBLE IN ACCORDANCE WITH BS5837:2012. REINSTATE HEDGEROW

POTENTIAL VISUAL IMPACTS FROM VEGETATION LOSS AND CHANNEL WORKS

NATIVE HEDGEROW AND HEDGEROW TREE PLANTING TO SOUTH SIDE OF BECK (SEE INSET A), REINSTATEMENT OF DISTURBED GRASS AREAS

POTTERS CLOSE

SCHOLLA LANE

£ !

PUBLIC FOOTPATH REQUIRES DIVERSION BOTH DURING CONSTRUCTION AND UPON COMPLETION FOOTPATH DIVERTED TO NORTH OF TURKER BECK DURING CONSTRUCTION WORKS. ON COMPLETION OF CONSTRUCTION, FOOTPATH TO FOLLOW SIMILAR ALIGNMENT TO EXISTING BUT DIVERTED SLIGHTLY SOUTHWARDS. FOOTPATH TO TRAVEL THROUGH STORAGE AREA ALONG 1:10 EMBANKMENT SLOPES. OPPORTUNITY TO PLANT THORNY PLANTS AT ENTRANCE TO FOOTPATH TO DETER ANTISOCIAL BEHAVIOUR TO REAR OF HOUSES ALONG TURKER LANE

£ !

EXCAVATED MATERIAL FROM CHANNEL WORKS MAY CAUSE CHANGES IN TOPOGRAPHY

EXCAVATED TOPSOIL SPREAD WITHIN AGRICULTURAL FIELDS, ALL OTHER MATERIAL DISPOSED OF OFF SITE. MINIMAL CHANGE IN TOPOGRAPHY

! £

HEDGE REMOVED FOR WORKING AREA REINSTATE REMOVED HEDGEROW AND RETAIN AND PROTECT EXISTING TREES AND HEDGEROWS IN LINE WITH BS5837:2012

£ !

TREES AND HEDGEROWS REMOVED FOR CHANNEL WORKS. VEGETATION TOO CLOSE TO BECK TO AVOID REMOVAL.

NATIVE HEDGEROW AND HEDGEROW TREE PLANTING TO SOUTH SIDE OF BECK, MAINTENANCE ACCESS/ FOOTPATH PROVIDED FROM THE EXISTING FARM TRACK IN THE FORM OF A GRASS TRACK. WILDFLOWER SEEDING ON STORAGE AREA EMBANKMENTS, GRASS FIELD MARGIN PROVIDED BETWEEN WILDFLOWERS AND ARABLE FIELD TO MINIMISE SPREAD OF WILDFLOWERS INTO FIELD. TIMBER FENCING PROVIDED AROUND INLET STRUCTURE.

INSET A - 1:2500 @ A3

REPRESENTATIVE VIEWS FROM REAR OF HOUSING ALONG TURKER LANE. POTENTIAL VIEWS TOWARDS CONSTRUCTION WORKS, SITE COMPOUND AND WORKING AREA. VEGETATION LOSS LIKELY TO BE VISIBLE ALONG TURKER BECK. REPLACEMENT PLANTING AND REINSTATEMENT PROPOSED.

VIEW WEST ALONG TURKER BECK, EXISTING HEDGEROW AND TREES HAVE BEEN REMOVED TO ACCOMMODATE CHANNEL WORKS, REPLACEMENT PLANTING AND REINSTATEMENT PROPOSED

VIEW SOUTH WEST OVER AGRICULTURAL FIELD FROM FOOTPATH TO EAST OF TURKER BECK. CONSTRUCTION WORKS, SITE COMPOUND AND WORKING AREA LIKELY TO BE VISIBLE. REPLACEMENT PLANTING AND REINSTATEMENT PROPOSED.

VIEW WEST ALONG TURKER BECK FROM FOOTPATH TO THE EAST. EXISTING HEDGEROW WOULD BE RETAINED AND PROTECTED IN ACCORDANCE WITH BS5837:2005. OPPORTUNITY TO GAP UP EXISTING HEDGEROW.

KEY TO LANDSCAPE FEATURES AND DESIGNATIONS

- Watercourse
- Area of scheme proposals
- Improvements to inlet
- Significant vegetation to be retained
- Hedgerow to be retained
- Vegetation removed
- Public open space
- Environmental stewardship area
- Public right of way
- Temporary footpath diversion
- Permanent footpath diversion
- Tree preservation order
- Site access and working area
- Site compound - to include soil storage area
- Photo locations

KEY TO ENVIRONMENTAL CONSTRAINTS AND OPPORTUNITIES

- Risk of damage/ detriment
- Hedgerows at risk of damage/ detriment
- Implications for existing views
- Reinstate to original condition
- Time sensitive feature
- £ Costs associated with item
- ! Point of note
- ENVIRONMENTAL ISSUE
- ENVIRONMENTAL MITIGATION
- ENVIRONMENTAL OUTCOME

PROPOSED LANDSCAPE FEATURES

- Proposed tree
- Proposed wildflower grass seeding
- Proposed field margin grass seeding
- Proposed native hedgerow
- Proposed timber fence around inlet structure
- Proposed native shrub block (extent to be agreed with adjacent residents)

Rev.	Date	Purpose of Revision	Drawn	Check'd	Rev'd	App'd
0	MAY 12	FINAL	HP	DB	DB	AP

Client

Environment Agency

Project

NORTHALLERTON DETAILED DESIGN

File Reference No.

INDICATIVE LANDSCAPE PLAN - TURKER BECK

Drawing Status

FINAL

Scale @A3	1:5000	DO NOT SCALE
Jacobs No.	B1756400	
Client No.		

Drawing No.

B1756400_ILP_001

FIGURE 8

0 100 200 300 400 500 m

SCALE 1 : 5000

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VEHICULAR ROUTE OUT OF NORTHALLERTON

BULLAMOOR ROAD

POTENTIAL VISUAL IMPACTS FROM VEGETATION LOSS, CHANNEL WORKS AND PARTIAL HEDGEROW LOSS ALONG SCHOLLA LANE

REINSTATEMENT OF EXISTING HEDGEROWS TO THE NORTH OF SUN BECK AND 2NO. REPLACEMENT TREES (SEE INSET A). RETAIN AS MUCH EXISTING HEDGEROW AS POSSIBLE ALONG SCHOLLA LANE AT ACCESS ROAD ENTRANCE. REINSTATEMENT OF DISTURBED GRASS AREAS

POTENTIAL VISUAL IMPACTS FROM VEGETATION LOSS AND CHANNEL WORKS

REINSTATEMENT OF EXISTING HEDGEROWS TO THE NORTH OF SUN BECK AND 2NO. REPLACEMENT TREES (SEE INSET A). REINSTATEMENT OF DISTURBED GRASS AREAS

POTENTIAL VISUAL IMPACTS FROM VEGETATION LOSS AND CHANNEL WORKS

REINSTATEMENT OF EXISTING HEDGEROWS TO THE NORTH OF SUN BECK AND 2NO. REPLACEMENT TREES (SEE INSET A). REINSTATEMENT OF DISTURBED GRASS AREAS

POTTERS CLOSE

HAILSTONE DRIVE

SCHOLLA LANE

LOSS OF EXISTING HEDGEROW SECTION ALONG SCHOLLA LANE AT ACCESS ROAD ENTRANCE

RETAIN AS MUCH HEDGEROW AS POSSIBLE IN ACCORDANCE WITH BS5837:2012, PARTICULARLY ADJACENT TO WORKS AREA

BANKHEAD ROAD

INSET A

BANK CLOSE FARM

SUN BECK

POTENTIAL LOSS OF/ DAMAGE TO EXISTING HEDGEROW TREE DUE TO ACCESS ROAD AND WORKING AREA

REINSTATE SECTIONS OF EXISTING HEDGEROWS TO THE NORTH OF SUN BECK (SEE INSET A). RETAIN AND PROTECT EXISTING TREES AND HEDGEROWS IN LINE WITH BS5837:2005

POTENTIAL VISUAL IMPACTS FROM VEGETATION LOSS AND CHANNEL WORKS

REINSTATEMENT OF EXISTING HEDGEROWS TO THE NORTH OF SUN BECK AND 2NO. REPLACEMENT TREES (SEE INSET A). REINSTATEMENT OF DISTURBED GRASS AREAS

POTENTIAL VISUAL IMPACTS FROM VEGETATION LOSS AND CHANNEL WORKS

REINSTATEMENT OF EXISTING HEDGEROWS TO THE NORTH OF SUN BECK AND 2NO. REPLACEMENT TREES (SEE INSET A). REINSTATEMENT OF DISTURBED GRASS AREAS

PROSPECT HOUSE

POTENTIAL VISUAL IMPACTS FROM VEGETATION LOSS AND CHANNEL WORKS

REINSTATEMENT OF EXISTING HEDGEROWS TO THE NORTH OF SUN BECK AND 2NO. REPLACEMENT TREES (SEE INSET A). REINSTATEMENT OF DISTURBED GRASS AREAS

INSET A - 1:2000 @ A3

EXCAVATED MATERIAL FROM CHANNEL WORKS MAY CAUSE CHANGES IN TOPOGRAPHY

EXCAVATED TOPSOIL SPREAD WITHIN AGRICULTURAL FIELDS, ALL OTHER MATERIAL DISPOSED OF OFF SITE. MINIMAL CHANGE IN TOPOGRAPHY

TREE AND HEDGE REMOVAL REQUIRED FOR CHANNEL WORKS. VEGETATION TOO CLOSE TO BECK TO AVOID REMOVAL WILL NEED TO BE UNDERTAKEN OUTSIDE OF THE BIRD NESTING SEASON

REINSTATEMENT OF EXISTING HEDGEROWS TO THE NORTH OF SUN BECK AND 2NO. REPLACEMENT TREES, MAINTENANCE ACCESS PROVIDED FROM SCHOLLA LANE IN THE FORM OF A HARDCORE TRACK. GAP IN HEDGEROW PROVIDED FOR ACCESS TRACK. WILDFLOWER SEEDING ON CHANNEL EMBANKMENTS AND TO EDGE OF HOUSING ESTATE. GRASS FIELD MARGIN PROVIDED BETWEEN WILDFLOWERS AND ARABLE FIELD TO MINIMISE SPREAD OF WILDFLOWERS INTO FIELD. EXISTING INLET STRUCTURE AND CHANNEL BROKEN OUT AND FILLED IN

REPRESENTATIVE VIEWS FROM REAR OF HOUSING ALONG HAILSTONE DRIVE. POTENTIAL VIEWS TOWARDS CONSTRUCTION WORKS, SITE COMPOUND AND WORKING AREA. VEGETATION LOSS LIKELY TO BE VISIBLE ALONG SUN BECK. REPLACEMENT PLANTING AND REINSTATEMENT PROPOSED.

VIEW NORTH WEST ALONG SUN BECK. EXISTING HEDGEROW WOULD REQUIRE REMOVAL TO ACCOMMODATE CHANNEL WORKS. REPLACEMENT PLANTING AND REINSTATEMENT PROPOSED

VIEW SOUTH EAST ALONG SUN BECK. EXISTING HEDGEROW WOULD REQUIRE REMOVAL TO ACCOMMODATE CHANNEL WORKS. REPLACEMENT PLANTING AND REINSTATEMENT PROPOSED.

PROPOSED ACCESS TRACK WOULD FOLLOW LINE OF HEDGEROW BETWEEN SCHOLLA LANE AND SUN BECK. EXISTING TREES AND HEDGEROWS WOULD BE RETAINED AND PROTECTED IN ACCORDANCE WITH BS5837:2012.

KEY TO LANDSCAPE FEATURES AND DESIGNATIONS

- Watercourse
- Watercourse to be filled in
- Area of scheme proposals
- New inlet structure
- Existing inlet structure to be broken out
- Significant vegetation to be retained
- Hedgerow to be retained
- Vegetation to be removed
- Public open space
- Environmental stewardship area
- Public right of way
- Tree preservation order
- Tree with bat roost potential
- Site access and working area
- Site compound
- Photo locations

KEY TO ENVIRONMENTAL CONSTRAINTS AND OPPORTUNITIES

- Risk of damage/ detriment
- Hedgerows at risk of damage/ detriment
- Implications for existing views
- Reinstate to original condition
- Time sensitive feature
- £ Costs associated with item
- ! Point of note
- ENVIRONMENTAL ISSUE
- ENVIRONMENTAL MITIGATION
- ENVIRONMENTAL OUTCOME

PROPOSED LANDSCAPE FEATURES

- Proposed tree
- Proposed wildflower grass seeding
- Proposed field margin grass seeding
- Proposed native hedgerow
- Proposed hardcore access track

Rev.	Date	Purpose of Revision	Drawn	Check'd	Rev'd	App'd
0	MAY 12	FINAL	HP	DB	DB	AP

Client: Environment Agency

Project: NORTHALLERTON DETAILED DESIGN

File Reference No.: INDICATIVE LANDSCAPE PLAN - SUN BECK

Drawing Status: FINAL

Scale @A3	1:5000	DO NOT SCALE
Jacobs No.	B1756400	
Client No.		

Drawing No.: B1756400_ILP_002

Appendix 4:
Landscape and Visual Assessment

RECEPTOR	SENSITIVITY	MAGNITUDE OF CHANGE		LEVEL OF EFFECT		TYPE OF EFFECT		RATIONALE
LANDSCAPE ELEMENTS		With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	
Landform/ Drainage Construction Effects Operational Effects Residual Effects	MEDIUM	MODERATE MODERATE MODERATE	MODERATE MODERATE MODERATE	MODERATE MODERATE MODERATE	MODERATE MODERATE MODERATE	ADVERSE ADVERSE ADVERSE	ADVERSE ADVERSE ADVERSE	**Sensitivity** Whilst the local landscape character area is characterised by open, flat and uniform fields, the topography in this area is slightly more varied and of medium sensitivity. **Construction** The construction of the flood alleviation measures would alter and contrast with the existing landform at both Turker and Sun Becks. The moderate magnitude of change also reflects the presence of the altered landform adjacent to the urban edge of Northallerton where its presence would be felt by residents and users of Public Rights of Way. **Operation and Residual** The shape of the landform will be permanent and open in nature and mitigation will not lessen the effect on landform over time. **Mitigation** Design to allow for shallow gradients to reduce impact on landform and views.

RECEPTOR	SENSITIVITY	MAGNITUDE OF CHANGE		LEVEL OF EFFECT		TYPE OF EFFECT		RATIONALE
LANDSCAPE ELEMENTS		With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	
Vegetation Construction Effects Operational Effects Residual Effects	MEDIUM	MODERATE MINOR MINOR	MODERATE MODERATE MODERATE	MODERATE MINOR MINOR	MODERATE MODERATE MODERATE	ADVERSE ADVERSE BENEFICIAL	ADVERSE ADVERSE ADVERSE	**Sensitivity** Although often neglected, vegetation within the vicinity of the schemes is generally of medium sensitivity due to the loss of characteristic field vegetation and natural elements identified within the local landscape character assessment (Area 5c). **Construction** Construction would result in the removal of hedgerows for access at Bullamoor Road and Scholla Lane. The excavation work would also result in the loss of hedgerows and trees on the line of Turker and Sun Beck. **Operation & Residual** No further loss of vegetation would occur during the operational phase. Mitigation planting would mature and provide additional benefit. **Mitigation** Protection of existing hedgerows and trees during construction to reduce loss. Reinstatement of hedgerow removed for access at Turker Beck after construction.

RECEPTOR	SENSITIVITY	MAGNITUDE OF CHANGE		LEVEL OF EFFECT		TYPE OF EFFECT		RATIONALE
LANDSCAPE ELEMENTS		With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	
								Additional hedgerow reinstatement along Turker and Sun Beck. Scrub vegetation to sides of footpath at western end of Turker Beck.
Pattern Construction Effects Operational Effects Residual Effects	HIGH	MODERATE MINOR MINOR	MODERATE MODERATE MODERATE	MODERATE MINOR MINOR	MODERATE MODERATE MODERATE	ADVERSE ADVERSE ADVERSE	ADVERSE ADVERSE ADVERSE	**Sensitivity** The loss of field pattern in recent decades within this landscape character area (5c) leads to remaining field boundaries and pattern to be of high sensitivity. **Construction** Disruption due to temporary compounds in open fields. Loss of poor quality section of hedgerow at Turker Beck, but beck would remain as boundary. At both sites access routes follow boundaries. Line of new storage feature follows boundary at Sun Beck. **Operation and Residual** Removal of construction compounds reduces effect on pattern, minor effect due to absence of vegetated boundary at Turker and Sun Beck. Reinstated hedgerow sections would mature to fill gaps in boundaries.

Deleted: Turker and

RECEPTOR	SENSITIVITY	MAGNITUDE OF CHANGE		LEVEL OF EFFECT		TYPE OF EFFECT		RATIONALE
LANDSCAPE ELEMENTS		With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	
								Mitigation Infill hedgerow planting to restore pattern once construction works complete. Reinstatement of field areas once compounds removed.
Type 5c Intensively Farmed Lowland (Simple Topography) – Open Construction Effects Operational Effects Residual Effects	MEDIUM	MAJOR MINOR MINOR	MAJOR MODERATE MODERATE	MODERATE MINOR MINOR	MODERATE MODERATE MODERATE	ADVERSE ADVERSE ADVERSE	ADVERSE ADVERSE ADVERSE	**Sensitivity** Both sites lie within Area 5c, characterised by simple topography, open large fields and degraded field boundaries and vegetation, making it sensitive to further changes such as the proposed development, however this is offset by the proximity of built environment. **Construction** The creation of the measures, especially an open basin at Turker Beck would contrast with local landscape character, as would the loss of associated boundary vegetation and construction activity. **Operation and Residual** The permanent excavated features would continue to contrast with local character, but this would lessen with the re-introduction of boundary vegetation and wildflower

RECEPTOR	SENSITIVITY	MAGNITUDE OF CHANGE		LEVEL OF EFFECT		TYPE OF EFFECT		RATIONALE
LANDSCAPE ELEMENTS		With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	
								grassland within the excavated areas. **Mitigation** Grassland creation and boundary vegetation would partially offset the impact on landscape character due to the excavated areas.
Type 4b Intensively Farmed Lowland (Varied Topography) – Intermediate Enclosure Construction Effects Operational Effects Residual Effects	MEDIUM	MODERATE NEGLIGIBLE NEGLIGIBLE	MODERATE MINOR MINOR	MINOR MINOR MINOR	MINOR MINOR MINOR	ADVERSE ADVERSE ADVERSE	ADVERSE ADVERSE ADVERSE	**Sensitivity** Although some decline in management, the scale of fields is generally smaller than in Area 5c and the boundaries are more intact, with more varied topography, meaning a slightly greater ability to accommodate change without affecting the wider area, however at this location it would still be of medium sensitivity due to the location and characteristics of the sites near the boundary of Type 5c **Construction** There would be a less direct effect on the character area than for Area 5c as the only part affected would be where the access routes and site compound would be situated. The presence of the proposals would have limited effect on the wider character area

RECEPTOR	SENSITIVITY	MAGNITUDE OF CHANGE		LEVEL OF EFFECT		TYPE OF EFFECT		RATIONALE
LANDSCAPE ELEMENTS		With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	
								due to the limited visual envelope. **Operation and Residual** Restoration of the compound and access routes would reduce the adverse effects. **Mitigation** Reinstatement of boundary vegetation and the views of adjacent grassland and boundary treatment would reduce adverse effects.

RECEPTOR		SENSITIVITY	MAGNITUDE OF CHANGE		LEVEL OF EFFECT		TYPE OF EFFECT		RATIONALE
VISUAL RECEPTORS			With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	
1	**Houses on Turker Lane** **<u>Effects</u>** **Construction** **Operational** **Residual**	HIGH	MAJOR MODERATE MINOR	MAJOR MODERATE MODERATE	MAJOR MODERATE MINOR	MAJOR MODERATE MODERATE	ADVERSE ADVERSE ADVERSE	ADVERSE ADVERSE ADVERSE	**Sensitivity** Mixed restricted and open views due to partial rear boundary screening out onto ordinary setting. Close proximity. **Construction** Direct close views of construction activity at Turker Beck, of excavation, access and compound. **Operation** Adverse effects would lessen with removal of construction activity, remaining views of excavated area and removed vegetation. **Residual** Replacement and enhancement vegetation would mature to reduce visual impact, along with development of the wildflower grass areas.

RECEPTOR		SENSITIVITY	MAGNITUDE OF CHANGE		LEVEL OF EFFECT		TYPE OF EFFECT		RATIONALE
VISUAL RECEPTORS			With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	
2	**Houses on Thorntree Road** **<u>Effects</u>** **Construction** **Operational** **Residual**	MEDIUM	MAJOR MODERATE MINOR	MAJOR MODERATE MODERATE	MODERATE MODERATE MINOR	MODERATE MODERATE MODERATE	ADVERSE ADVERSE ADVERSE	ADVERSE ADVERSE ADVERSE	**Sensitivity** Restricted views due to rear boundary screening, single storey dwellings and out onto ordinary setting. **Construction** As above but more oblique towards excavation and partial screening of compound. **Operation** Adverse effects would lessen with removal of construction activity, remaining views of excavated area and removed vegetation. **Residual** Replacement and enhancement vegetation would mature to reduce visual impact, along with development of the wildflower grass areas.

RECEPTOR		SENSITIVITY	MAGNITUDE OF CHANGE		LEVEL OF EFFECT		TYPE OF EFFECT		RATIONALE
VISUAL RECEPTORS			With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	
3	**Houses on Lewis Road** **<u>Effects</u>** **Construction** **Operational** **Residual**	MEDIUM	MAJOR MODERATE MINOR	MAJOR MODERATE MODERATE	MODERATE MODERATE MINOR	MODERATE MODERATE MODERATE	ADVERSE ADVERSE ADVERSE	ADVERSE ADVERSE ADVERSE	**Sensitivity** Restricted views due to rear boundary screening out onto ordinary setting. **Operation** As above but more oblique towards excavation and partial screening of compound. **Operation** Adverse effects would lessen with removal of construction activity, remaining views of excavated area and removed vegetation. **Residual** Replacement and enhancement vegetation would mature to reduce visual impact, along with development of the wildflower grass areas.

RECEPTOR		SENSITIVITY	MAGNITUDE OF CHANGE		LEVEL OF EFFECT		TYPE OF EFFECT		RATIONALE
VISUAL RECEPTORS			With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	
4	**Bullamoor Road** **<u>Effects</u>** **Construction** **Operational** **Residual**	LOW	MODERATE MINOR NEGLIGIBLE	MODERATE MINOR MINOR	MINOR MINOR NSE	MINOR MINOR MINOR	ADVERSE ADVERSE NEUTRAL	ADVERSE ADVERSE ADVERSE	**Sensitivity** Local road but with oblique views filtered by hedge **Construction** Direct views of Turker Beck access, oblique heavily filtered or screened views of main works and compound **Operation** Visual effect of access would lessen with end of construction activity. **Residual** Growth of hedgerow planting would replace that lost in construction phase and reduce gap in roadside hedge.

RECEPTOR		SENSITIVITY	MAGNITUDE OF CHANGE		LEVEL OF EFFECT		TYPE OF EFFECT		RATIONALE
VISUAL RECEPTORS			With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	
5	**Footpath to South of Turker Beck** **<u>Effects</u>** **Construction** **Operational** **Residual**	HIGH	 MAJOR MAJOR MODERATE	 MAJOR MAJOR MODERATE	 MAJOR MAJOR MAJOR	 MAJOR MAJOR MAJOR	 ADVERSE ADVERSE ADVERSE	 ADVERSE ADVERSE ADVERSE	**Sensitivity** Public Right of Way directly passing through scheme with direct and immediate views. **Construction** Footpath would require diversion, which would be subject to direct close range views of construction activity at Turker Beck, including excavation works, access and compound. **Operation** Although visual effect of construction and compound would cease, footpath would be re-routed through the excavated area, losing views of the surrounding area. **Residual** Vegetation would mature to shrub planting areas and hedgerows, and wildflower grassland would establish, but effect of altered views would remain.

RECEPTOR		SENSITIVITY	MAGNITUDE OF CHANGE		LEVEL OF EFFECT		TYPE OF EFFECT		RATIONALE
VISUAL RECEPTORS			With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	
6	**Footpath on farm track to east of Turker Beck** **<u>Effects</u>** **Construction** **Operational** **Residual**	HIGH	MAJOR MINOR MINOR	MAJOR MAJOR MODERATE	MAJOR MODERATE MODERATE	MAJOR MAJOR MAJOR	ADVERSE ADVERSE ADVERSE	ADVERSE ADVERSE ADVERSE	**Sensitivity** Public Right of Way directly passing through scheme along the access road and past the site compound with direct and immediate views. **Construction** Footpath would require diversion, which would be subject to direct close range views of construction activity at Turker Beck, including excavation works, access and compound. **Operation** The visual effect of construction and compound would cease, views would remain of the excavated area, but these would be of part of the western slope in the context of the view of the housing. **Residual** Vegetation would mature to shrub planting areas and hedgerows, and wildflower grassland would establish, but effect of altered views would remain.

RECEPTOR		SENSITIVITY	MAGNITUDE OF CHANGE		LEVEL OF EFFECT		TYPE OF EFFECT		RATIONALE
VISUAL RECEPTORS			With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	
7	**Footpath from Turker Beck to Bullamoor** **<u>Effects</u>** **Construction** **Operational** **Residual**	HIGH	MAJOR MINOR NEGLIGIBLE	MAJOR MINOR MINOR	MAJOR MODERATE MINOR	MAJOR MODERATE MINOR	ADVERSE ADVERSE ADVERSE	ADVERSE ADVERSE ADVERSE	**Sensitivity** Public Right of Way directly passing, elevated views but partially screened towards excavation area by vegetation. **Construction** Elevated direct open views of construction compound, storage area and access. Partially filtered view of excavation and engineering works. Views of construction works would reduce towards the western end due to the decrease in elevation of the viewer. **Operation** Visual impact would decline significantly with the removal of compound area and access movements. Excavated area would be partially filtered by hedgerow vegetation and viewed in close context with urban edge, which would reduce the magnitude of change in the view. **Residual** Establishment of grassland and hedgerow vegetation will serve to further reduce visual impact.

RECEPTOR		SENSITIVITY	MAGNITUDE OF CHANGE		LEVEL OF EFFECT		TYPE OF EFFECT		RATIONALE
VISUAL RECEPTORS			With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	
8	**Harrogate House** **<u>Effects</u>** **Construction** **Operational** **Residual**	HIGH	MAJOR MINOR NEGLIGIBLE	MAJOR MINOR MINOR	MAJOR MODERATE MINOR	MAJOR MODERATE MINOR	ADVERSE ADVERSE ADVERSE	ADVERSE ADVERSE ADVERSE	**Sensitivity** Elevated direct views from a residential property towards scheme though partially screened by vegetation. **Construction** Elevated direct open views of construction compound, storage area and access. Partially filtered view of excavation and engineering works. **Operation** Visual impact would decline significantly with the removal of compound area and access movements. Excavated area would be partially filtered by hedgerow vegetation and viewed in close context with urban edge, which would reduce the magnitude of change in the view. **Residual** Establishment of grassland and hedgerow vegetation will serve to further reduce visual impact.

RECEPTOR		SENSITIVITY	MAGNITUDE OF CHANGE		LEVEL OF EFFECT		TYPE OF EFFECT		RATIONALE
VISUAL RECEPTORS			With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	
9	**Houses on Bullamoor Road** **<u>Effects</u>** **Construction** **Operational** **Residual**	MEDIUM	MAJOR MODERATE MINOR	MAJOR MODERATE MODERATE	MAJOR MODERATE MINOR	MAJOR MODERATE MODERATE	ADVERSE ADVERSE ADVERSE	ADVERSE ADVERSE ADVERSE	**Sensitivity** Rear views towards Turker Beck and frontal views towards Sun Beck, generally partially obscured or screened by boundary features and intervening vegetation **Construction** Views would be possible at medium range from most properties of construction works at both sites, including access routes, compounds and excavation areas **Operation** Removal of construction activities and compounds would greatly reduce visual impact, with views still possible of the excavation area at Turker Beck. The excavation area at Sun Beck is likely to be screened more by existing vegetation, as is the permanent access route there. **Residual** The establishment of grassland and growth of hedgerow and tree planting is likely to further reduce visual impact at both sites.

RECEPTOR		SENSITIVITY	MAGNITUDE OF CHANGE		LEVEL OF EFFECT		TYPE OF EFFECT		RATIONALE
VISUAL RECEPTORS			With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	
10	**Houses on Scholla Lane** **<u>Effects</u>** **Construction** **Operational** **Residual**	MEDIUM	MODERATE MINOR NEGLIGIBLE	MODERATE MINOR MINOR	MODERATE MINOR MINOR	MODERATE MINOR MINOR	ADVERSE ADVERSE ADVERSE	ADVERSE ADVERSE ADVERSE	**Sensitivity** Restricted views out onto ordinary setting. Views towards compound area. **Construction** Houses may have upper storey partial views of site compound, access and possibly excavation works. **Operation** Removal of compound and access will significantly reduce adverse visual impact, with a reduced view more likely to be available from eastern properties. **Residual** Growth of hedgerow and tree vegetation and grassland will further reduce visual impact by year 15.

RECEPTOR		SENSITIVITY	MAGNITUDE OF CHANGE		LEVEL OF EFFECT		TYPE OF EFFECT		RATIONALE
VISUAL RECEPTORS			With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	
11	**Newsham Grange** **<u>Effects</u>** **Construction** **Operational** **Residual**	MEDIUM	MINOR NEGLIGIBLE NO CHANGE	MINOR NEGLIGIBLE NEGLIGIBLE	MINOR NEGLIGIBLE NSE	MINOR NEGLIGIBLE NEGLIGIBLE	ADVERSE ADVERSE NEUTRAL	ADVERSE ADVERSE ADVERSE	**Sensitivity** Heavily filtered and partial views may be possible from upper floor windows **Construction** Views of excavation works and site compound will be restricted and filtered by topography and vegetation. **Operation** The removal of the site compound and access arrangements will further reduce the visual impact **Residual** Growth of hedgerow and tree planting will serve to further reduce visual impact caused by the initial removal of vegetation.

RECEPTOR		SENSITIVITY	MAGNITUDE OF CHANGE		LEVEL OF EFFECT		TYPE OF EFFECT		RATIONALE
VISUAL RECEPTORS			With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	
12	**House on Banks Road** **<u>Effects</u>** **Construction** **Operational** **Residual**	MEDIUM	MINOR NEGLIGIBLE NO CHANGE	MINOR NEGLIGIBLE NEGLIGIBLE	MINOR NEGLIGIBLE NSE	MINOR NEGLIGIBLE NEGLIGIBLE	ADVERSE ADVERSE NEUTRAL	ADVERSE ADVERSE ADVERSE	**Sensitivity** Longer range views heavily filtered by vegetation. **Construction** Views are heavily filtered by vegetation. Construction activity is likely to be visible due to the nature of vehicle movements and vertical structures such as those at the site compound and soil storage heaps. **Operation** Due to topography and intervening vegetation the scheme is likely to be imperceptible. **Residual** Again, due to topography and intervening vegetation the scheme is likely to be imperceptible.

RECEPTOR		SENSITIVITY	MAGNITUDE OF CHANGE		LEVEL OF EFFECT		TYPE OF EFFECT		RATIONALE
VISUAL RECEPTORS			With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	
13	**Scholla Lane** **<u>Effects</u>** **Construction** **Operational** **Residual**	MEDIUM	MAJOR MINOR NEGLIGIBLE	MAJOR MINOR MINOR	MAJOR MINOR NSE	MAJOR MINOR MINOR	ADVERSE ADVERSE ADVERSE	ADVERSE ADVERSE ADVERSE	**Sensitivity** Direct views of site access and compound, very restricted views of main works area due to roadside and intervening vegetation. **Construction** The construction compound and access would be directly visible from a short stretch of the road during construction, when the compound and vehicle movements would be visible. **Operation** The removal of construction works would significantly reduce any visual impact. The remaining visible elements would be a permanent access with a gate and surfaced track. **Residual** Any hedgerow planting alongside the access point would have significantly matured.

RECEPTOR		SENSITIVITY	MAGNITUDE OF CHANGE		LEVEL OF EFFECT		TYPE OF EFFECT		RATIONALE
VISUAL RECEPTORS			With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	
14	**Potters Close** **<u>Effects</u>** **Construction** **Operational** **Residual**	HIGH	MODERATE NEGLIGIBLE NEGLIGIBLE	MODERATE NEGLIGIBLE NEGLIGIBLE	MODERATE MINOR NSE	MODERATE MINOR MINOR	ADVERSE ADVERSE NEUTRAL	ADVERSE ADVERSE ADVERSE	**Sensitivity** First and ground floor views from property only partially screened by vegetation **Construction** Construction activity at the main works would be visible over the height of existing hedgerows, but the excavation itself and much of the compound area would be reasonably filtered by existing vegetation. **Operation** The ceasing of construction activity would greatly reduce the views of the works, which would become imperceptible due to existing hedgerows. **Residual** The growth of hedgerow and tree planting, whilst beneficial, is not likely to reduce the already low level of visual impact to a large degree.

RECEPTOR		SENSITIVITY	MAGNITUDE OF CHANGE		LEVEL OF EFFECT		TYPE OF EFFECT		RATIONALE
VISUAL RECEPTORS			With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	
15	**Prospect House** **<u>Effects</u>** **Construction** **Operational** **Residual**	MEDIUM	MAJOR MODERATE MINOR	MAJOR MODERATE MODERATE	MODERATE MODERATE MINOR	MODERATE MODERATE MODERATE	ADVERSE ADVERSE ADVERSE	ADVERSE ADVERSE ADVERSE	**Sensitivity** Gable end elevated direct views, partially filtered by vegetation. **Construction** Direct views of the construction works and compound would be possible. **Operation** Once construction ceases, there would remain a view of the excavated area and access track **Residual** Establishment of the grassland would reduce the visual impact of the excavation. Growth of hedgerow and tree planting would partially screen elements such as the access track.

RECEPTOR		SENSITIVITY	MAGNITUDE OF CHANGE		LEVEL OF EFFECT		TYPE OF EFFECT		RATIONALE
VISUAL RECEPTORS			With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	
16	**Bank Close Farm** **<u>Effects</u>** **Construction** **Operational** **Residual**	MEDIUM	MODERATE NEGLIGIBLE NEGLIGIBLE	MODERATE NEGLIGIBLE NEGLIGIBLE	MODERATE NSE NSE	MODERATE MINOR MINOR	ADVERSE NEUTRAL NEUTRAL	ADVERSE ADVERSE ADVERSE	**Sensitivity** Gable end views from property partially screened by vegetation **Construction** Construction activity at the main works would be visible over the height of existing hedgerows, but the excavation itself and much of the compound area would be reasonably filtered by existing vegetation. **Operation** The ceasing of construction activity would greatly reduce the views of the works, which would become imperceptible due to existing hedgerows. **Residual** The growth of hedgerow and tree planting, whilst beneficial, is not likely to reduce the already low level of visual impact by a large degree.

RECEPTOR		SENSITIVITY	MAGNITUDE OF CHANGE		LEVEL OF EFFECT		TYPE OF EFFECT		RATIONALE
VISUAL RECEPTORS			With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	
17	**Properties on Hailstone Drive** **<u>Effects</u>** **Construction** **Operational** **Residual**	HIGH	MAJOR MODERATE MINOR	MAJOR MODERATE MODERATE	MAJOR MODERATE MINOR	MAJOR MODERATE MODERATE	ADVERSE ADVERSE ADVERSE	ADVERSE ADVERSE ADVERSE	**Sensitivity** First floor and several ground floor direct short range views. Oblique views to extraction area. Some rear boundary screening. **Construction** There would be direct views of construction compound, activity and excavation area along with loss of vegetation. **Operation** **T**he ceasing of construction would reduce visual impact but the permanent surfaced access, loss of vegetation and extracted area would all be clearly visible. **Residual** The growth of hedgerow and tree planting would reduce the visibility of the extracted area, but elements such as the access point and track would remain open to view.

RECEPTOR		SENSITIVITY	MAGNITUDE OF CHANGE		LEVEL OF EFFECT		TYPE OF EFFECT		RATIONALE
VISUAL RECEPTORS			With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	
18	**Properties on Bankhead Road** **<u>Effects</u>** **Construction** **Operational** **Residual**	MEDIUM	MAJOR MODERATE MINOR	MAJOR MODERATE MODERATE	MAJOR MODERATE MINOR	MAJOR MODERATE MODERATE	ADVERSE ADVERSE ADVERSE	ADVERSE ADVERSE ADVERSE	**Sensitivity** Mostly first floor views due to rear boundary screening out onto ordinary setting. **Construction** There would be views of construction compound and activity along with loss of vegetation. **Operation** **T**he ceasing of construction would reduce visual impact but the permanent surfaced access, loss of vegetation and extracted area would all be clearly visible. **Residual** The establishment of grassland and growth of hedgerow and tree planting would partly reduce the visibility of the extraction area and access track.

Appendix 5:
Gazetteer of Heritage Assets

Gazetteer of heritage assets

Asset Number	Asset Name	NGR	Designation	Period	Value	HER reference	Description	Study Area
1	Building (site of) 1	437849, 494509	None	Post medieval	Negligible	-	Site of building shown on 1st edition 6" Ordnance Survey map of 1857. Now demolished and site redeveloped.	Turker Beck
2	Building (site of) 2	438006, 494357	None	Post medieval	Low	-	Site of building shown on 1st edition 6" Ordnance Survey map of 1857. Now demolished.	Turker Beck
3	Building (site of) 3	437928, 494315	None	19th century	Negligible	-	Site of building shown on 1st edition 25" Ordnance Survey map of 1894. Now demolished and site redeveloped.	Turker Beck
4	Building (site of) 4	437878, 493829	None	Post medieval	Negligible	-	Site of building shown on 1st edition 6" Ordnance Survey map of 1857. Now demolished and site redeveloped.	Sun Beck
5	Building (site of) 5	438110, 493832	None	Post medieval	Low	-	Site of building shown on 1st edition 25" Ordnance Survey map of 1894. Now demolished.	Sun Beck
6	Building (site of) 6	438142, 493772	None	19th century	Low	-	Site of building shown on 1st edition 25" Ordnance Survey map of 1894. Now demolished	Sun Beck
7	Prospect Cottages	437972, 493716	None	20th century	Negligible	-	Pair of cottages dating from the early 20th century. Of two-storeys and brick construction, now with modern extensions and windows.	Sun Beck
8	Building (site of) 7	438008, 493704	None	Post medieval	Negligible	-	Site of building shown on 1st edition 6" Ordnance Survey map of 1857. Now demolished and site redeveloped.	Sun Beck
9	Rifle range (site of)	438155, 493703	None	20th century	Negligible	-	Site of rifle range identified on the 1st edition 25" Ordnance Survey map of 1894. Remained in use into the early 20th century. Site now in agricultural use.	Sun Beck

Asset Number	Asset Name	NGR	Designation	Period	Value	HER reference	Description	Study Area
10	Building (site of)	437431, 494597	None	19th century	Negligible	-	Site of building shown on 1st edition 6" Ordnance Survey map of 1857. Now demolished and site redeveloped.	Bullamoor Park
11	Building (site of)	437254, 494479	None	19th century	Negligible	-	Site of building shown on 1st edition 6" Ordnance Survey map of 1857. Now demolished and site redeveloped.	Bullamoor Park
12	Building (site of)	437130, 494463	None	19th century	Negligible	-	Site of building shown on 1st edition 6" Ordnance Survey map of 1857. Now demolished and site redeveloped.	Bullamoor Park
13	Building (site of)	437245, 494460	None	19th century	Negligible	-	Site of building shown on 1st edition 6" Ordnance Survey map of 1857. Now demolished and site redeveloped.	Bullamoor Park
14	Building (site of)	437356, 494320	None	19th century	Negligible	-	Site of building shown on 1st edition 6" Ordnance Survey map of 1857. Now demolished and site redeveloped.	Bullamoor Park
15	Building (site of)	437034, 494265	None	19th century	Negligible	-	Site of building shown on 1st edition 6" Ordnance Survey map of 1857. Now demolished and site redeveloped.	Bullamoor Park
16	Carmelite Friary (site of)	437176, 494247	None	Medieval	Medium	MNY12834	Dedicated to the Virgin Mary. Founded 1356-7 on site given by Edward III and adjoining land granted by the bishop of Durham. Dissolved in 1538. Site was dug for gravel and human bones and skulls have been found. Foundations and terrace were still discernable in the late c18.	Bullamoor Park

Asset Number	Asset Name	NGR	Designation	Period	Value	HER reference	Description	Study Area
17	Northallerton Union Workhouse	437078, 494154	None	19th century	Low	-	Workhouse established in 1857 to replace an earlier workhouse situated located within the former 15th century Guild Hall on High Street. Single-storey entrance block to the west, with central gabled entrance and protecting outer blocks with hipped roofs. Two-storey block holding the male and female wings in the centre, with two-storey infirmary block to the east. Now incorporated into the Friarage Hospital (Asset 18).	Bullamoor Park
18	Friarage Hospital	437176, 494146	None	20th century	Low	-	Hospital established in 1939 at Northallerton Workhouse as an emergency hospital for civilian casualties anticipated from bombing in Teeside. Hutted accommodation erected to the north of the existing buildings and expanded throughout the war. Hospital was adopted as an RAF hospital in 1943 and taken into the National Health Service in 1948. Although now much modernised and extended, some World War 2 survive including a water tower to the west of the site and a single-storey E-plan building located on the east side of the hospital.	Bullamoor Park
19	Horse Pond	437061, 494125	None	18th century	Negligible	-	Horse pond shown on historic maps from the late 18th century, used to water and wash stage coach horses	Bullamoor Park

Asset Number	Asset Name	NGR	Designation	Period	Value	HER reference	Description	Study Area
20	Buildings (site of)	437245, 494083	None	19th century	Low	-	Site of buildings shown on Tithe map and 1st edition 6" Ordnance Survey map of 1857. Now demolished and site part of Bullamoor Park.	Bullamoor Park
21	Victorian houses, Bullamoor Road	437285, 494053	None	Post medieval	Low	-	Pair of late Victorian houses, constructed of red brick with painted stone dressings. Bay windows to the outer bays, and paired doorways towards the centre of the elevation. Well-maintained houses which, despite some loss of original glazing, retain much of their historic character.	Bullamoor Park
22	Building (site of)	437317, 494237	None	Post medieval	Low	-	Site of building shown on 1st edition 6" Ordnance Survey map of 1857. Now demolished and site now part of Bullamoor Park.	Bullamoor Park
23	Buildings (site of)	437213, 494087	None	Post medieval	Negligible	-	Site of buildings shown on Tithe map and 1st edition 6" Ordnance Survey map of 1857. Now demolished and site redeveloped.	Bullamoor Park
24	Former field boundary	437990, 494790	None	Post medieval	Negligible	ENY3114	Field boundary aligned northeast – southwest identified by geophysical survey. Appears to correlate to a field boundary shown on the 1st edition Ordnance Survey map of 1857	Turker Beck
25	Ridge and furrow area 1	437990, 494730	None	Medieval / Post medieval	Negligible	ENY3114	Traces of ridge and furrow cultivation identified by geophysical survey as weak parallel positive magnetic anomalies broadly aligned NW – SE evenly spaced at 5-6m intervals. Focussed to the north of the survey area.	Turker Beck

Asset Number	Asset Name	NGR	Designation	Period	Value	HER reference	Description	Study Area
26	Ridge and furrow area 2	438180, 494630	None	Medieval / Post medieval	Negligible	ENY3114	Extremely faint traces of ridge and furrow cultivation detected by geophysical survey as weak parallel positive magnetic anomalies broadly aligned NW – SE evenly spaced at 5-6m intervals	Turker Beck
27	Ridge and furrow area 3	438200, 493960	None	Medieval / Post medieval	Negligible	ENY2058	Traces of ridge and furrow cultivation identified by geophysical survey as weak parallel positive magnetic anomalies broadly aligned NW – SE	Sun Beck
28	Geophysical anomalies	438210, 493930	None	Unknown	Low	ENY2058	Geophysical survey identified extremely weak, arctuate positive magnetic anomalies. These possibly represent scant remains of former ditches or gullies.	Sun Beck
29	Ridge and furrow area 4	438150, 493740	None	Medieval / Post medieval	Negligible	ENY2058	Faint traces of ridge and furrow cultivation identified from geophysical survey as weak parallel positive magnetic anomalies aligned northeast-southwest. Tentative remains of a short length of ditch perpendicular to the ridge and furrow was also identified.	Sun Beck
30	Ridge and furrow area 5	438110, 493640	None	Medieval / Post medieval	Negligible	ENY3114	Geophysical survey in this area identified very weak parallel positive magnetic lineations aligned north-south which represent the remains of ridge and furrow.	Sun Beck
31	Former field system	438170, 493500	None	Unknown	Medium	ENY2058	Geophysical survey identified a series of ditched boundaries which defined a series of enclosed fields, once of which may have a clavicular entrance.	Sun Beck

Asset Number	Asset Name	NGR	Designation	Period	Value	HER reference	Description	Study Area
32	Possible Ring Ditch	438180, 493490	None	Prehistoric	Medium	ENY2058	Geophysical survey identified a possible ring ditch possibly associated with a ditched field system (Asset 31).	Sun Beck

Appendix 6: Bullamoor Park Desk Based Assessment

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Environment Agency

Northallerton Flood Alleviation Scheme (FAS)

Bullamoor Park

Cultural Heritage Desk-based assessment

May 2012

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Document Control Sheet

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Contents

1 Introduction

Jacobs have been commissioned by the Environment Agency to prepare proposals and supporting documents for an application for flood alleviation works at three locations in Northallerton. The flood alleviation works have been proposed in order to protect 259 residential properties, 32 commercial properties and a hospital against flooding during a flood event with a return period of 200 years.

This report presents the results of a heritage desk-based study of the location of proposed works in Bullamoor Park (NGR 437264,494271; Figure 1), where it is proposed to replace four existing concrete headwalls and trash screens along Turker Beck.

Paragraphs 128 and 129 of the National Planning Policy Framework (NPPF) require applicants and the Local Planning Authority to assess the significance of any heritage assets affected by development and the contribution of their setting to that significance. The impact of the proposals on the significance of the heritage asset will then be taken into account by the Local Planning Authority in determining the application. This report has been prepared in fulfilment of the requirements of paragraphs 128 and 129 of the NPPF.

2 Planning Policy Context

2.1 Legislative Context

Scheduled Monuments are by definition of National importance and are protected by law under the Ancient Monuments and Archaeological Areas Act 1979. Consequently, it is a criminal offence to damage a Scheduled Monument, and Consent must be obtained from the Secretary of State before any works affecting a Scheduled Monument may take place.

Listed buildings are protected under the Planning (Listed Buildings and Conservation Areas) Act 1990, and are recognised to be of special architectural or historic interest. Under the Act, planning authorities are instructed to have special regard to the desirability of preserving a listed building, its setting, or any features of special architectural or historic interest which it possesses (Planning (Listed Buildings and Conservation Areas) Act s.66(1)). Designation as a listed building confers additional controls over demolition and alteration through the requirement for Listed Building Consent to be gained before undertaking works of alteration or demolition.

Under Section 69 of the Planning (Listed Buildings and Conservation Areas) Act 1990, Local Planning Authorities have the duty to designate 'areas of special architectural or historic interest the appearance of character of which it is desirable to preserve or enhance' as conservation areas. Designation provides control over demolition of unlisted buildings through the requirement for Conservation Area Consent. In addition conservation area designation limits certain permitted development rights, and provides the basis for planning policies to further preserve and enhance the area's special character.

2.2 National Planning Policy Framework

National planning policies on the conservation of the historic environment are set out in section 12 of the National Planning Policy Framework (NPPF) (DCLG 2012).

The NPPF recognises that heritage assets are an irreplaceable resource which should be conserved in a manner appropriate to their significance. Significance is defined by the NPPF as 'the value of a heritage asset to this and future generations because of its heritage interest'. This significance may be related to archaeological, architectural and artistic or historic elements, and may also derive from the setting of the site (DCLG 2012, 56).

Under paragraph 128, applicants for planning permission are required to provide a description of the significance of heritage assets affected and the contribution of setting to this, in sufficient detail to understand the potential impact of the proposal on this.

In determining planning applications, local planning authorities are instructed to take into account:

- *the desirability of sustaining and enhancing the significance of heritage assets and putting them to viable uses consistent with their conservation;*
- *the positive contribution that conservation of heritage assets can make to sustainable communities including their economic vitality; and*

- *the desirability of new development making a positive contribution to local character and distinctiveness. (DCLG 2012, para 131).*

Under paragraph 135, the impact of a proposed development of the significance of undesignated heritage assets is to be taken into account in determining planning applications, with a balanced judgement to be made with regards to the scale of any harm/loss, and the significance of the asset.

Where a heritage asset will be wholly or partially lost, local planning authorities are instructed to require developers to record and advance understanding of the significance of the heritage assets in a manner proportionate to their importance and the impact. This evidence should then made publicly accessible through deposit with the relevant Historic Environment Record (DCLG 2012, para 141).

2.3 Local Planning Policy

Core Strategy Policy CS16 of the Hambleton District Council (HDC) Local Development Framework (HDC 2007) states that development or other initiatives which preserve and enhance the District's natural and manmade assets will be supported. Development or activities will not be supported which have a detrimental impact upon the interests of a natural or man-made asset, are inconsistent with the principles of an asset's proper management or contrary to the necessary control of development within nationally or locally designated areas. The policy also sets out the requirement to provide any necessary mitigating or compensatory measures to address potential harmful implications of development.

Development Plan Policies DP28 and DP29 (HDC 2008) provide further specific guidance in relation to the historic environment. Policy DP28 sets out the council's commitment to the preservation and enhancement of listed buildings, conservation areas, historic battlefields and parks and gardens, and other features or uses which contribute to the heritage of the district. The policy goes on the set out the requirement that development affecting a historic feature or its setting should seek to preserve or enhance all aspects that contribute to its character and appearance. Permission for development will be granted where this is consistent with the conservation of the feature, and its interpretation and public enjoyment. Developments will be refused which could prejudice the restoration of a historic feature.

Policy DP29 relates to archaeology. The policy supports the preservation or enhancement of archaeological remains and their settings, and sets out a presumption in favour of preservation of Scheduled Monuments, or other nationally important archaeological sites. For sites of lesser significance, development will only be permitted where the need for development and other material considerations outweighs the importance of the remains. Preservation in situ is preferred; however where this is not justifiable or achievable, the policy sets out the requirement for the excavation and recording of the archaeological remains and the publication of the results. An appropriate assessment and evaluation in areas of known or potential archaeological interest is required to accompany any development proposals.

3 Methodology

3.1 Data gathering

A study area was defined extending 200m in all directions around the proposed works within Bullamoor Park. For this study area, information was gathered from the following sources:

- *National Heritage List for information on nationally designated heritage assets;*
- *North Yorkshire Historic Environment Record for information on undesignated heritage assets, previous archaeological fieldwork and Historic Landscape Characterisation data;*
- *Historic Ordnance Survey mapping and pre-Ordnance Survey mapping held by the North Yorkshire Record Office;*
- *Conservation area information from Hambleton District Council;*
- *Published sources on Northallerton history held by Northallerton Library; and*
- *A site inspection undertaken on May 1st 2012.*

The numbering of assets identified from these sources continues the sequence used for assets within the Turker Beck and Sun Beck study areas (see section 6.6 of the Environmental Report).

3.2 Assessment of Value

For the purposes of this assessment, the methodology for the assessment of value provided in Volume 11, Section 3, Part 2 of the Design Manual for Roads and Bridges (DMRB 208/07) was employed, as this provides a robust methodology for the assessment and impacts on heritage assets.

An assessment of the value of each heritage asset was made on a six-point scale of Very High, High, Medium, Low, Negligible and Unknown, using professional judgement guided by the criteria provided by DMRB Volume 11, Section 3 Part 2 (HA 208/07). These are provided in Tables 1 to 3 below.

Historic Landscape Characterisation data provided by the North Yorkshire Historic Environment Record was assessed by Jacobs and grouped into 'types' (Rippon 2004). These areas represent all of the individual elements, parcels and components within the study area which contribute to the broader categories of type as described below. The types have then been assessed for value, based on their contribution to the historic landscape of the study area and on a regional and national scale as described below.

Table 1 - Criteria to Assess the Value of Archaeological Remains

Value	Criteria
Very High	World Heritage Sites (including nominated sites). Assets of acknowledged international importance. Assets that can contribute significantly to acknowledged international research objectives.
High	Scheduled Monuments (including proposed sites). Undesignated assets of schedulable quality and importance. Assets that can contribute significantly to acknowledged national research objectives.
Medium	Designated or undesignated assets that contribute to regional research objectives.
Low	Designated and undesignated assets of local importance. Assets compromised by poor preservation and/or poor survival of contextual associations. Assets of limited value, but with potential to contribute to local research objectives.
Negligible	Assets with very little or no surviving archaeological interest.
Unknown	The importance of the site has not been ascertained.

Table 2 - Criteria to Assess the Value of Historic Buildings

Value	Criteria
Very High	• Structures inscribed as of universal importance as World Heritage Sites. • Other buildings of recognised international importance.
High	• Scheduled Monuments with standing remains. • Grade I and II* Listed Buildings. • Other listed buildings that can be shown to have exceptional qualities in their fabric or historical associations not adequately reflected in the listing grade. • Conservation areas containing very important buildings. • Undesignated structures of clear national importance.
Medium	• Grade II Listed Buildings. • Historic (unlisted) buildings that can be shown to have exceptional qualities in their fabric or historical associations. • Conservation areas containing buildings that contribute significantly to its historic character. • Historic Townscape or built-up areas with important historic integrity in their buildings, or built settings (e.g. including street furniture and other structures).
Low	• 'Locally listed' buildings. • Historic (unlisted) buildings of modest quality in their fabric or historical association. • Historic Townscape or built-up areas of limited historic integrity in their buildings, or built settings (e.g. including street furniture and other structures).
Negligible	• Buildings of no architectural or historical note; buildings of an intrusive character.
Unknown	• Buildings with some hidden (i.e. inaccessible) potential for historic significance.

Table 3 - Criteria to Assess the Value of the Historic Landscape

Value	Criteria
Very High	• World Heritage Sites inscribed for their historic landscape qualities. • Historic landscapes of international value, whether designated or not. • Extremely well preserved historic landscapes with exceptional coherence, time-depth, or other critical factor(s).
High	• Designated historic landscapes of outstanding interest. • Undesignated landscapes of outstanding interest. • Undesignated landscapes of high quality and importance, and of demonstrable national value. • Well preserved historic landscapes, exhibiting considerable coherence, time-depth or other critical factor(s).
Medium	• Designated special historic landscapes. • Undesignated historic landscapes that would justify special historic landscape designation, landscapes of regional value. • Averagely well-preserved historic landscapes with reasonable coherence, time-depth or other critical factor(s).
Low	• Robust undesignated historic landscapes. • Historic landscapes with importance to local interest groups. • Historic landscapes whose value is limited by poor preservation and/or poor survival of contextual associations.
Negligible	• Landscapes with little or no significant historical interest.
Unknown	• World Heritage Sites inscribed for their historic landscape qualities. • Historic landscapes of international value, whether designated or not. • Extremely well preserved historic landscapes with exceptional coherence, time-depth, or other critical factor(s).

4 Cultural Heritage Background

Evidence of prehistoric activity has been identified around Northallerton, including a Bronze Age axehead found to the west of Castle Hills in 1918, and a Bronze Age spearhead found to the south of the town. Evidence of Roman activity has been identified in the surrounding area. Castle Hills, to the west of the town has been suggested as the site of a Roman encampment, following the discovery of evidence including Roman coins, building foundations and an altar during the construction of the Great North of England Railway in the late 1830s (Riordan 2002, 5). The presence of a colonia has also been suggested following the identification of evidence for Roman field boundaries during excavations in advance of the construction of a Tesco supermarket on East Road (Ibid.). However, the overall form and nature of Roman settlement in Northallerton is largely unclear.

The Domesday Book records the manor of Aluertune, with extensive lands including eleven villages and 24 outlying properties (ASDU 2007, 5). No reference is made to the settlement of Northallerton, possibly indicating that it was not large or significant at this time. The manor is recorded as waste in Domesday probably as a result of destruction during the harrying of the North. The manor was granted to the Bishop of Durham in the 11th century, beginning a long association between the town and bishopric, and resulting in the construction of the Bishop's Palace to the west of the town.

Throughout the medieval period, Northallerton developed as a local market and administrative centre, with its growth aided by its location on the important north-south route of Dere Street. The distinctive corridor plan of Northallerton developed during this period, with the broad High Street flanked to either side by parallel lines of buildings with long narrow burgage plots extending to their rear.

During the Medieval period, two friaries were established in the town: an Austin Friary founded in 1340 at the north end of High Street; and a Carmelite Friary (Asset 16) established further to the northeast, close to the site of the current Friarage Hospital. The precise date of the Carmelite Friary's foundation is unknown; however it is possible that it was established following a grant of land to the Order by Thomas Hatfield, then the Bishop of Durham in 1354. Two years later, Edward III granted the Order licence to establish a house in Northallerton on a plot of land called Tentour and three acres of pasture gifted by a London merchant called John Yole (ASDU 2007, 6). The Friary grew over the following years with further grants of land from the Bishop of Durham and notable benefactors including the Neville family, who were responsible for building the friary church. Historical documents record the numerous grants and bequests to the friary over the following centuries, including grants from individuals such as Lord Scrope of Bolton Castle, Sir Thomas de Boynton of Acklam and Sir Fitz-Randolph, the Lord of Middleham (ASDU 2007, 7).

The friary was dissolved in 1539, and its lands are recorded to have been held by Hugh Wetherell by February 1539, passing to Richard and Henry Vavasour by 1553 (ASDU 2007, 7). The friarage site appears to have been converted back to agriculture, and was known as Friarage Fields over the following centuries.

Northallerton was an important agricultural and market centre in the post-medieval period. Settlement continued to be focussed along the High Street, with little development outside this area (Figures 2 and 3). Communication remained

important to the development of Northallerton in the post-medieval period, with its establishment as a coaching town in the 18th century, and the construction of the Great North of England Railway (now the East Coast Mainline) through Northallerton in the late 1830s, and the later addition of local branch lines. From the mid-19th century, the town began to expand beyond the confines of the High Street, including the establishment of a workhouse on the Friary site to the east of the town in 1857, and the laying out of South Parade to connect the town with the railway station (Figure 4). Friarage Fields were used as the location for the Northallerton Agricultural Show in the 19th century.

The town remained an important local centre into the 20th and 21st centuries, being the County Town, as well as an agricultural and commercial centre. Suburban expansion has greatly extended the town, with the construction of large modern suburbs around the historic core. The study area was extensively developed during the 20th century with suburban housing, including both social and private estates. Bullamoor Park, a small public park, was established in the mid-20th century to provide recreational space for these new developments, including a football pitch, lawns and some small areas of ornamental planting (Plate 1).

5 Baseline Conditions

From the sources identified in Section 3.1 above, a total of fourteen heritage assets were identified within the study area. These are listed in Table 4 below and shown on Figure 5.

Asset 16, the site of the Carmelite Friary is located outside the study area, however has been included in the baseline data due to the potential for associated archaeological remains to extend into the study area.

Table 4: Baseline archaeological and historic building assets

Asset Number	Asset Name	Designation	Value
10	Building (site of)	None	Negligible
11	Building (site of)	None	Negligible
12	Building (site of)	None	Negligible
13	Building (site of)	None	Negligible
14	Building (site of)	None	Negligible
15	Building (site of)	None	Negligible
16	Carmelite Friary (site of)	None	Medium
17	Northallerton Union Workhouse	None	Low
18	Friarage Hospital	None	Low
19	Horse Pond	None	Negligible
20	Buildings (site of)	None	Low
21	Victorian houses, Bullamoor Road	None	Low
22	Building (site of)	None	Negligible
23	Building (site of)	None	Low

5.1 Archaeological Remains

Asset 16 is the site of the Carmelite Friary established around the mid-14th century, following grants of land from a London merchant and a licence from Edward III in 1356. The site of the friary extended from the current hospital to the High Street and between Bullamoor Lane and Turker Beck Lane (Riordan 1990, 11). Following the dissolution of the foundation in 1539, this land appears to have been returned to agriculture, although it continued to be known as Friarage Fields. In his history of Northallerton in the County of York written in 1791, Thomas Langdale recorded that the 'the terrace, and some foundations of the out walls are still discernible' (quoted in ASDU 2007, 7); however, by 1858 no evidence of the friary was said to survive, save reused stonework in a wall on Brompton Road. Gravel working to the north of the friarage site in the 19th century is recorded to have revealed evidence including substantial amounts of human bone and a large stone wall (Riordan 1990, 12). Today, the site of the friarage has been extensively developed, both with suburban buildings and the Friarage Hospital (Asset 18). Archaeological investigations to the west of Brompton Road identified the east side of the cloister, a possible domestic building and a number of burials; however, there has been no other archaeological investigation of the site. The geographical extents of the former friary are unclear from currently available information and it is possible that the asset formerly extended into the area of Bullamoor Park. The Carmelite Friary has been assessed to be of Medium importance due to its historic and archaeological potential.

Assets 20 and 23 are the sites of buildings identified from historic mapping, which are shown to have been located along the roadside on the eastern edge of Northallerton. These assets are now demolished. Due to the potential for associated archaeological remains to survive, the value of these assets has been assessed to be Low.

Asset 19 is the site of the horse pond which is shown on historic maps from the late 18th century (Figure 3) and was used to water and wash stage coach horses. The pond was removed by construction of the workhouse (Asset 17) in the mid-19th century. The asset has therefore been assessed to be of Negligible value.

The most numerous asset type identified within the study area are the sites of buildings shown on historic Ordnance Survey maps from the mid-19th to early 20th centuries (Assets 10, 11, 12, 13, 14, 15, and 22; Figures 2-4). These are all depicted as small, stand-alone structures located within fields which may represent field barns. All have now been demolished and their sites redeveloped. The value of these assets has therefore been assessed to be Negligible.

5.2 Archaeological potential

Although there has been no modern development within Bullamoor Park; ground levelling has been undertaken for the creation of football pitches and car parking, and the banks of Turker Beck have been artificially graded to form an even slope (Plates 1, 2 and 3). These works may have impacted on the preservation of archaeological remains within the park.

Whilst no evidence for prehistoric and Roman activity has been identified within the study area, evidence is known from the surrounding area. This includes occasional prehistoric finds from around Northallerton, Roman field boundaries excavated at the Tesco site on East Road, and antiquarian references to roman material discovered during the construction of the East Coast mainline in the 19th century. Consequently, there is moderate potential for archaeological remains of dating from these periods to be present within the study area.

The geographical extents of the Carmelite Friary (Asset 16) are currently poorly defined and may extend into the area of Bullamoor Park. The potential for archaeological evidence associated with the Friary to extend into the proposed development areas has been assessed to be Moderate.

5.3 Historic Buildings

The Northallerton Union Workhouse (Asset 17) was established in 1857 to replace an earlier workhouse situated located within the former 15th century Guild Hall on High Street. By the 19th century, the former Guild Hall was in very condition and noted as being ‘one of the most wretched poor houses in England with a medical man fully qualified but seldom sober!’ (1844 report quoted in Riordan 1990, 15). The workhouse comprises a single-storey entrance block to the west, with central gabled entrance and protecting outer blocks with hipped roofs (Plate 4). To the east of this is the two-storey brick block which held separate male and female wings and, further to the east is another two-storey block which held the infirmary. The workhouse is now incorporated into the Friarage Hospital (Asset 18) and has been assessed to be of Low value.

Asset 18 is the Friarage Hospital which was established in 1939 as an emergency hospital to cater for anticipated civilian casualties from bombing in Teeside. The

hospital was established at the workhouse (Asset 17) with the construction of hutted accommodation erected to the north of the existing buildings (ASDU 2007, 8). The hospital expanded throughout the war, and was adopted as an RAF hospital in 1943 before being taken into the National Health Service at its establishment in 1948. Whilst the hospital has been considerably extended and improved over the last two decades, a number of structures dating from the establishment of the hospital in World War 2 survive today, including a water tower to the west of the site and a single-storey E-plan building located on the east side of the hospital. Taking its architectural and historic interest into account, the Friarage Hospital has been assessed to be of Low value.

Asset 21 comprises a pair of late Victorian houses, located to the south of Bullamoor Road. The houses are constructed of red brick with painted stone dressings, bay windows to the outer bays, and paired doorways towards the centre of the elevation (Plate 5). The houses are well-maintained and, despite some loss of original glazing, retain much of their historic character. Asset 21 is therefore assessed to be of Low value.

5.4 Historic Landscape

Within the study area, one historic landscape character type has been identified. This is shown on Figure 6 and comprises an area of planned residential estate. This type is characterised by development of suburban and council housing in the second half of the 20th century, and has been assessed to be of Negligible value.

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Ordnance Survey XX edition 25" map. 1913. North Yorkshire sheet 56.13

Ordnance Survey XX edition 25" map. 1929. North Yorkshire sheet 56.13

7 Plates

Plate 1: General view southeast across Bullamoor Park

Plate 2: general view of Turker Beck in Bullamoor Park adjacent to the Friarage Hospital, showing the artificially graded banks

Plate 3: general view of Turker Beck in Bullamoor Park looking northeast towards Turker Close, showing the artificially graded banks

Plate 4: the Northallerton Union Workhouse (Asset 17)

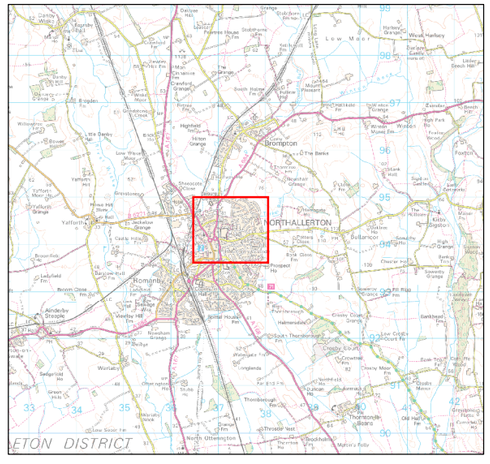
Plate 5: the Victorian houses to the south of Bullamoor Road (Asset 21)

8 Figures

FIGURE 1

Legend

- 200m Study Area
- Location of Headwalls Proposed for Replacement



Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	MAY 12	Initial Issue	AD	SH	JD	AP

Environment Agency

Project

NORTHALLERTON FAS

Drawing Title

BULLAMOOR PARK DESK BASED STUDY
LOCATION PLAN

Drawing Status

Scale @ A3	1:5,000	DO NOT SCALE
Jacobs No.	B1756400	
Client No.		

Drawing No.

B1756400_CHD_01

FIGURE 2

Legend

200m Study Area

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Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	MAY 12	Initial Issue	AD	SH	JD	AP

Environment Agency

Project: NORTHALLERTON FAS

Drawing Title: EXTRACT FROM THE 1797 TOWN MAP OF NORTHALLERTON

Drawing Status:

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Jacobs No.	B1756400	
Client No.		

Drawing No. B1756400_CHD_02

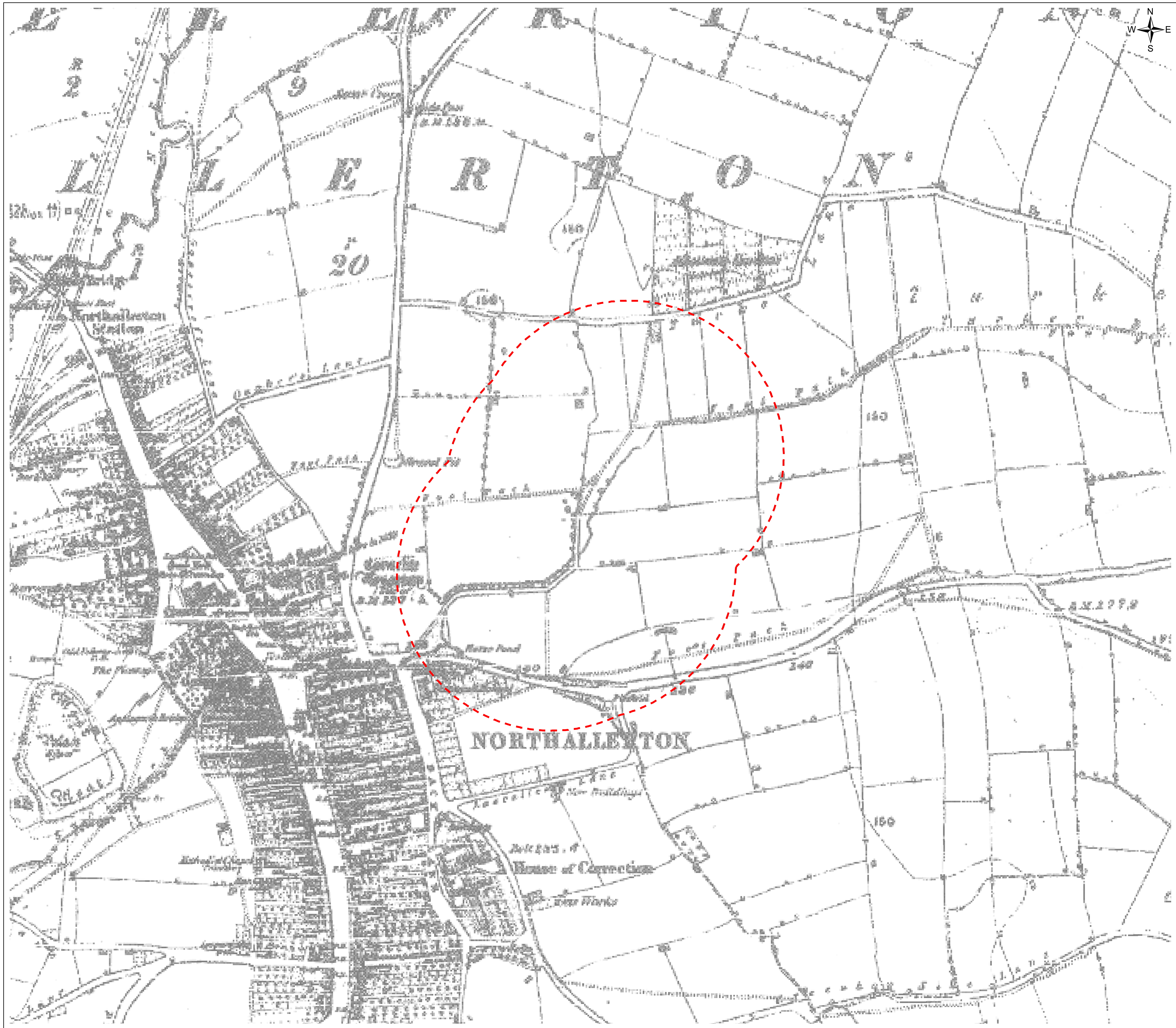

FIGURE 3

Legend

200m Study Area

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	MAY 12	Initial Issue	AD	SH	JD	AP

Environment Agency

Project

NORTHALLERTON FAS

Drawing Title

EXTRACT FROM THE 1ST EDITION 6" ORDNANCE SURVEY MAP, 1856, NORTH YORKSHIRE SHEET 56

Drawing Status

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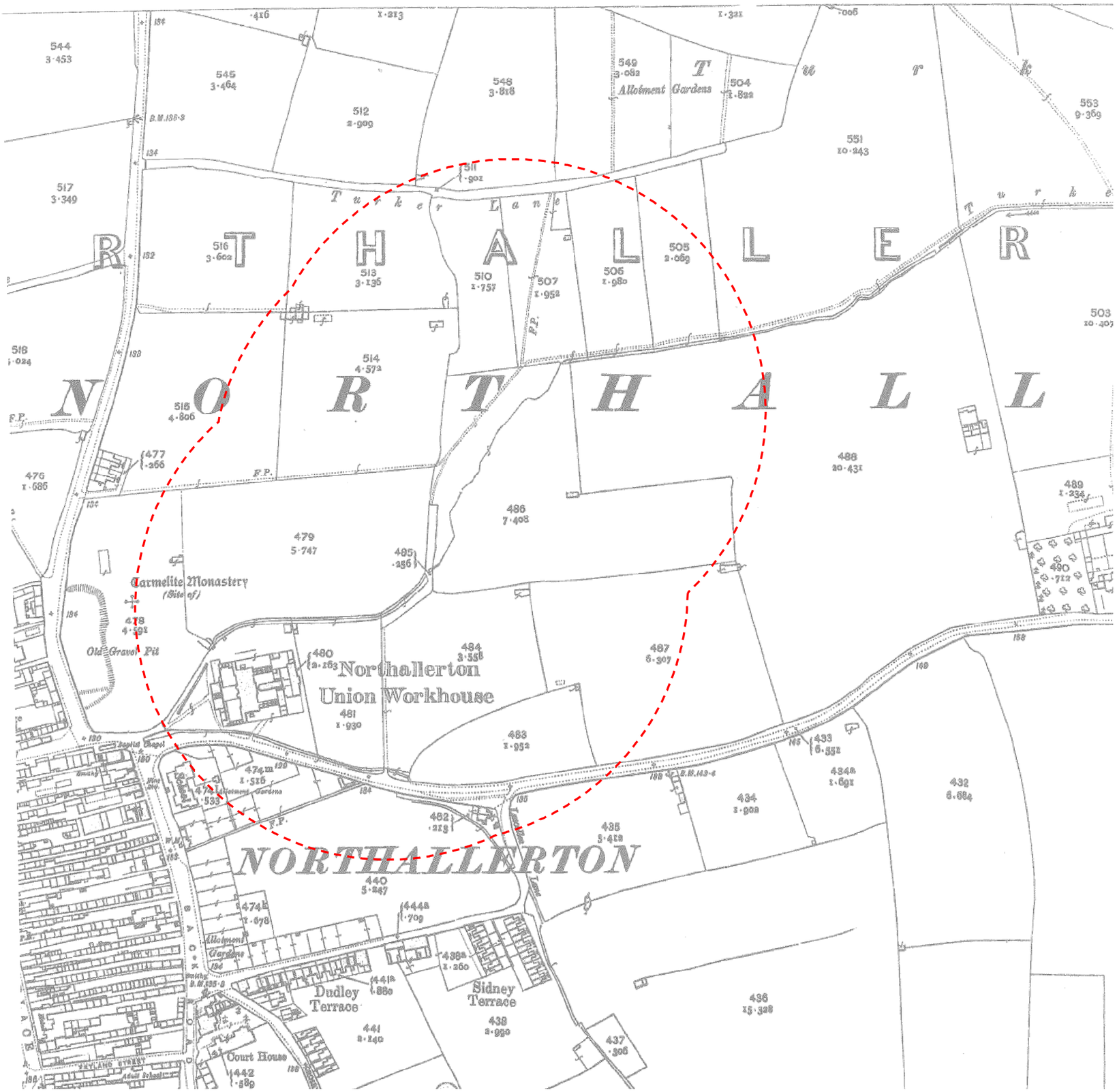
Drawing No.

B1756400_CHD_03

FIGURE 4



Legend

200m Study Area

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	MAY 12	Initial Issue	AD	SH	JD	AP

Environment Agency

Project

NORTHALLERTON FAS

Drawing Title

EXTRACT FROM THE 2ND EDITION 25" ORDNANCE SURVEY MAP OF 1913, NORTH YORKSHIRE SHEET 56.13

Drawing Status

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Drawing No.

B1756400_CHD_04

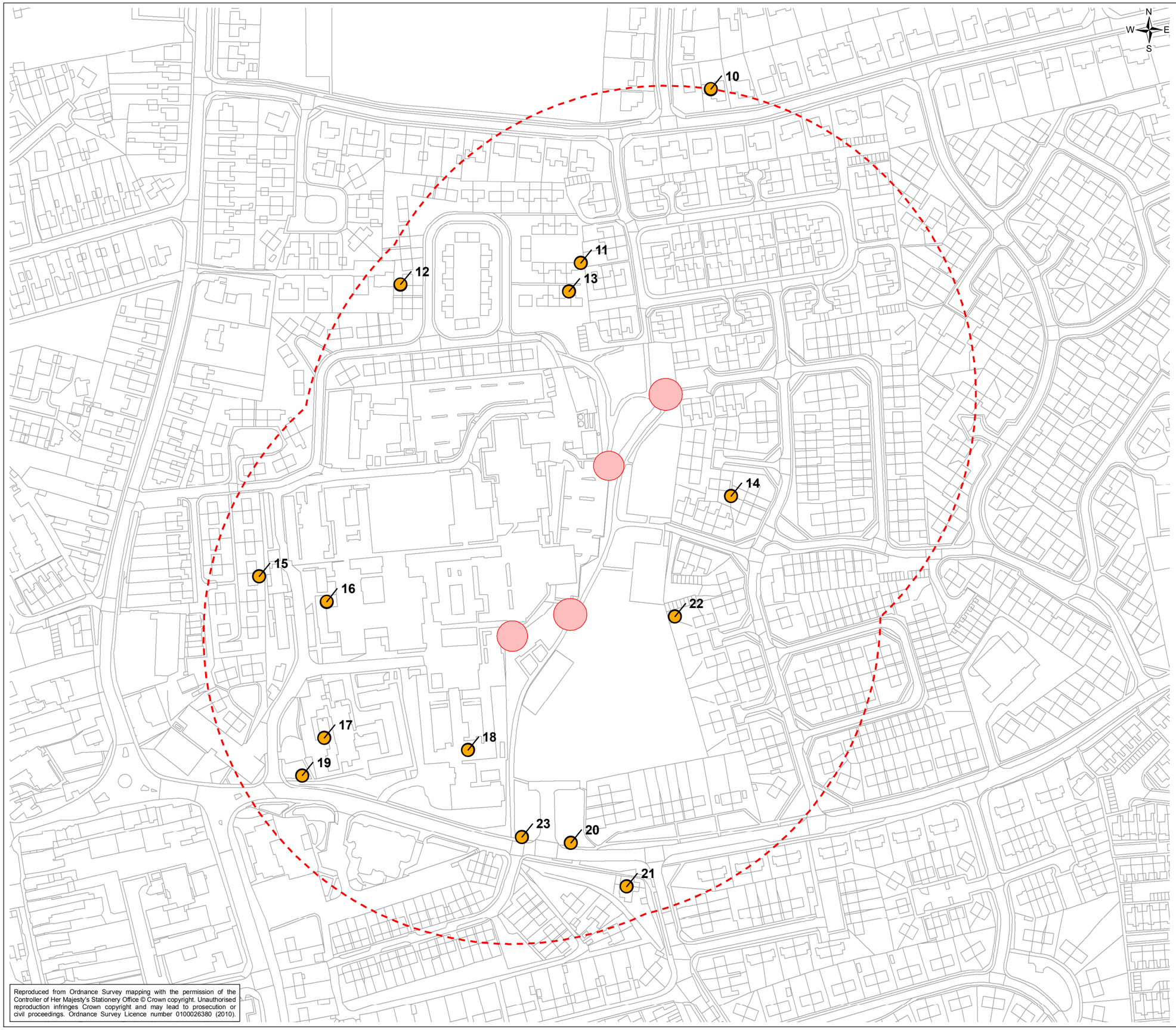

FIGURE 5

Legend

- 200m Study Area
- Location of Headwalls Proposed for Replacement
- Undesignated Cultural Heritage Asset

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	MAY 12	Initial Issue	AD	SH	JD	AP

Environment Agency

Project: NORTHALLERTON FAS

Drawing Title: LOCATION OF CULTURAL HERITAGE ASSETS

Drawing Status:

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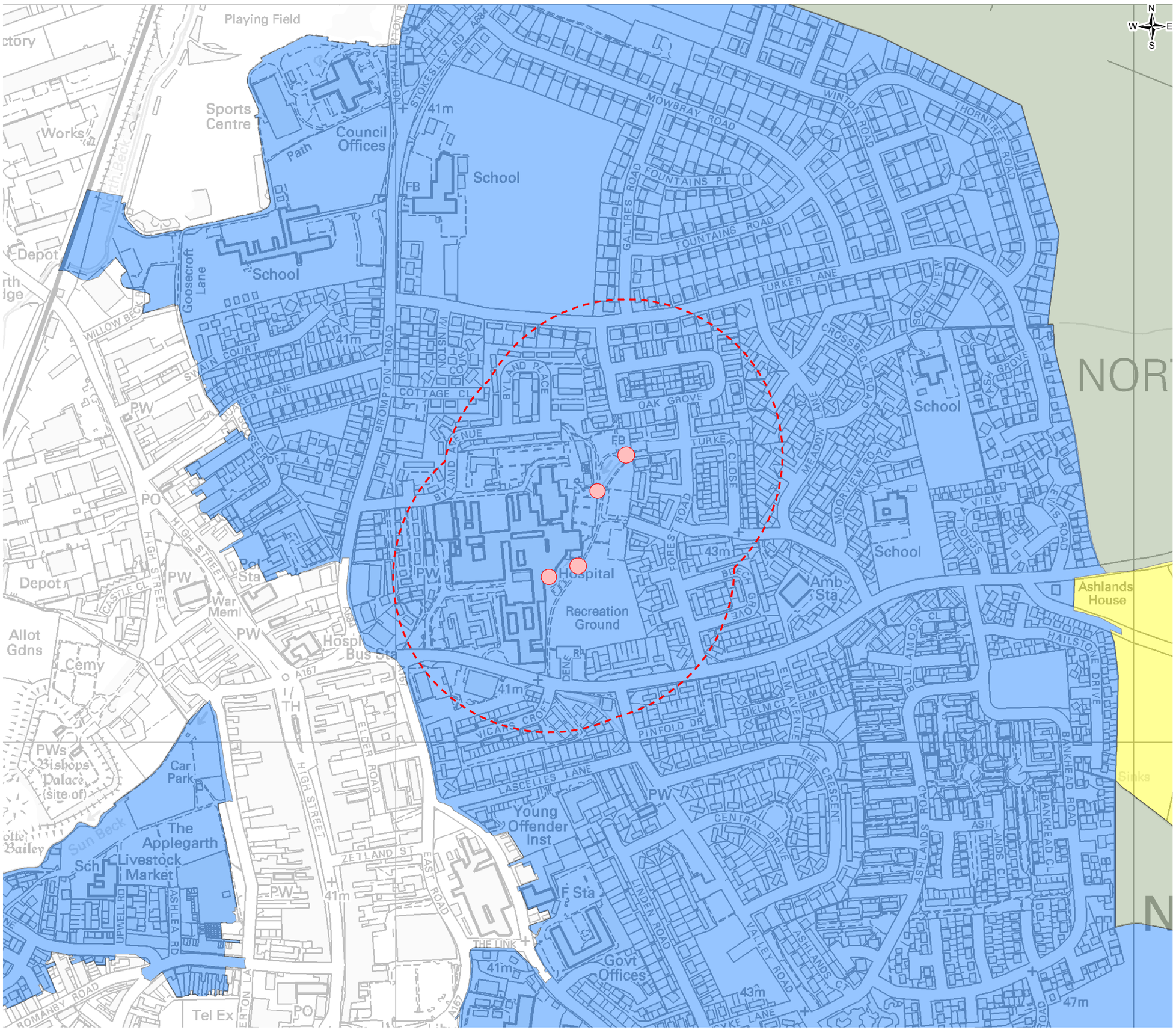

FIGURE 6

Legend

- 200m Study Area
- Location of Headwalls Proposed for Replacement

Historic Landscape Character Types

- Modern Improved Fields
- Planned Estate
- Strip Fields

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	App'd
0	MAY 12	Initial Issue	AD	SH	JD	AP

Environment Agency

Project: NORTHALLERTON FAS

Drawing Title: HISTORIC LANDSCAPE

Drawing Status

Scale @ A3	1:5,000	DO NOT SCALE
Jacobs No.	B1756400	
Client No.		

Drawing No. B1756400_CHD_06

Appendix A: Gazetteer of heritage assets

Asset Number	Asset Name	NGR	Designation	Period	Value	HER reference	Description
10	Building (site of)	437431, 494597	None	19th century	Negligible	-	Site of building shown on 1st edition 6" Ordnance Survey map of 1857. Now demolished and site redeveloped.
11	Building (site of)	437254, 494479	None	19th century	Negligible	-	Site of building shown on 1st edition 6" Ordnance Survey map of 1857. Now demolished and site redeveloped.
12	Building (site of)	437130, 494463	None	19th century	Negligible	-	Site of building shown on 1st edition 6" Ordnance Survey map of 1857. Now demolished and site redeveloped.
13	Building (site of)	437245, 494460	None	19th century	Negligible	-	Site of building shown on 1st edition 6" Ordnance Survey map of 1857. Now demolished and site redeveloped.
14	Building (site of)	437356, 494320	None	19th century	Negligible	-	Site of building shown on 1st edition 6" Ordnance Survey map of 1857. Now demolished and site redeveloped.
15	Building (site of)	437034, 494265	None	19th century	Negligible	-	Site of building shown on 1st edition 6" Ordnance Survey map of 1857. Now demolished and site redeveloped.
16	Carmelite Friary (site of)	4370180,494247	None	Medieval	Medium	MNY12834	Dedicated to the Virgin Mary. Founded 1356-7 on site given by Edward III and adjoining land granted by the bishop of Durham. Dissolved in 1538. Site was dug for gravel and human bones and skulls have been found. Foundations and terrace were still discernable in the late c18.

Asset Number	Asset Name	NGR	Designation	Period	Value	HER reference	Description
17	Northallerton Union Workhouse	437078, 494154	None	19th century	Low	-	Workhouse established in 1857 to replace an earlier workhouse situated located within the former 15th century Guild Hall on High Street. Single-storey entrance block to the west, with central gabled entrance and protecting outer blocks with hipped roofs. Two-storey block holding the male and female wings in the centre, with two-storey infirmary block to the east. Now incorporated into the Friarage Hospital (Asset 18).
18	Friarage Hospital	437176, 494146	None	20th century	Low	-	Hospital established in 1939 at Northallerton Workhouse as an emergency hospital for civilian casualties anticipated from bombing in Teeside. Hutted accommodation erected to the north of the existing buildings and expanded throughout the war. Hospital was adopted as an RAF hospital in 1943 and taken into the National Health Service in 1948. Although now much modernised and extended, some World War 2 survive including a water tower to the west of the site and a single-storey E-plan building located on the east side of the hospital.
19	Horse Pond	437061, 494125	None	18th century	Negligible	-	Horse pond shown on historic maps from the late 18th century, used to water and wash stage coach horses
20	Buildings (site of)	437245, 494083	None	19th century	Low	-	Site of buildings shown on Tithe map and 1st edition 6" Ordnance Survey map of 1857. Now demolished.
21	Victorian houses, Bullamoor Road	437285, 494053	None	Post medieval	Low	-	Pair of late Victorian houses, constructed of red brick with painted stone dressings. Bay windows to the outer bays, and paired doorways towards the centre of the elevation. Well-maintained houses which, despite some loss of original glazing, retain much of their historic character.
22	Building (site of)	437317, 494237	None		Negligible	-	Site of building shown on 1st edition 6" Ordnance Survey map of 1857. Now demolished and site redeveloped.

Asset Number	Asset Name	NGR	Designation	Period	Value	HER reference	Description
23	Buildings (site of)	437213, 494087	None		Low	-	Site of buildings shown on Tithe map and 1st edition 6" Ordnance Survey map of 1857. Now demolished.

Appendix 7:
Durham University Archaeological Desk Based Assessment

ARCHAEOLOGICAL SERVICES
DURHAM UNIVERSITY

on behalf of
The Environment Agency

Northallerton Flood Alleviation Scheme
Turker Beck and Sun Beck
Northallerton
North Yorkshire

archaeological desk-based assessment

report 2838
February 2012

Durham University

Contents

Figures

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1. Summary

The project

1.1 This report presents the results of an archaeological desk-based assessment conducted in advance of proposed development at Turker Beck and Sun Beck, east of Northallerton, North Yorkshire. The assessment comprised a search of pertinent documentary and cartographic records, records of archaeological interventions, the Historic Environment Record, and a site walk-over survey.

1.2 The works were commissioned by The Environment Agency, and conducted by Archaeological Services Durham University.

The archaeological resource

1.3 There are no historic or statutorily protected buildings, or Scheduled Ancient Monuments, on or in the vicinity of the site.

1.4 There is no direct evidence of prehistoric or Roman activity in the proposed development area. However, there is evidence that the surrounding area was exploited in prehistory, and an as yet unidentified resource relating to this has the potential to survive within the proposed development area.

1.5 The area lies beyond the edge of the medieval town of Northallerton, and it is probable that the area was utilised in the medieval and post-medieval periods as agricultural land. Evidence relating to this, in the form of ridge and furrow cultivation and field boundaries has been shown to survive in the results of a geophysical survey conducted as part of the flood alleviation works (Archaeological Services 2005b).

1.6 Deposits relating to early 20th-century buildings may survive in the southeast part of the Sun Beck development area. These are likely to be of low archaeological significance.

Impact assessment

1.7 The proposed development has the potential to impact upon any archaeological resource that may be present, through ground works, including the excavation of flood alleviation storage areas, the provision of new roads and ground reduction for site compounds and topsoil storage areas.

Recommendations

1.8 It is recommended that geophysical survey is conducted within the proposed development areas to identify any potential archaeological resource.

2. Project background

Location (Figures 1 & 2)

2.1 The proposed development areas are located east of Northallerton, North Yorkshire and are centred on two becks; Turker Beck and Sun Beck. The site of Turker Beck is situated on the northeast edge of the town (NGR centre: SE 3808 9460). To the west is residential housing, to the south is Bullamoor Road, and to the north and east is open farmland. The Sun Beck site is located south of the Turker Beck site (NGR centre: SE 3820 9381). To the west is residential housing, to the north is Scholla Lane and to the east and south is open farmland.

Development proposal (Figure 3)

2.2 The proposal is for the provision of a flood alleviation scheme with associated road access and site compound.

Objective

2.3 The objective of the scheme of works was to assess the nature, extent and potential significance of any surviving archaeological resource within the proposed development area, so that an informed decision may be made regarding the nature and scope of any further scheme of archaeological works that may be required in relation to the proposed development.

Methods statement

2.4 The works have been conducted in accordance with standard Archaeological Services' procedures for desk-based assessments. The works comprised the study of pertinent cartographic and other historical sources, records of previous archaeological interventions, sites listed in the Historic Environment Record (HER) within 800m of the proposed development area, and a site walk-over survey.

Planning guidance

2.5 This assessment and its recommendations are a considered response to the proposed development in relation to Government policy, as it is set out in *Planning Policy Statement 5: Planning for the Historic Environment*, and the *Historic Environment Planning Practice Guide*.

Dates

2.6 The field visit took place on 31st January 2012. This report was prepared for the 28th February 2012.

Personnel

2.7 Research was conducted and this report prepared by Natalie Swann, with illustrations by David Graham. The Project Manager was Daniel Still.

OASIS

2.8 Archaeological Services Durham University is registered with the **O**nline **A**cces**S** to the **I**ndex of archaeological investigation**S** project (**OASIS**). The OASIS ID number for this project is **archaeol3-119009.**

Acknowledgements

2.9 Archaeological Services Durham University is grateful for the assistance of the personnel of Northallerton Record Office in facilitating this scheme of works.

3. Landuse, topography and geology

Landuse

3.1 At the time of this assessment, the proposed development area comprised seven fields of arable land.

Topography

3.2 There is a general slope across the proposed development area from approximately 60m OD in the east to 50m OD in the west. The Turker and Sun Becks cross the site.

Geology and soils

3.3 The underlying solid geology of the area comprises Triassic Mudstone overlain by Devensian till.

4. Site walk-over survey

4.1 A walk-over survey was conducted, to help ascertain the potential of the proposed development area to contain any archaeological resource. The visit noted site topography, earthworks and areas of modern overburden, modern services, boundaries, buildings and other upstanding remains. A *pro forma* recording sheet was completed.

4.2 At the time of the survey the three fields around the Turker Beck were planted with a seedling brassica crop (Figure 8). The boundaries of the fields consisted of mature hedgerows. There was a notable rise in the field forming the northeastern part of the proposed development area (PDA) but generally the fields were gently sloping from north to south, north of the beck, and southeast to northwest to the south of the beck. No archaeological features or significant earthworks were noted.

4.3 The west end of the Turker Beck was culverted to run beneath the housing estate and surrounded by wooden fencing to prevent public access. Public footpaths ran along both sides of the beck. Telegraph poles supporting overhead cables ran east-west across the two north fields.

4.4 The three fields north of Sun Beck and south of Scholla Lane were planted with a seedling cereal crop and the boundaries consisted of mature hedgerows and trees (Figure 9). The fields were predominately level with a very slight slope down from the northeast to the southwest. The field south of the beck (Figure 10) was planted with a seedling brassica crop and was gently sloping from east to west. No archaeological features or significant earthworks were noted.

5. Geotechnical investigations

5.1 Geotechnical investigations were conducted over the site by Soil Mechanics Ltd on behalf of Mouchel Parkman UK and archaeologically monitored by Archaeological Services Durham University (Archaeological Services 2005b). Nine test pits were excavated around the Turker Beck site and six test pits around the Sun Beck site.

5.2 At Turker Beck, test pits 1, 7, 8 and 9 were excavated north of the beck; pits 2, 3, 4, 5 and 6 were excavated south of the beck. Test pits 7 and 8 showed similar stratigraphic sequences, with topsoil and a light orange-brown subsoil overlying a

series of clay deposits. Test pit 9 had similar upper layers of topsoil and subsoil, but at a depth of approximately 1.9m below ground level the deposits became increasingly stony and gravelly. All other pits in this area had similar deposits of topsoil and subsoil and appeared to be aligned along a ridge of underlying clays.

5.3 At Sun Beck, test pits 1, 2, 3 and 6 showed similar upper stratification; with topsoil overlying a layer of subsoil. Subsoil was not present in the other three test pits. The deeper stratification of pits 1, 2 and 3 consisted of approximately 2.5m of layered clay overlying gravely deposits. The other pits were all situated on a rise in the ground and showed layering of comparatively clean clays with increasingly compressed mudstone in the deeper strata.

5.4 Although no archaeological materials or features were encountered during the geotechnical works, the presence of topsoil and subsoil across most of the test pits suggests there has been little ground disturbance and therefore there is the potential for an archaeological resource to survive.

6. Historical and archaeological development

Previous archaeological works

6.1 Geophysical surveys were conducted north and southeast of the Turker Beck PDA and northeast and southeast of the Sun Beck PDA (Figure 2) as part of the wider Brompton, Northallerton, Romanby flood alleviation works (Archaeological Services 2004a, 2005a). Traces of former ridge and furrow cultivation, a former ditched field boundary and a double-ditched trackway were detected north of the Turker Beck. No anomalies reflecting archaeological features were detected south of the beck. No geophysical survey was conducted within the eastern part of the Turker Beck PDA.

6.2 Traces of former ridge and furrow cultivation were detected across the Sun Beck survey areas. A number of weak arcuate anomalies were detected east of the PDA which may reflect the remains of ditches and gullies. At the south end of the area small ditch-enclosed fields were detected. Within one of the enclosures a ring-ditch was detected. No survey was undertaken within the current Sun Beck PDA.

6.3 A programme of archaeological monitoring was undertaken during geotechnical works at both the Turker Beck and Sun Beck sites. No archaeological features were recorded or artefacts recovered during the works.

6.4 There are no sites listed in the Historic Environment Record within 800m of the proposed development areas.

6.5 Aerial photographs of the site do not show any features of possible archaeological origin.

The prehistoric and the Roman periods (up to 5th century)

6.6 There is no direct evidence of prehistoric activity in the proposed development area and there is scant evidence for prehistoric activity around Northallerton. Only two finds have been recovered, both dating to the Bronze Age; a spearhead was recovered west of the town in 1918 and a stone axe head was found approximately a mile south of the town. However the ring-ditch identified during the geophysical

survey of the site may suggest a resource relating to the prehistoric period has the potential to exist.

6.7 On the west side of the town an excavation at Castle Hills revealed the possible remains of a Roman settlement, however, there is no direct evidence of Roman activity within the proposed development area.

The medieval period (5th century to 1540)

6.8 The manor of 'Alertune' is recorded in the Domesday Book. This document lists the estates as containing quite extensive lands, in addition to 11 villages and a further 24 outlying properties. However by the time of the Domesday Survey the manor was listed as waste, presumably having been destroyed during the Harrying of the North in 1069-70.

6.9 The earliest documentary evidence for the town itself dates to the end of the 12th century and suggest it was a settlement of significant size by this time. Its position on the road from York gave it an important strategic location in the ongoing Anglo-Scottish wars. The Battle of the Standard was fought north of the town in 1138. The town continued to develop during the medieval period and by the 13th century the corridor form of the town centre was established. The PDAs were probably utilised as agricultural land during this period.

The post-medieval period (1541 to 1899)

6.10 The proposed development areas lie outside the centre of the medieval town. The earliest map to show any detail of the site is the Tithe map dating to 1842 (Figure 4) which shows that the proposed development area south of Turker Beck was divided into seven fields, three north of the beck and four south.

6.11 The PDA around the Sun Beck covers six fields on the Tithe map. There are no structures shown in any of the fields, suggesting they were devoted to agricultural use.

The modern period (1900 to present)

6.12 The Ordnance Survey (OS) map of 1913 (Figure 5) shows that there has been little change within both PDAs. South of the of the Turker Beck four field boundaries have been removed, reducing the number of fields the PDA covers to 4.

6.13 At the Sun Beck PDA the 1913 map shows that one field boundary has been removed, reducing the number of fields to five. A small square building is shown on the southeast part of the PDA on the south side of the beck, with a second building just beyond the southwest edge of the PDA.

6.14 The field layout of both PDAs remains the same on the OS map of 1929 (Figure 6). A second building is shown to the east of the small square building south of the Sun Beck.

6.15 There is no change in the layout of both PDAs on the OS map of 1938 (Figure 7).

6.16 Aerial photographs taken in 1951 and 1966 show no further change to the field layout of the PDAs. The small square building south of the Sun Beck is visible on the

1951 photo but is not shown on the 1966 photo. The buildings shown east of this small building on the OS maps are not present in the aerial photos.

6.17 Aerial photographs taken in 1971 show the field layout south of the Turker Beck was the same as the present day; boundaries have been removed to create one large field. Two fields remain north of the beck.

6.18 The 1971 aerial photograph shows that the field layout north of the Sun Beck has not changed. South of the Sun Beck a boundary has been removed to create one large field. This photograph also shows residential developments encroaching towards the west side of the Sun Beck PDA.

6.19 Aerial photographs from 1987 show the present day field layout at both PDAs. They also show further expansion eastwards of the residential development of Northallerton.

6.20 Aerial photographs taken in 1994 show that the residential development of Northallerton had expanded to reach the western edges of both PDAs.

The buildings

6.21 There are no statutorily protected buildings within proposed development areas.

Scheduled Ancient Monuments

6.22 There are no Scheduled Ancient Monuments within the proposed development areas, or the near vicinity.

7. The potential archaeological resource

7.1 There is no direct evidence for prehistoric or Roman activity within the study area, but the presence of activity in the surrounding vicinity indicates that an as yet unidentified resource has the potential to exist.

7.2 Geophysical survey has shown that archaeological deposits relating to the medieval and post-medieval field systems and agricultural practices have been shown to survive north and east of the proposed development areas in the form of ridge and furrow and former field boundaries.

7.3 There is potential for foundations or other deposits relating to early 20th century buildings to survive within the Sun Beck PDA.

8. Recommendations

8.1 No archaeological deposits have been identified which require preservation *in situ*.

8.2 It is recommended that geophysical survey is conducted within the proposed development areas to identify any potential archaeological resource.

9. Sources

Cartographic sources

Northallerton Record Office, 1842 Tithe apportionment for Northallerton.
Northallerton Record Office, 1850 map of Northallerton

Ordnance Survey 1st Edition, 25" sheet 54
Ordnance Survey 2nd Edition, 25" sheet 54
Ordnance Survey 3rd Edition, 25" sheet 54

Other sources

Archaeological Services 2004a *Brompton, Northallerton, Romanby flood Alleviation Scheme, North Yorkshire: Geophysical surveys*. Unpublished report **1080**, Archaeological Services Durham University

Archaeological Services 2004b *Willow Beck straightening works: Brompton, Northallerton, Romanby flood Alleviation Scheme, North Yorkshire: archaeological watching brief*. Unpublished report **1137**, Archaeological Services Durham University

Archaeological Services 2005a *Brompton, Northallerton, Romanby flood Alleviation Scheme, North Yorkshire: geophysical surveys (Phase 2)*. Unpublished report **1201**, Archaeological Services Durham University

Archaeological Services 2005b *Brompton, Northallerton, Romanby flood Alleviation Scheme, North Yorkshire: geotechnical test-pit excavation and archaeological watching brief*. Unpublished report **1329**, Archaeological Services Durham University

Archaeological Services 2006 *Land to the rear of 219 High Street, Northallerton, North Yorkshire: archaeological evaluation.* Unpublished report **1453**, Archaeological Services Durham Unniversity

Archaeological Services 2007 *Priory Close, Northallerton, North Yorkshire: archaeological investigations.* Unpublished report **1771** Archaeological Services Durham University

Aerial photographs (NMR)

RAF/540/567 Frame 3269, 29th July 1951
RAF/540/567 Frame 3270, 29th July 1951
OS/66214 Frame 079, 16th August 1966
MAL/71170 Frame 022, 10th November 1971
MAL/71170 Frame 179, 13th November 1971
MAL/76059 Frame 146, 7th July 1976
OS/87122 Frame 030, 30th August 1987
OS/87122 Frame 031, 30th August 1987
OS/94266 Frame 161, 29th July 1994
OS/94266 Frame 162, 29th July 1994

Geotechnical works

A programme of geotechnical works was carried out across the site (Archaeological Services 2005b), this was subject to a scheme of archaeological monitoring the results of which are discussed above (5.1).

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Turker Beck and Sun Beck
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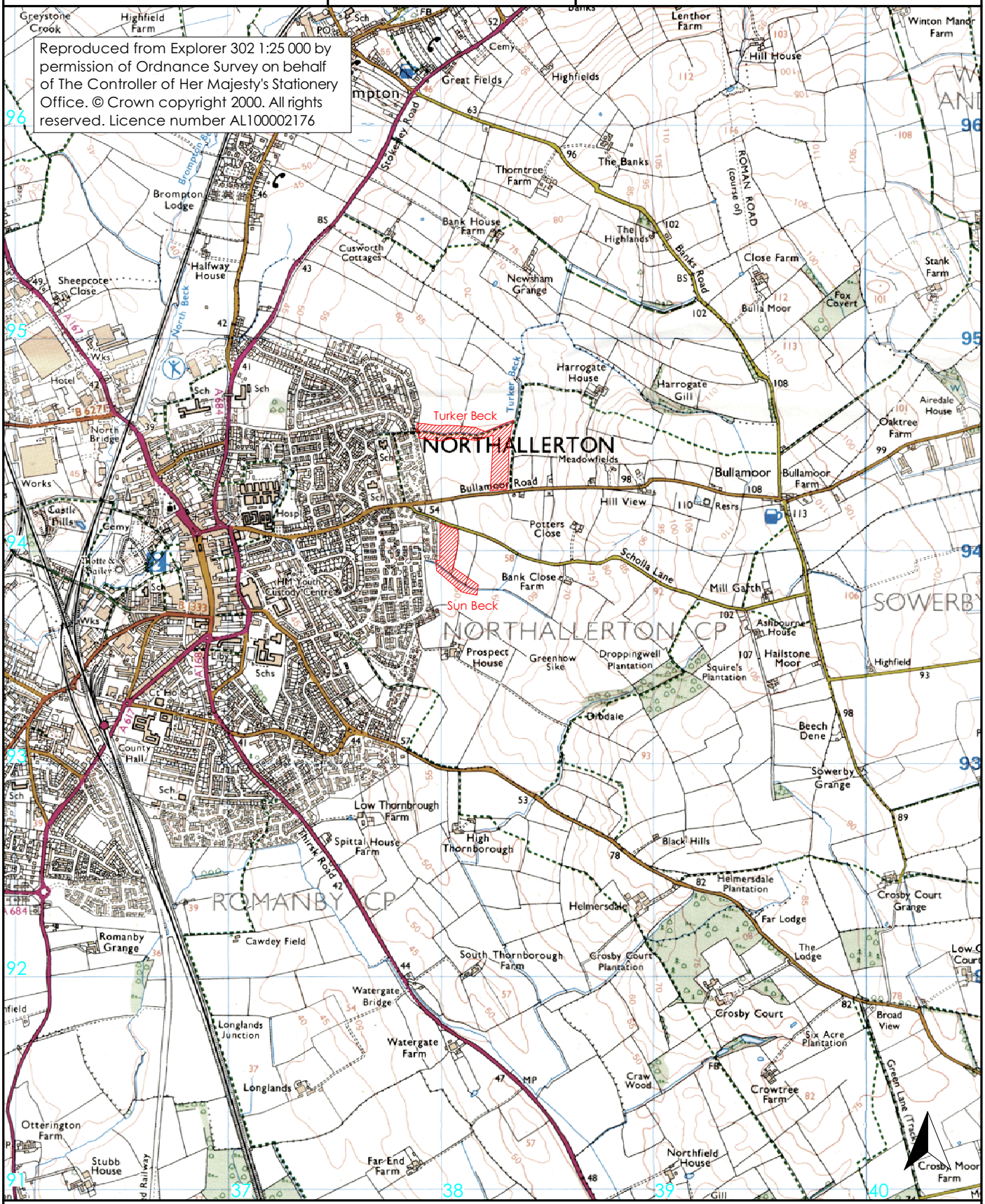
Figure 1: Site location



proposed development area

geophysical surveys

0 1km

scale 1:25 000 for A4 plot

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Figure 2: Site as existing and areas of geophysical survey

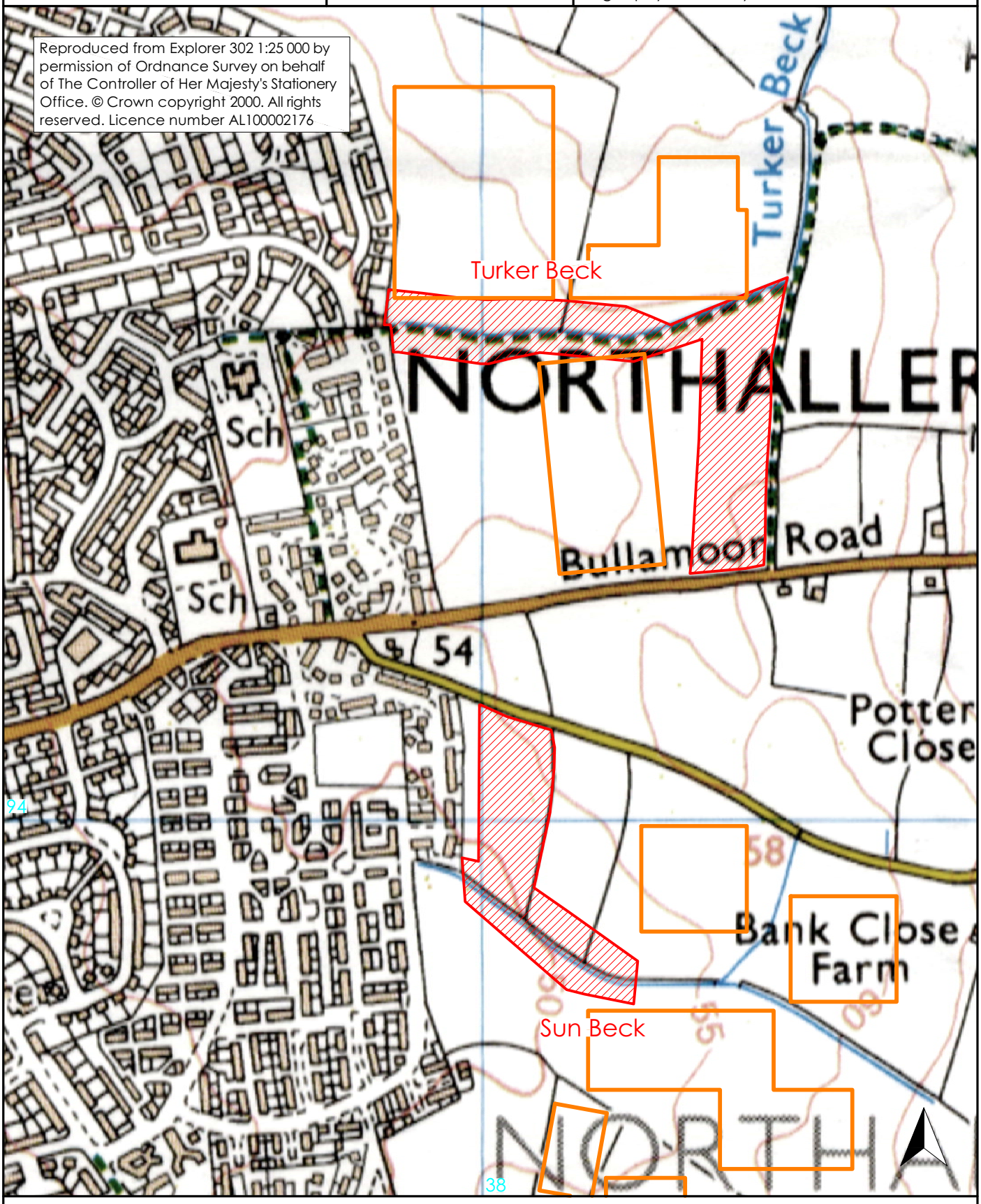

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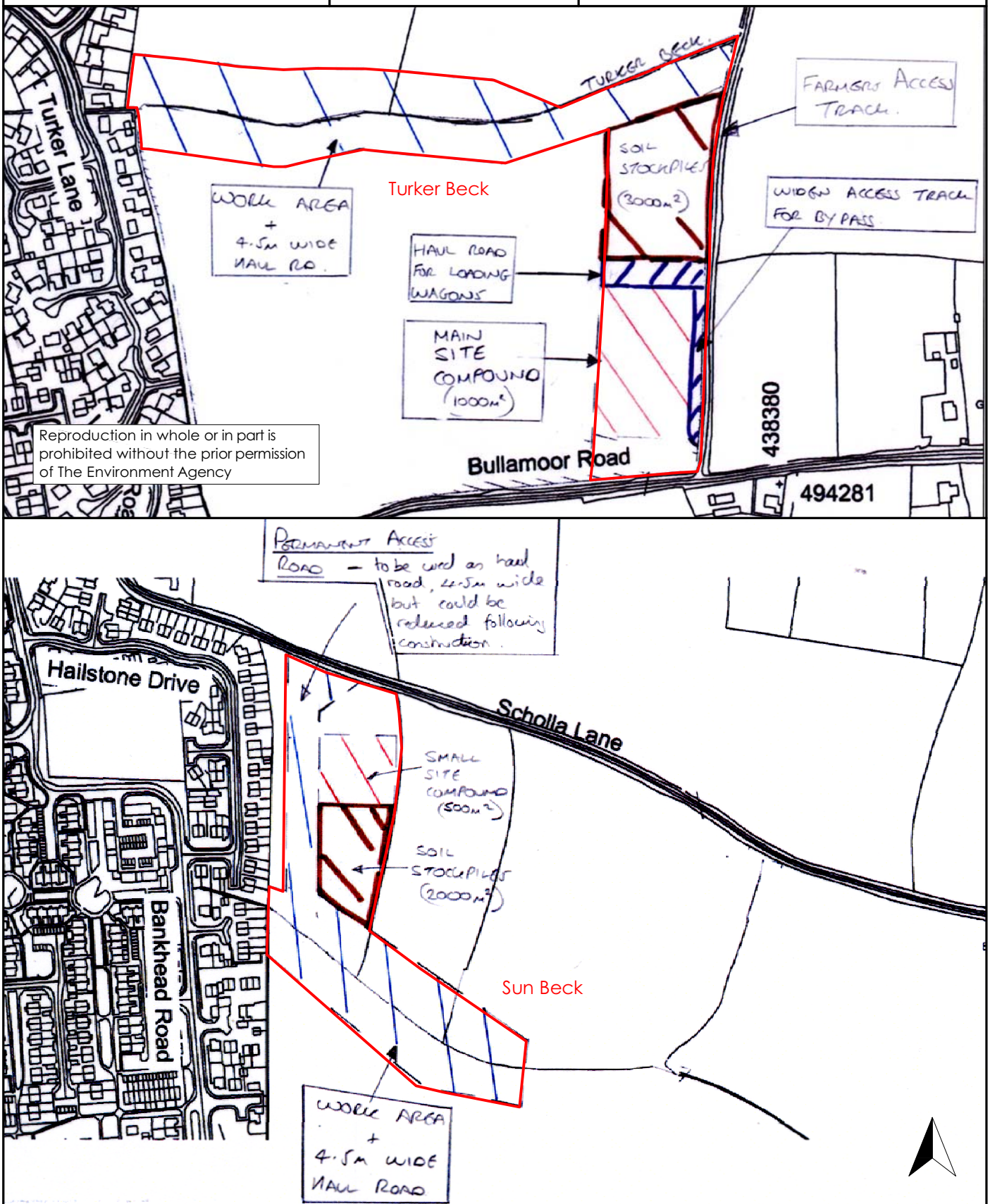
Figure 3: Proposed development



proposed development area

0 200m

scale 1:4000 for A4 plot

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Figure 4: Extract from the Tithe map of Northallerton, 1842

proposed development area

0 300m

scale 1:6000 for A4 plot

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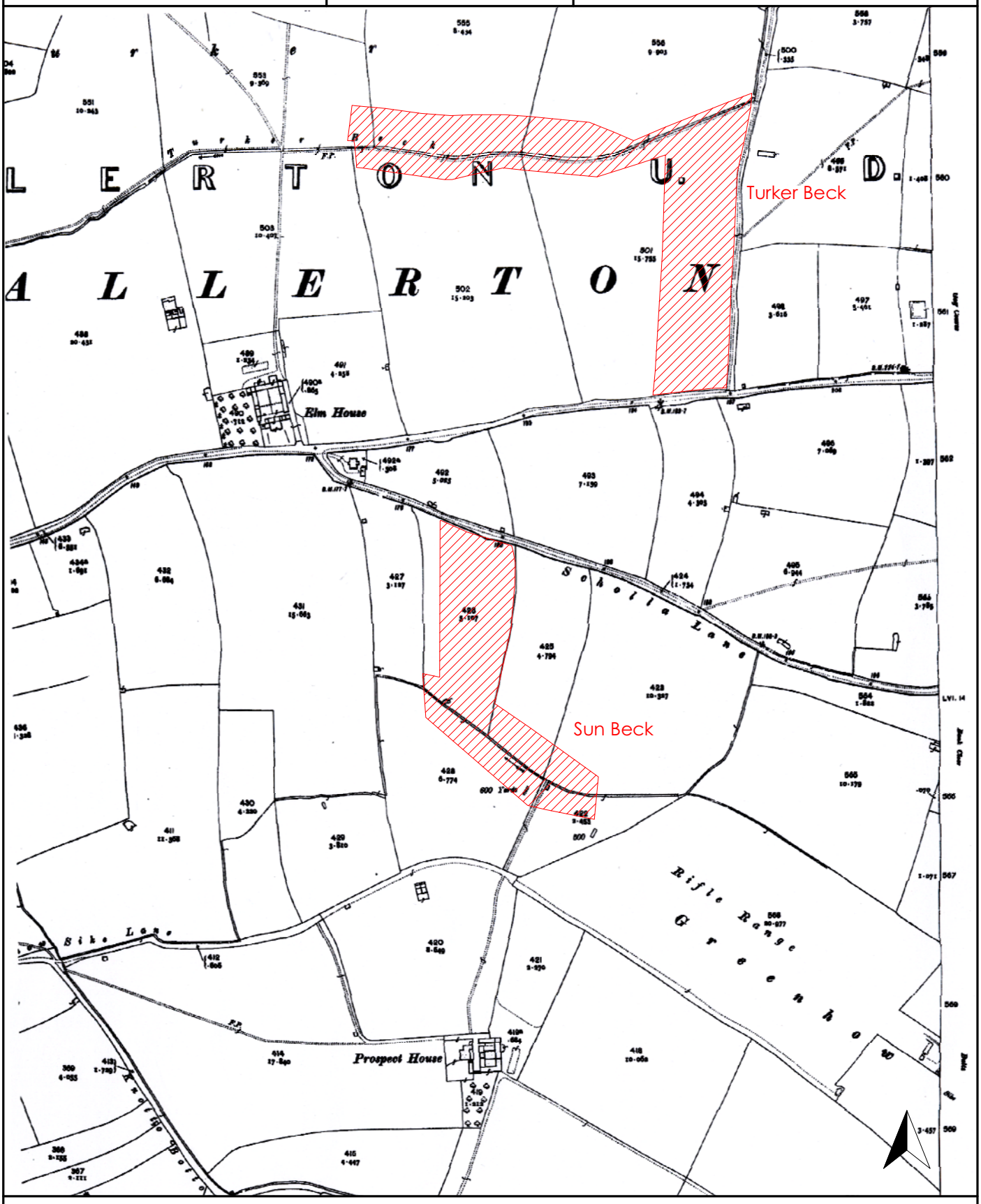
Figure 5: Extract from the Ordnance Survey map, 1913



proposed development area

0 300m

scale 1:6000 for A4 plot

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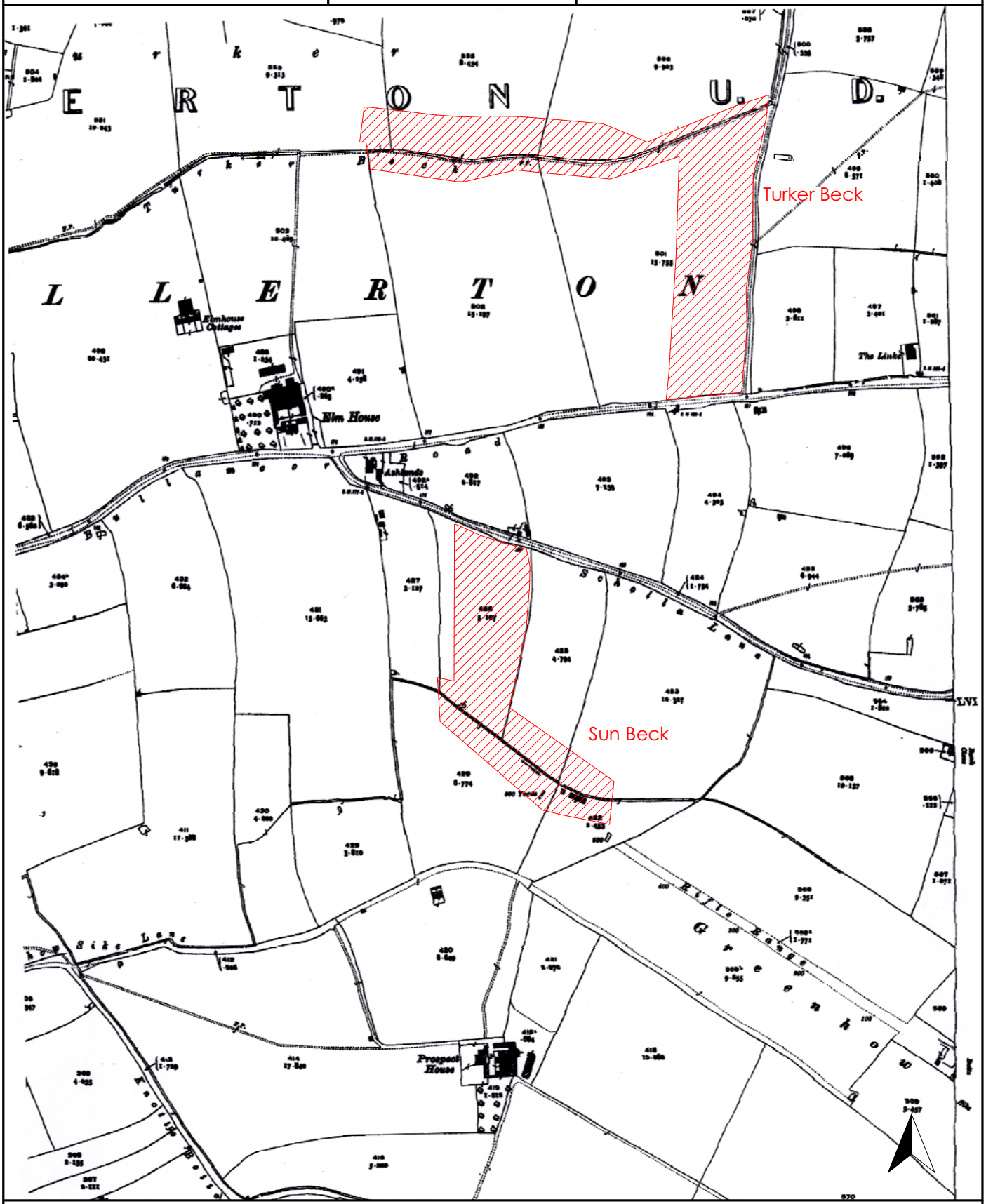
Figure 6: Extract from the Ordnance Survey map, 1929



proposed development area

0 300m

scale 1:6000 for A4 plot

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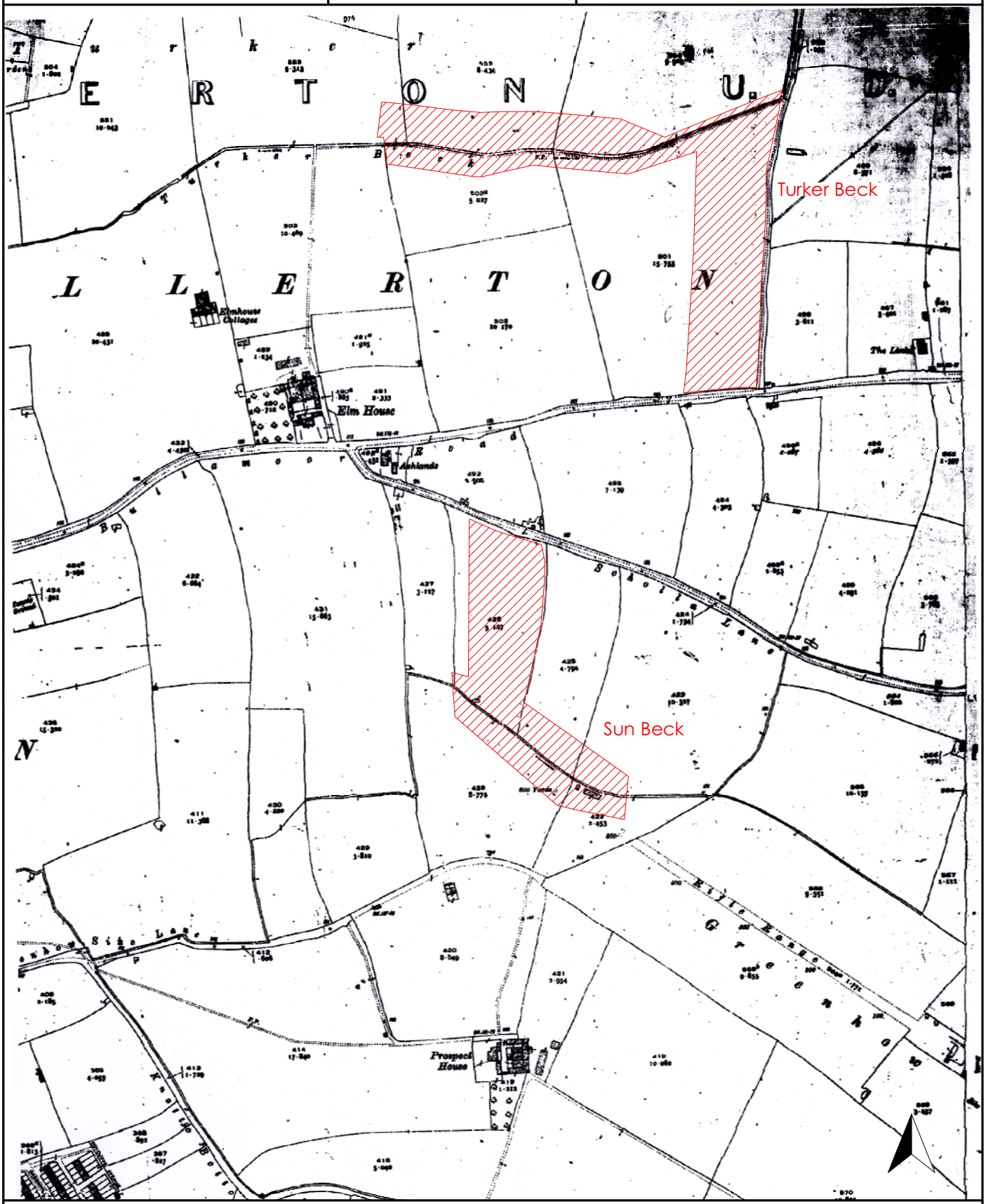
Figure 7: Extract from the Ordnance Survey map, 1938



proposed development area

0 300m

scale 1:6000 for A4 plot

Figure 8: View looking northeast along the Turker Beck

Figure 9: View south from Scholla Lane towards Sun Beck

Figure 10: View south with Sun Beck in foreground

Appendix 8:
Water Framework Directive Level 1 Assessment Report

Environment Agency
Northallerton Flood Alleviation Scheme
Water Framework Directive Level 1 Assessment Report

May 2012

Addendum

This WFD assessment was originally prepared in February 2011 and since this time certain elements of the scheme design have changed, as described in the Environmental Report (Jacobs, May 2012).

The hydromorphology assessment which underpins this WFD assessment has been updated (Jacobs, May 2012; see Appendix A). Based on the findings of the revised hydromorphology assessments, the findings of this WFD assessment are considered to remain valid. References to the Brompton flood storage area are not relevant at this time, since this element of the scheme is not progressing at present so is not the subject of the environmental assessment. The detailed design of the works at Sun and Turker Becks has changed, but the changes in design are not considered to affect the conclusions of this report that the works are very unlikely to lead to deterioration in status class under the WFD.

Furthermore, the final design for Sun Beck includes deculverting a length of the watercourse, which will help increase the biological quality in line with WFD objectives.

1. Introduction and Background

1.1 Purpose of the Report

The Water Framework Directive (WFD) came into force in 2000 and is the most substantial piece of EU water legislation to date. All new activities in the water environment will need to take the Directive into account. The Environment Agency, as competent authority in England and Wales responsible for delivering the Directive, has integrated the assessment of new schemes and strategies into new project appraisal guidance. The Northallerton Flood Alleviation Scheme (FAS) was progressed prior to the publication of this guidance, and so this assessment is based upon the guidance, but has been completed after the outline design, as opposed to being considered as the design was developed. The findings of this assessment will be used to influence the detailed design stage of this project.

A Water Framework Directive Preliminary Assessment for the scheme has been produced (Jacobs, May 2010; Reference 1). (It should be noted that this report also includes an assessment of a component element of the scheme at Willow Beck at Romanby which is not part of the current FAS preferred option). The report concludes that the each of the scheme components has the potential to cause a hydromorphological impact that could impact on the biological quality elements (BQEs) (see Section 1.2 for more details on BQEs). The report recommended that a Level 1 WFD Assessment be carried out, hence this report has been produced.

The aims of this Level 1 WFD assessment are as follows (taken from EA/DEFRA WFD Expert Assessment of Flood Management Impacts (Reference 2)):

- Document the likely scale (temporal and spatial) of the hydromorphological change, and identify any direct loss of BQEs.
- Document the likely nature (rate, direction and mechanism) of the hydromorphological change, to allow the indirect loss of BQEs to be evaluated.
- Identify the ability of the BQEs to recover from the changes that have been identified (eco-adaptability) and the timescale over which such recovery is likely.
- Identify whether any hydromorphological changes are likely to result in a deterioration in ecological status or ecological potential (taking into account spatial and temporal scales of change).
- Provide an indication of the level of confidence associated with the likely outcome (i.e. the degree of uncertainty in the assessment based on available information).
- Provide justification of why further Level 2 assessment is required to increase certainty about the likely change and impact.

This assessment therefore only considers the potential effects of the preferred option on the WFD objectives. It does not consider alternative scheme options.

This report has been produced by the Environment Agency's (EA) National Environmental Assessment Service (NEAS) with input from other EA functions within the EA and external consultants (see Section 2).

1.2 Background to WFD

The EU Water Framework Directive was transposed into law in England and Wales by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003. The Directive requires that Environmental Objectives be set for all surface and ground waters in England and Wales to enable them to achieve

Good Ecological Status (or Good Ecological Potential for Heavily Modified and Artificial Water Bodies) by a defined date. These Environmental Objectives are listed below:

- prevent deterioration in the status of aquatic ecosystems, protect them and improve the ecological condition of waters;
- aim to achieve at least good status for all water bodies by 2015. Where this is not possible and subject to the criteria set out in the Directive, aim to achieve good status by 2021 or 2027;
- meet the requirements of Water Framework Directive Protected Areas;
- promote sustainable use of water as a natural resource;
- conserve habitats and species that depend directly on water;
- progressively reduce or phase out the release of individual pollutants or groups of pollutants that present a significant threat to the aquatic environment;
- progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants;
- contribute to mitigating the effects of floods and droughts.

The Northallerton FAS is located within the Humber River Basin District (RBD). The Environmental Objectives for this RBD, together with the specific actions (mitigation measures) necessary to enable each water body to meet these objectives, are set out in the Humber River Basin Management Plan (RBMP).

1.3 Preventing Deterioration in Status

For each water body, three different status objectives are identified. These are: the overall status, the ecological status (or potential) and chemical status objectives. A default objective for all surface water bodies is to prevent the deterioration in the Ecological Status (or Ecological Potential for Heavily Modified and Artificial Water Bodies).

Ecological Status is determined through analysis of its constituent biological Quality Elements (listed below). These elements are in turn supported by a series of physio-chemical and hydromorphological Quality Elements. These Quality Elements are taken from Annex V of the Directive and are listed below. The overall Ecological Status is determined by the lowest element status.

Biological Quality Elements

- Fish
- Invertebrates
- Macrophytes

Any activity that has the potential to have an impact upon any of the Quality Elements will need consideration in terms of whether it could cause a deterioration in the status of a water body. The activity will also need to be considered in terms of whether it will compromise the ability of the water body to reach Good Ecological Status (or Good Ecological Potential) by the date specified in the Humber RBMP.

Phytobenthos are scoped out of this assessment on the basis that they are used as indicators of nutrient pollution. As described in Section 2.1, chemical impacts have been scoped out of this assessment.

1.4 Artificial or Heavily Modified Water Bodies

Whilst good ecological status is defined as a slight variation from undisturbed natural conditions in natural water bodies, artificial and heavily modified water bodies are unable to achieve natural conditions. Instead, artificial and heavily modified water bodies have a target to achieve Good Ecological Potential, which recognises their important uses, whilst making sure ecology is protected as far as possible. Ecological potential is also measured on the scale high, good, moderate, poor and bad. The chemical status of these water bodies is measured in the same way as for natural water bodies.

Specific mitigation measures have been identified for each 'use' of a Heavily Modified Water Body and are listed in the RBMP. These mitigation measures are necessary to reduce existing hydromorphological impacts connected with the use of the water body and all measures need to be in place in order for the water body to achieve Good Ecological Status or Potential.

1.5 The Proposed FAS

Northallerton is a market town in the Hambleton district of North Yorkshire. The villages of Brompton and Romanby are located north and south west of Northallerton respectively.

The watercourse flowing north to south through Northallerton is known as Brompton / North / Willow Beck. This is a single watercourse that flows through Brompton (where it is known as Brompton Beck), Northallerton (North Beck) and Romanby (Willow Beck). The main tributary to the watercourse is Sun Beck flowing east to west through a residential part of the town. Turker Beck discharges into Sun Beck south of Friarage Hospital. The majority of the reaches of Sun Beck and Turker Beck are culverted through Northallerton. The watercourses in Northallerton were designated main river in 2004 as part of the Critical Ordinary Watercourse enmainment programme.

- The economically preferred option at Brompton is to construct an embankment dam with orifice flow control. This will provide a 1 in 100 (1%) AEP standard of protection. Consideration for climate change should be reviewed in the future. This sub option will provide benefit to Brompton, West Northallerton and Romanby.
- The economically preferred option at both Sun Beck and Turker Beck is to provide channel storage. This will provide a 1 in 200 (0.5%) AEP standard of protection. Consideration for climate change should be reviewed in the future. This sub option will provide benefit to East Northallerton and the High Street area in the town centre, together with some further benefit at Romanby.

1.6 Willow Beck Water Body

Pressures on Water Body/Mitigation Measures

As identified in the preliminary WFD assessment, all the works proposed as part of the FAS fall within the Willow Beck catchment water body (ID: 104027069540). The water body is classified in the Humber RBMP as heavily modified. The water body is currently classified as moderate ecological potential, with an objective to achieve good ecological potential by 2027. The water body has been designated as Heavily Modified for the 'uses' of Flood Protection, Land Drainage and Urbanisation.

The pressures on the water body, as identified in the Humber RBMP are shown below:

High Risk Pressures	Diffuse Phosphorous from Agriculture Ammonia Dissolved Oxygen Total oxidised nitrogen Physical and morphological
Medium risk Pressures	Diffuse pesticides Diffuse sediments Diffuse urban pollution Phosphorous

The mitigation measures set out in the Humber RBMP for the heavily modified Willow Beck water body are shown below. All are classified as 'Not in Place'.

Pressure / physical modification	Mitigation measure
Navigation	Awareness raising / information boards (boat wash / sources of fine sediment)
Channel Alteration Realignment / re-profiling / regrading	Retain marginal aquatic and riparian habitats (channel alteration)
Operations and maintenance Vegetation control	Appropriate techniques (invasive species)
Land drainage activities Pumping station operations	Management of the risk of fish entrainment in intakes for hydropower turbines or water resource purposes (or pumping stations) where there is downstream fish migration
Bank & Bed reinforcement / in-channel structures Hard protection e.g. Steel piling, vertical walls and gabion baskets. Includes hard bank protection in a state of disrepair.	Preserve and, where possible, restore historic aquatic habitats
Bank & Bed reinforcement / in-channel structures Hard protection e.g. Steel piling, vertical walls and gabion baskets. Includes hard bank protection in a state of disrepair.	Removal of hard bank reinforcement / revetment, or replacement with soft engineering solution

BQE Baseline

Very little data on the baseline condition of the BQEs is available. The EA Area Analysis and Reporting (A&R) team have indicated that no routine ecological monitoring has been carried out within the water body area to date, and no information was available on the National Fish Population Database.

Anecdotal information from the A&R officer, based on informal sampling of Brompton Beck near the ford in the village of Brompton in summer 2009, indicated that pollution sensitive invertebrate taxa including shrimps and mayfly species were present.

Fisheries survey data provided by the Area Fisheries Officer (Appendix B) includes the results of fisheries surveys on Winton/Brompton Beck close to the location of the proposed FSA and downstream, through Brompton and Northallerton. Comments provided indicate that stickleback were present in one location, but no fish were encountered in other sample points. Evidence of organic pollution, including anoxic silts and over-abundant macrophyte growth were noted in several locations.

No data for Sun and Turker Becks has been made available, however a site visit with an Area Biodiversity Officer in January 2011 indicated that the becks are unlikely to be of significant interest for fisheries or invertebrates given their small size and the fact that they are extensively culverted downstream, through Northallerton.

Area EA staff have indicated that water quality is considered to be a limiting factor on the ecological status of the water body, and that in the area of the proposed works at the Holmes FSA and Sun and Turker Becks, agriculture is likely to be main pollution source. Area staff have worked with the Catchment Sensitive Farming Officer to provide information on environmentally sensitive practices to local farmers. The study area lies within the target area of the Yorkshire Ouse, Nidd and Swale catchment sensitive farming capital grants scheme.

2. Level 1 Assessment Methodology

2.1 Scope of Survey

The scheme is not considered likely to have a significant impact on chemical quality elements, and these have been scoped out of this assessment. This assessment focuses on potential direct impacts on BQEs and impacts on supporting hydromorphological quality elements.

The assessment focuses on permanent impacts. Temporary impacts as a result of construction, from which the environment will naturally recover, have not been assessed in detail. Construction impacts will be managed by adopting good environmental management practices during construction.

2.2 Methodology

The assessment is based on professional judgement by a geomorphologist and an ecologist and was undertaken using the following information:

1. Review of baseline information from the environmental scoping report, Humber RBMP and Preliminary WFD Assessment
2. A geomorphological technical note, produced by Jacobs following a site visit in January 2011 (see Appendix A)
3. Information following a site visit by the Area Biodiversity officer in January 2011
4. Advice and information from the EA Area Fisheries and Biodiversity officers and A&R team

The draft report was reviewed by the Area Fisheries and Biodiversity officers and A&R teams and Regional Hydromorphology Pressure Lead.

An assessment was undertaken to determine the effects that the proposed flood scheme could have directly or indirectly on BQEs. Any impacts identified were then considered in relation to the Ecological status of the water body and the status objectives. To ensure that the scheme will not prevent the achievement of WFD objectives, , it is also assessed against the relevant mitigation measures of each Artificial or Heavily Modified Water Body. The assessment is presented in a tabulated format and is divided into the individual components of the proposed FAS. Each quality element has been considered individually. Where necessary, proposed mitigation measures are described in the assessment.

The following assessment objectives have been used to determine whether the flood scheme complies with the overarching objectives of the WFD. These objectives were derived from the Environmental Objectives of the Directive (as listed in Section 1.2).

1. Objective 1: The proposed scheme does not cause deterioration in the Status of the Biological Elements of the water body
2. Objective 2: The proposed scheme does not compromise the ability of the water body to achieve its WFD status objectives
3. Objective 3: The proposed scheme does not cause a permanent exclusion or compromise achieving the WFD objectives in other bodies of water within the same RBD
4. Objective 4: The proposed scheme contributes to the delivery of the WFD objectives

If is predicted that the scheme is likely to cause deterioration in water body status or prevent a water body from meeting its ecological objectives, then an assessment would also be made against the conditions listed in Article 4.7 of the WFD. Article 4.7 of the Directive defends deterioration in status or failure to meet WFD objectives resulting from 'new modifications' or 'sustainable human development activities', if all conditions set out under this Article are met. The Environment Agency would not be in breach of the Directive if it can be demonstrated that all these conditions have been met.

The results of the assessment are presented in tabular form in Section 3 of this report.

3. Scheme Assessment

The assessment of the proposed scheme is shown in the tables below.

- Table 1 shows how the individual components of the scheme could impact on the individual quality elements (Fish, Invertebrates, Macrophytes and geomorphology)
- Table 2 shows how the scheme impacts on the RBMP mitigation measures for the water body
- Table 3 shows how the scheme meets WFD objectives as a whole

Table 1: Assessment of Impact of Proposed Scheme on WFD Quality Elements

Scheme component	Geomorphology	Fish	Invertebrates	Macrophytes
Flow control structure (Brompton FSA)	**Potential Impacts** Permanent modification to the channel over approximately 100m (0.4% of the water body) but as the existing channel is already impacted by modification this would not significantly change the morphological diversity of the water body. *Upstream*: Channel siltation upstream over a maximum of approximately 2.1km (11% of the water body) in a 1 in 100 year event. The degree of fine sediment accumulation is likely to be limited by bankfull flows ($8m^3s^{-1}$). *Downstream*: Pass forward flows of up to $8m^3s^1$ would maintain existing in-channel flow variability downstream and sediment transport. **Mitigation** The following Options would be investigated in detailed design: Retain a section of the original channel as a backwater feature. Provide a varied bed morphology (pools and riffles) in the open channel. Promote awareness of measures which could be undertaken by land owners/managers to reduce soil erosion and fine sediment ingress to the channel. Improvements to the riparian	**Potential Impacts** Prevention of upstream migration to the presence of flow control structure. Fish stranding within flood plain storage area during storage and mortality Siltation during storage periods causing damage to habitat quality. **Mitigation** The preferred option comprises an open orifice plate to allow fish migration. Options for managing flows through the flow control structure to allow fish passage will be investigated during detailed design. It is envisaged the residual impact following mitigation would be low. Options for designing the FSA to avoid fish stranding will be investigated during detailed design. It is envisaged the residual impact following mitigation would be low.	**Potential Impacts** Flows being too high / low for movement through the flow control structure. Siltation during storage periods causing suffocation to invertebrates and change of habitat quality. **Mitigation** Options for managing flows through the flow control structure to allow invertebrate passage will be investigated during detailed design.	**Potential Impacts** Loss of potential habitat from the structure's footprint, though macrophytes are probably not abundant in this area, based on previous site visits by the Area Biodiversity officer and the results of a previous survey by Jacobs (ref 3).

Scheme component	Geomorphology	Fish	Invertebrates	Macrophytes
	zone upstream of structure.			
Culvert structure and bank protection (Brompton FSA)	**Potential Impacts** Localised reduction in morphological diversity due to 25m culvert (0.1% of water body length) not likely to be of sufficient magnitude to reduce morphological diversity of the water body. Slight reduction in morphological diversity due to hard bank reinforcement over approximately 94m of bank (0.2% of the total length of banks along the water body). Change for current conditions limited as the existing channel has a very uniform morphology. **Mitigation** The following Options would be investigated in detailed design: The bed sediments placed in the culvert to be stable across a range of flows to allow continuity of bed morphology. Reduction in the extent of hard protection. Use of alternative (green/soft) bank protection measures.	**Potential Impacts** Loss of potential spawning habitat within the footprint of the culvert and scour protection. Inhibition of upstream movement due to dark culvert. Lack of fish cover reducing habitat potential. **Mitigation** The culvert invert level will be set to allow the accumulation of natural bed material. It is envisaged the residual impact following mitigation would be low.	**Potential Impacts** Loss of bed habitat in footprint of culvert and scour protection. Inhibition of upstream movement due to dark culvert. Loss of marginal habitat and marginal vegetation. **Mitigation** The culvert invert level will be set to allow the accumulation of natural bed material. Opportunities for minimising hard banks will be investigated during detailed design.	**Potential Impacts** Loss of potential habitat from the structure's footprint, though macrophytes are probably not abundant in this area, based on previous site visits by the Area Biodiversity officer and the results of a previous survey by Jacobs (ref 3).

Scheme component	Geomorphology	Fish	Invertebrates	Macrophytes
Set back banks at Sun Beck and Turker Beck	**Potential Impacts** Replacing 424m (1% of the water body) of highly modified/artificial channel with almost identical sections of artificial channel would not cause a reduction in channel morphological diversity from that existing at present. Channel siltation over 240m of Turker Beck and 184m of Sun Beck (1% of water body). **Mitigation** The potential for channel siltation could be reduced by promoting (during detailed design) awareness of measures which could be undertaken by land owners/managers in the upper catchment to reduce soil erosion and fine sediment ingress to the channel.	**Potential Impacts** Given the likely absence of fisheries interest in the becks, no significant impact is considered likely.	**Potential Impacts** Loss of invertebrates due to removal of bed material and reprofiling of bed. Potential degradation in habitat quality as a result of siltation of bed material. **Mitigation** Options for retaining and reusing existing bed material in order to maintain habitat diversity will be identified during detailed design.	**Potential Impacts** Given the likely absence of macrophytes in the becks, no significant impact is considered likely, based on previous site visits by the Area Biodiversity officer and the results of a previous survey by Jacobs (ref 3).

Table 2: Assessment of the scheme against the Willow Beck Catchment mitigation measures

Scheme component	HMWB Mitigation Measures					
	Awareness raising / information boards (boat wash / sources of fine sediment)	Management of the risk of fish entrainment in intakes for hydropower turbines or water resource purposes (or pumping stations) where there is downstream fish migration	Appropriate techniques (invasive species)	Retain marginal aquatic and riparian habitats (channel alteration)	Preserve and, where possible, restore historic aquatic habitats	Removal of hard bank reinforcement / revetment, or replacement with soft engineering solution
Flow control structure (Brompton FSA)	Development of the proposed FSA will require landowner cooperation and may present an opportunity to promote wider environmentally sensitive farming practices. (To be investigated further during detailed design).	Not applicable.	No invasive species have been noted in a previous habitat survey (Ref 3) or recent site visits.	Hard banks will be required as part of this component, but opportunities to minimise the amount of hard banks (or replace with soft/green alternatives) will be investigated during detailed design. The current outline design is for approximately 94m of hard bank. Given that the water body is approximately 24.2km in length, this element of the scheme is not considered to significantly prevent the implementation of this mitigation measure or the achievement of GEP at water body scale. Furthermore, the water body has low variation in morphology and riparian vegetation assemblages at the dam site. Opportunities to mitigate the impacts of increasing hard banks (by naturalising banks and habitat) will be investigated during detailed design. Where hedges and trees are lost as a result of the scheme they will be replaced. It is not proposed to carry out compensatory removal of hard banks in other locations.		
Culvert structure and bank protection (Brompton FSA)	See above.	Not applicable.	No invasive species have been noted in a previous habitat survey (Ref 3) or recent site visits.	See above.		
Set back banks at Sun Beck and Turker Beck	See above.	Not applicable.	No invasive species have been noted in a previous habitat survey (Ref 3) or recent site visits.	The proposed setting back of the banks of the becks presents a chance to enhance the existing riparian habitat, which will require further investigation during detailed design. Where hedges and trees are lost as a result of the scheme they will be replaced. The existing culvert headwalls will be removed but replaced. This component of the FAS will therefore not significantly add to hard banks but does not present an opportunity to remove them.		

Table 3: Assessment of the proposed scheme against the WFD assessment objectives

Scheme component	Assessment Objectives			
	Objective 1: The proposed scheme does not cause deterioration in the Status of the Biological Elements of the water body	**Objective 2: The proposed scheme does not compromise the ability of the water body to achieve its WFD status objectives**	**Objective 3: The proposed scheme does not cause a permanent exclusion or compromise achievement of the WFD objectives in other bodies of water within the same RBD**	**Objective 4: The proposed scheme contributes to the delivery of the WFD objectives**
Upstream storage at Brompton FSA (including associated culverting works, flow control structure and bank protection)	The works are considered unlikely to cause a deterioration in status of the quality elements . There is a potential for localised impacts following periods of flood water storage, but given their infrequent timing and localised nature, any such impacts are not considered sufficient to lead to deterioration in status at water body scale.	The RBMP status objective is to reach GEP by 2027. The RBMP and EA Area staff have indicated that the major constraint on GEP for the water body is water quality, particularly comprising agricultural pollution in the area of the proposed FAS (i.e. upstream of the settlements of Brompton and Northallerton). The FAS is not considered likely to have a significant impact on water quality or WFD quality elements at the water body scale.	The proposed scheme is not considered likely to have a significant impact on other water bodies. The areas of works are situated in the upper reaches of the catchment, and there are no further water bodies upstream. Impacts on downstream water bodies are considered unlikely, since Brompton Beck is a tributary of the Willow Beck and both fall within the same water body.	The scheme could help to deliver the RBPM mitigation measures by raising awareness of fine sediment issues and retaining (and potentially enhancing) marginal habitat. The scheme also presents wider opportunities to work with local landowners and farmers to encourage environmentally sensitive farming practices.
Setting back banks at Sun and Turker Becks	As above. Furthermore, Sun Beck lies outside of the WFD water body, so the works carried out there will not directly impact the biological quality elements.	As above	The proposed scheme is not considered likely to have a significant impact on other water bodies. The areas of works are situated in the upper reaches of the catchment, and there are no further water bodies upstream of them. Impacts on downstream water bodies are considered unlikely, since both becks are culverted through Northallerton and part of a larger water body that extends downstream to include Willow Beck.	As above

4. Discussion and Conclusion

It is considered that the proposed FAS represents a very low risk of causing deterioration in the status of the water body in which it is located (Willow Beck Catchment) or any other water bodies, and will not prevent the water body from achieving Good Ecological Potential by 2027.

Despite a lack of quantitative data for the FAS area, the conclusions of this report are made with reasonable confidence, since the areas of geomorphological impact of the FAS can be predicted reasonably well using expert judgement. If the design of the FAS changes or our understanding of the environment changes as the scheme progresses, we will undertake an additional assessment.

Measures to mitigate the negative impacts of the scheme have been identified in this assessment. This mitigation identified in this report is not considered necessary to prevent deterioration in status under WFD, given the limited magnitude of the impacts. However, the options for mitigation (listed below) will be considered during detailed design as part of the Environmental Impact Assessment (EIA) for the scheme in order to limit negative environmental impacts. Furthermore, there may be opportunities to implement the mitigation measures in the RBMP as part of the FAS, thus helping to improved the WFD status of the water body.

No further assessment of WFD compliance is considered necessary at this time.

Recommendations

- Options for mitigating the impacts of the works should be investigated during detailed design, including the following opportunities:
    - Brompton FSA: options for managing flows through the flow control structure to allow fish and invertebrate passage.
    - Brompton FSA: options for designing the FSA to avoid fish stranding.
    - Brompton FSA: options for retaining parts of the original channel as a backwater feature.
    - Brompton FSA: options for providing a varied bed morphology in the open channel sections.
    - Sun and Turker Becks: options for retaining and reusing existing bed material in order to maintain habitat diversity.
    - Both components: minimise the amount of hard banks and seek opportunities to enhance the riparian habitat (e.g. green/soft bank protection).
    - Both components: investigate opportunities to work with landowners and farmers to promote environmentally sensitive farming practices which could be undertaken by land owners/managers to reduce soil erosion and fine sediment ingress to the channel. It is recommended that the Natural England Catchment Sensitive Farming Officer is contacted during detailed design to determine whether the proposed scheme could help deliver the objectives of the Catchment Sensitive Farming initiative.

References

1 Water Framework Directive Level 1 Hydromorphology Assessment, Jacobs, May 2012

2 WFD Expert Assessment of Flood Management Impacts (R&D Technical Report FD2609/TR), EA/DEFRA, May 2009

3 Northallerton Flood Alleviation Scheme: Ecology Extended Phase 1 Habitat Survey, Jacobs, September 2009

Appendix A: Hydromorphology Assessment (Jacobs, May 2012)

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Northallerton PAR

Water Framework Directive
Level 1 Hydromorphology Assessment

May 2012

Environment Agency

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Executive summary

The objectives of the Water Framework Directive (WFD) include the prevention of deterioration of the Ecological Status of water bodies. The Environment Agency requires an assessment of the impact of all new Flood and Coastal Erosion Risk Management (FCRM) activities upon ecological quality (as set down under Article 4 of the Water Framework Directive). To achieve this, the Environment Agency and Defra have developed an Expert Assessment Framework to provide guidance on the level of assessment required within project appraisal, to ensure that the preferred FCRM options are compliant with the requirements of the WFD (Defra, 2009). This report describes the findings of a Level 1 Assessment of the potential hydromorphological impacts associated with proposed flood risk management options for Northallerton. This assessment follows the Expert Assessment Framework developed by the Environment Agency and Defra (Defra, 2009).

There are three objectives to the Level 1 Hydromorphology Assessment:

1. Identify and document the hydromorphological changes that are likely to result from the FCRM options.
2. Identify potential mitigation measures to help ensure no deterioration in WFD status occurs.
3. If necessary, provide justification for undertaking further assessment.

The flood risk management options proposed at PAR stage on Brompton Beck and Turker Beck are located within the Willow Beck Catchment water body (ID: 104027069540). The water body is 24.2km in length. It is classed as a Heavily Modified Water Body (HMWB) due to the extensive nature of channel modifications associated with existing land drainage and urban development. Sun Beck is not located within a WFD water body, but the risks of downstream impacts on the Willow Beck Catchment water body have been considered.

Three FCRM options were assessed at the PAR stage:

- Brompton Beck Storage Area (not carried forward to Detailed Design and removed from this assessment)
- Turker Beck Storage Area
- Sun Beck Storage Area

The assessment found that direct alterations to the Willow Beck Catchment water body would occur in the Turker Beck Storage Area. These potential changes would consist of direct modifications associated with channel engineering, and consequential changes in flow and sediment transport.

Changes to channel morphology in the location of the Turker Beck Storage Area consist of 240m of channel enlargement (1% of water body) and a high likelihood of channel siltation over this length. The alterations to channel morphology in the location of the Sun Beck Storage Area consist of 184m of channel enlargement and a high likelihood of channel siltation over this length. It is proposed to create the storage area in a new open section of channel which is currently culverted.

The impacts of these modifications on the Willow Beck Catchment water body have been assessed and are not considered to represent significant changes to the hydromorphology of the water body from that existing at present. This is because:

1. The existing channel modifications mean many of the additional channel modifications proposed do not lead to significant changes from the existing situation.

2. Adverse impacts on the hydromorphology of the Willow Beck Catchment water body are restricted to an increased potential for channel siltation caused by flow impoundment along 125m at Turker Beck (1% of the water body).

3. The modifications to Sun Beck do not lead to any knock on impact on the Willow Beck Catchment water body, and culvert decommissioning/open channel design would be seen as a beneficial measure for hydromorphology.

4. Mitigation Options were recommended for Detailed Design to reduce the impact of each option.

It is not deemed to be necessary to undertake any further more detailed hydromorphological assessment.

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Contents

1 Introduction

1.1 Background

The objectives of the Water Framework Directive (WFD) include the prevention of deterioration of Ecological Status of water bodies. As such, the Environment Agency now requires an assessment of the impact of all new Flood and Coastal Erosion Risk Management (FCRM) activities upon ecological quality (as set down under Article 4 of the Water Framework Directive). To achieve this, the Environment Agency and Defra have developed an Expert Assessment Framework to provide guidance on the level of assessment required within project appraisal, to ensure that the preferred FCRM options are compliant with the requirements of the WFD (Defra, 2009). The Expert Assessment Framework has a tiered structure that involves a preliminary step to provide an initial assessment before continuing (if required) through a process that builds-up the assessment (by up to two levels) to arrive at a final assessment.

In May 2010, Jacobs undertook a Preliminary Assessment of the potential hydromorphological and ecological impacts associated with proposed flood risk management options for Northallerton. The assessment concluded that each of the options has the potential to cause a hydromorphological impact which would impact on the Biological Quality Elements (BQEs) within the channel. The report recommended that further assessment would be required, in the form of a Level 1 Assessment (Defra, 2009).

This report describes the findings of the Level 1 Hydromorphology Assessment of the FCRM options for Northallerton. It has subsequently been updated at the Detailed Design stage (May 2012), including the removal of the previously proposed works at Brompton Beck, which are no longer part of the scheme.

1.2 Aim and Objectives

The Level 1 Hydromorphology Assessment of the potential impacts of the FCRM options has the following specific objectives:

1. Identify and document the hydromorphological changes that are likely to result from the FCRM options.
2. Identify potential mitigation measures to help ensure no deterioration in WFD status occurs.
3. Where necessary provide justification for undertaking further assessment.

The assessment focuses on evaluating impacts at the site of the FCRM options and also downstream.

1.3 Methodology

The assessment is based upon a combination of a desk study to review existing information, field survey (site visits) to collect baseline data and expert assessment of the likely impact of the FCRM options.

1.3.1 Study Area

The Level 1 Hydromorphology Assessment described in this report evaluates the nature of the hydromorphological changes that would occur in response to the flood risk management options included with the Project Appraisal Report (PAR) and Detailed Design. These are:

- Turker Beck Storage Area;
- Sun Beck Storage Area.

The Turker Beck flood risk management option is located within the Willow Beck Catchment water body (ID: 104027069540). Turker Beck is a tributary of Sun Beck (the confluence is located within Northallerton at NGR 437208 494081) (Figure 1.1). The section of Sun Beck upstream of the confluence with Turker Beck is not included in the Willow Beck Catchment water body. However, it is included in this assessment as it flows directly into the Willow Beck Catchment water body.

The survey examined the following open channel sections of the Willow Beck Catchment water body and Sun Beck (Figure 1.1):

- Turker Beck from the access track to Harrogate House (NGR 438356 494597) to the entrance of the culvert at the edge of the urban area (NGR 437898 494551);
- Sun Beck from the field corner south of Bank Close Farm (NGR 438520 493679) to the entrance of the culvert at the edge of the urban area (NGR 437986 493930);
- Open channel sections of Turker Beck and Sun Beck within Northallerton (Figure 1b and c).

1.3.2 Desk study

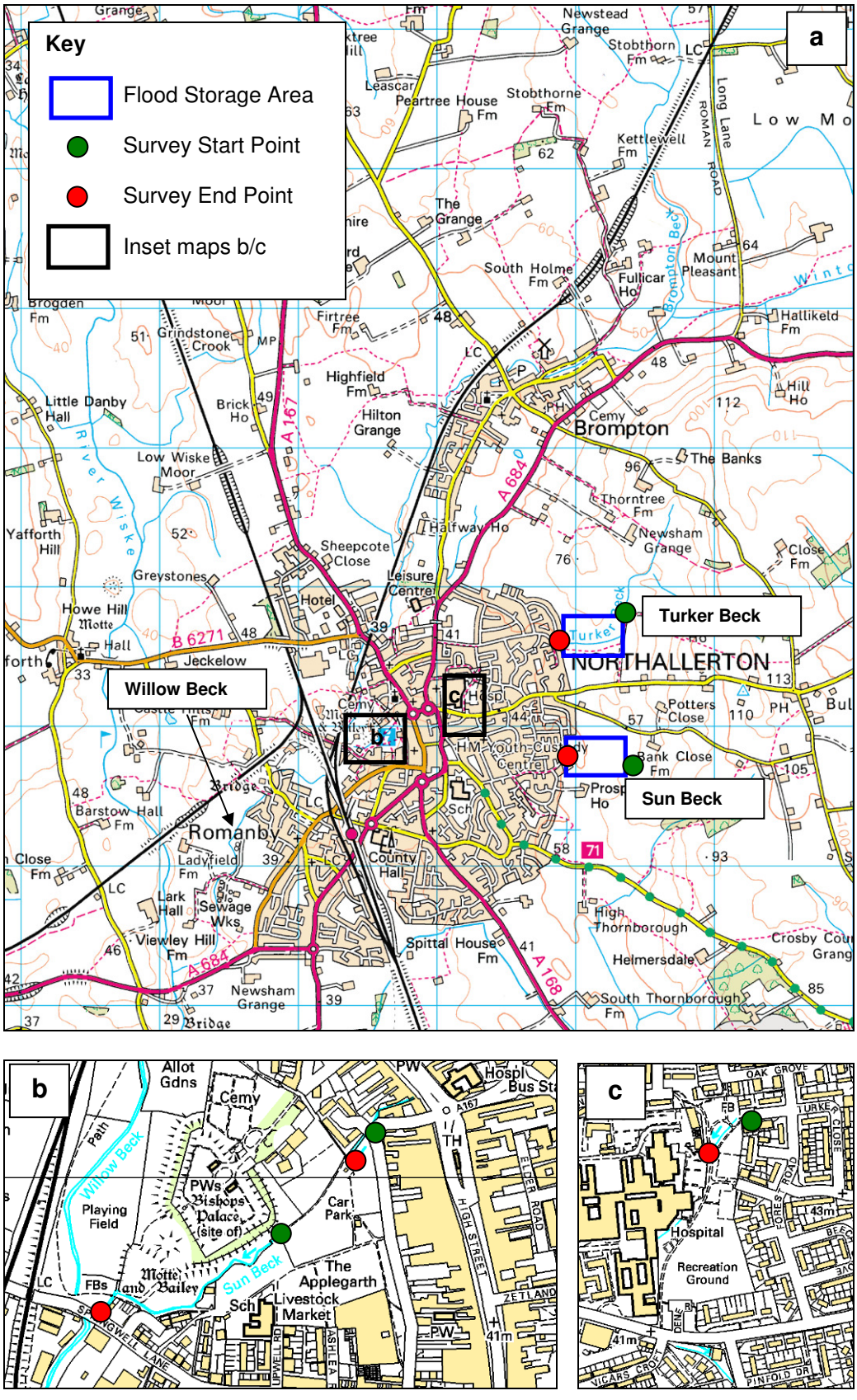
The desk study involved a review of previously collected data describing the hydromorphology of the water body and Historical Trend Analysis (HTA) to assess trends in geomorphological behaviour over time (Defra, 2009).

1.3.3 Field Survey

The field survey was designed to assess the direct and consequential impacts of the options both in the location of the options and downstream. The survey involved a visual assessment and interpretation of geomorphological process and forms along the water body by examining:

- The location and scale of geomorphological features, specifically erosion features and sediment deposits;
- The degree and extent of existing channel modification;
- The condition of hydromorphological quality elements:
    - River depth and width variation;
    - Structure and substrate of the channel bed;
    - Structure of the riparian zone.

Figure 1.1: The location of the FCRM options assessed by this study and extent of field survey.



2 Water body Overview

2.1 WFD Status

The flood risk management option on Turker Beck is located within the Willow Beck Catchment water body (ID: 104027069540). The characteristics of this water body, as assessed under the Water Framework Directive, are detailed in Table 2.1. The flood risk management option on Sun Beck lies outwith the Willow Beck Catchment water body. However any downstream changes to hydromorphology caused by this option would potentially impact on the Willow Beck Catchment water body.

Table 2.1: Characteristics of the Willow Beck water body (source: www[1] and Environment Agency, 2009).

Element	Classification
Waterbody ID	GB104027069540
Waterbody Name	Willow Beck Catchment (tributary of Wiske)
Waterbody Length	24.2km
Management Catchment	Swale, Ure, Nidd and Upper Ouse
River Basin District	Humber
Typology Description	Low, Small, Calcareous (River Type 2)
Hydromorphological Status	Heavily Modified
Hydromorphological Quality	Not High
Current Ecological Quality	Moderate Potential
Current Chemical Quality	Does Not Require Assessment
2015 Predicted Ecological Quality	Moderate Potential
2015 Predicted Chemical Quality	Does Not Require Assessment
Overall Risk	At Risk
Protected Area	Yes – Freshwater Fish Directive
High Risk Pressures	Diffuse Phosphorous from Agriculture Ammonia Dissolved Oxygen Total oxidised nitrogen Physical and morphological
Medium Risk Pressures	Diffuse pesticides Diffuse sediments Diffuse urban pollution Phosphorous

The water body is classed as a Heavily Modified Water Body (HMWB) and the ecological quality is classed as being of moderate potential. The classification of ecological potential (as opposed to status in the case of HMWBs) is based on an assessment of whether measures have been implemented to mitigate the modified hydromorphological characteristics of the watercourse (UK TAG, 2008). In the case of the Willow Beck Catchment water body the following Mitigation Measures have been identified:

- Awareness raising with regard to fine sediment supply;
- Retain marginal aquatic and riparian habitats;
- Appropriate measures to control invasive species;
- Management of the risk of fish entrainment in intakes (e.g. pumping stations);
- Preserve and, where possible, restore historic aquatic habitats;
- Removal of hard bank reinforcement / revetment, or replacement with soft engineering solution.

At present none of these measures are currently in place (Environment Agency, 2009). As these measures are not in place the water body can therefore only achieve moderate ecological potential or worse. In order for good ecological potential to be achieved all Mitigation Measures must be in place. In the case of Willow Beck Catchment water body the Mitigation Measures assessment previously undertaken by the Environment Agency, states that moderate ecological potential is anticipated by 2015 on the basis that the implementation of these measures is technically infeasible (Environment Agency, 2009).

The WFD describes hydromorphological elements as 'supporting biological elements' (UK TAG, 2004) and defines hydromorphological elements as comprising both hydrological and morphological attributes. For rivers hydrological attributes are:

- Quantity and dynamics of flow, and
- Connection to groundwaters.

Morphological attributes are:

- River depth and width variation;
- Structure and substrate of the river bed, and
- Structure of the riparian zone.

Hydromorphological elements contribute to status classification only for water bodies at high ecological status. In the case of lower ecological status or potential, hydromorphological values are not specified but are to be consistent with the achievement of the values specified for the biological quality elements (UK TAG, 2004). In the case of the Willow Beck Catchment water body this is moderate ecological potential. This study therefore considers whether the proposed flood risk measures would lead to a decline to a lower class of ecological potential.

2.2 Hydromorphology of the Water body

2.2.1 Channel modification

As described above, Willow Beck Catchment water body is classed as being Heavily Modified. Observations made during the field survey indicate that the modifications to the water body are very extensive, but that the degree of channel modification and its impact on morphology varies along the water body.

The most widespread form of channel modification consists of modifications to the channel cross-section involving bank re-profiling and channel deepening (re-sectioning) to improve land drainage (Figure 2.1a). This type of modification involves lowering the bed of the watercourse (deepening) to enable gravity-driven

field drainage and creating a uniform cross-section (trapezoidal) to improve flow conveyance. These sections of channel generally have a relatively uniform channel bed, being dominated by long smooth glides with occasional riffles. This form of modification is extensive along all the main watercourses in the area.

Channel planform realignment (straightening), in addition to re-sectioning, is also very extensive (Figure 2.1a). Turker Beck and Sun Beck have been impacted by straightening almost continuously although Willow Beck has several sections of channel with a relatively natural sinuous channel planform.

Hard bank protection is extensive in the urban sections of the water body (Figure 2.1b), but is more infrequent in rural areas where agriculture is the dominant land use. Hard bed protection (in addition to bank protection) and culverting (full enclosure) is widespread in Northallerton, particularly along Turker Beck and Sun Beck.

2.2.2 Morphological Attributes

River depth and width variation is relatively low along the watercourses which comprise the water body, reflecting the widespread channel re-sectioning. The beds of the watercourses are all composed of a mixture of sediment sizes (where it is natural) ranging from silts to gravels. However, the topography of the channel beds is generally uniform with only occasional short sections of Willow Beck showing significant variability. The riparian zone of the watercourse has been severely degraded throughout the water body. Sections of well vegetated channel margins are restricted to situations where the banks of the channel are lined by hedgerows. These (managed) hedgerows do not constitute natural riparian vegetation assemblages.

The highly modified channel morphology of all of the water bodies also has an impact on current geomorphological processes. The channel shows little evidence of active ongoing changes in channel morphology. The channel form appears to be generally static with little evidence of active features (only occasional bank slips). Sediment supply appears to be dominated by fine sediment derived from fields, roads and occasional bank slips.

Figure 2.1: Examples of channel modification, (a) re-sectioning and straightening – Turker Beck (b) hard bank protection – Sun Beck.

a

b

3 Turker Beck Flood Storage Area

3.1 Site description

Turker Beck is a tributary of Sun Beck and is located within the Willow Beck Catchment water body (ID: 104027069540). The characteristics of this water body as assessed under the Water Framework Directive are detailed in Table 1.1. Turker Beck is culverted along much of its length within Northallerton (Figure 1.1). Upstream of the urban area of Northallerton the channel has a highly artificial and uniform morphology being straight (Figure 3.1) and deep with a trapezoidal cross-section (Figure 3.2a). This type of channel morphology is typical of agricultural areas and reflects enlargement of the watercourse to improve land drainage. The bed of the channel is composed of gravel and occasional cobbles and small boulders but is often covered by a layer of silt where flow velocities are low (Figure 3.2b). The bed has a varied morphology which reflects some small-scale localised adjustment to past modification. The morphological diversity of this watercourse is very low.

Figure 3.1: The location of the proposed Turker Beck Flood Storage Area (the location of photographs is indicated).

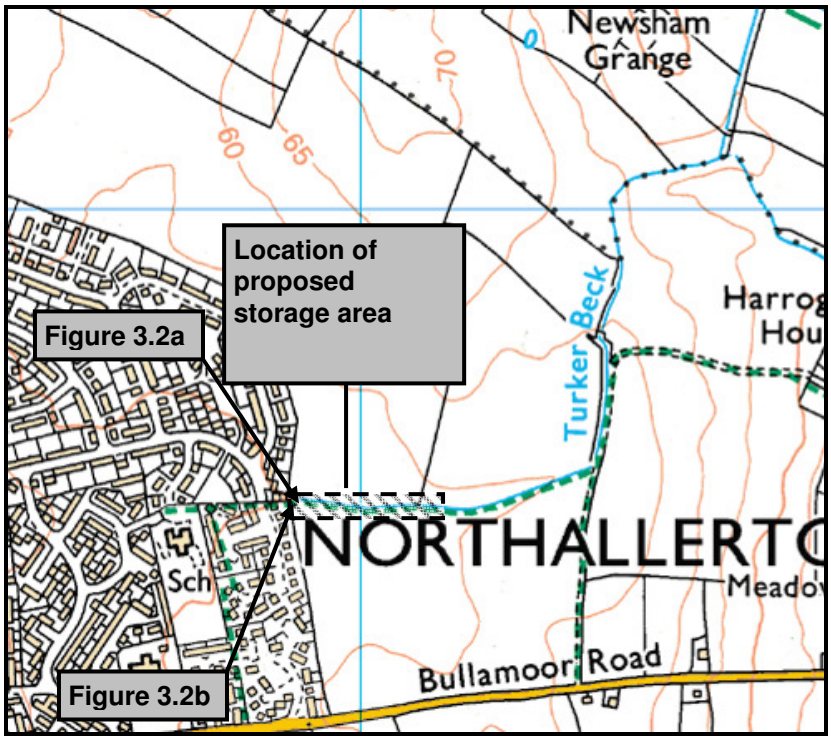


Figure 3.2: Photographs of Turker Beck at the site of the proposed storage area immediately upstream of the culvert inlet (a) and a detailed view of the bed (b).

3.2 Flood Risk

Flood risk along Turker Beck stems from culvert surcharging which causes out-of-bank flow from the open section at Bullamoor Park in Northallerton Town Centre (Jacobs, 2010). This inundates the hospital buildings during a 10% AEP (1 in 10 years) flood event. A 4% AEP (1 in 25 years) event causes more severe flooding, with additional surcharging at the hospital culvert and overland flows through the hospital, onto Bullamoor Road, propagating further on the west side of the High Street (Jacobs, 2010). During a 0.5% AEP (1 in 200 years) event, additional surcharging is seen further upstream at the Turker Lane culvert inlet, overland flow propagates through the housing estate inundating a large number of properties before joining the flow waters merging from the Bullamoor Park flood source (Jacobs, 2010).

3.3 FCRM Option

Hydraulic modelling revealed that to alleviate flood risk from Turker Beck the flow in the culvert needs to be limited to $1.3m^3s^{-1}$ (Jacobs, 2010). The proposed FCRM option would be to create online storage by enlarging the channel of the watercourse immediately upstream from the urban area of Northallerton with a total length of 240m (Figure 4). The flood storage area would consist of a stretch of two-stage channel 240m in length along the existing watercourse alignment. Creation of the two-stage channel would involve widening (re-profiling the banks) and regrading (deepening) the existing channel. Regrading the channel would result in a significant reduction in channel slope from $0.014m\ m^{-1}$, which is relatively steep, to $0.002m\ m^{-1}$, a significant reduction.

The completed channel would have a normal flow channel with a bed width of 1m which is similar to the existing channel. The bed would be composed of mixed coarse sediments (gravel/cobbles) similar to that of the existing channel bed.

3.4 Impact of option upon hydromorphology

3.4.1 Hydrology

To alleviate flood risk downstream flow passing into the culvert must be limited to $1.3m^3s^{-1}$ (Jacobs, 2010). This pass flow is designed to prevent culvert surcharging. This would have a limited impact on the flow conveyed through the channel (and culverts) downstream of the proposed storage area as this is currently limited by surcharging. Therefore the option would have no significant effect on in-channel

flow variation downstream. The FCRM option would not alter connectivity to groundwater.

3.4.2 Morphology

(a) Direct Impact

The channel morphology would be directly impacted by modification over a distance of 240m, representing 1% of the water body length. The channel is proposed to be modified by widening the channel cross-section and creating a two-stage channel with a normal flow channel with a bed 1m wide. The completed normal flow channel would have an identical channel planform (straight) to that at present and a similar cross-sectional shape and bed and bank composition (gravel). The FCRM option therefore involves replacing a highly modified/artificial section of channel with an almost identical section of artificial channel. This would not cause a reduction in channel morphological diversity from that existing at present.

(b) Consequential Impacts

The impoundment of flows greater than $1.3m^3s^{-1}$ is likely to increase the likelihood of siltation along the channel within the flood storage area. Flow impoundment would reduce velocities to negligible levels and lead to sediment deposition on the channel bed. Flows of $1.3m^3s^{-1}$ or less would be unlikely to be able to flush this sediment from the bed. Over time it is likely that silt would accumulate within the channel during flood events when the flood storage area operates. Siltation would result in smothering of the gravel bed with silt and sand and potentially also encourage subsequent vegetation colonisation in the channel. Coarse sediment transport along this section of channel is already negligible and would be unlikely to be changed by the flood storage option.

It is therefore likely that the morphology of the channel bed would be adversely impacted by this siltation. However, the impact would affect a maximum of 1% of the Willow Beck Catchment water body length. This assumes that siltation would occur along the full length of the modified channel. This is likely to be a worst case scenario as complete inundation of the full length of the storage area would be infrequent. A maximum impact on 1% of the Willow Beck Catchment water body length does not represent a widespread change in the morphological diversity at the water body scale.

An increase in siltation within the storage reservoir could reduce the fine sediment load of the watercourse downstream and could lead to some minor reductions in channel siltation, improving channel morphological conditions. However as Turker Beck is highly modified downstream (including extensive culverting), this would be unlikely to generate a significant improvement in channel morphology.

3.4.3 Potential Mitigation Option

The potential for channel siltation could be reduced by promoting awareness of measures which could be undertaken by land owners/managers in the upper catchment to reduce soil erosion and fine sediment ingress to the channel. This would also contribute to fulfilling one of the Mitigation Measures for the water body (Section 2.1), that of awareness raising with regard to fine sediment supply. Implementation of measures to reduce fine sediment to the channel could reduce the rate of channel siltation.

Providing occasional protruding boulders (similar to those found on the channel bed at present) would create variation in the bed morphology and cause localised flow variation, including local increases in velocity which could help to entrain fine sediment stored on the bed.

4 Sun Beck Flood Storage Area

4.1 Site description

Sun Beck is a tributary of Willow Beck (the confluence is located within Northallerton at NGR 437208 494081) (Figure 1.1). The section of channel between the confluence with Turker Beck and Willow Beck [NGR 436381 493812] is known as Sun Beck. The section of Sun Beck upstream of the confluence with Turker Beck is not included in the Willow Beck Catchment water body (ID: 104027069540).

In the location of the proposed FCRM option (Figure 4.1) the channel currently has a highly artificial and uniform morphology being straight and deep with a trapezoidal cross-section and is densely vegetated (Figure 4.2a). This type of channel morphology is typical of agricultural areas and reflects artificial enlargement of the watercourse to improve field drainage. The bed of the channel is composed of gravel and occasional cobbles but is smothered by a layer of silt and dense vegetation (Figure 4.2b). The morphological diversity of this watercourse is very low.

Figure 4.1: The location of the proposed Sun Beck Flood Storage Area (the location of photographs is indicated).

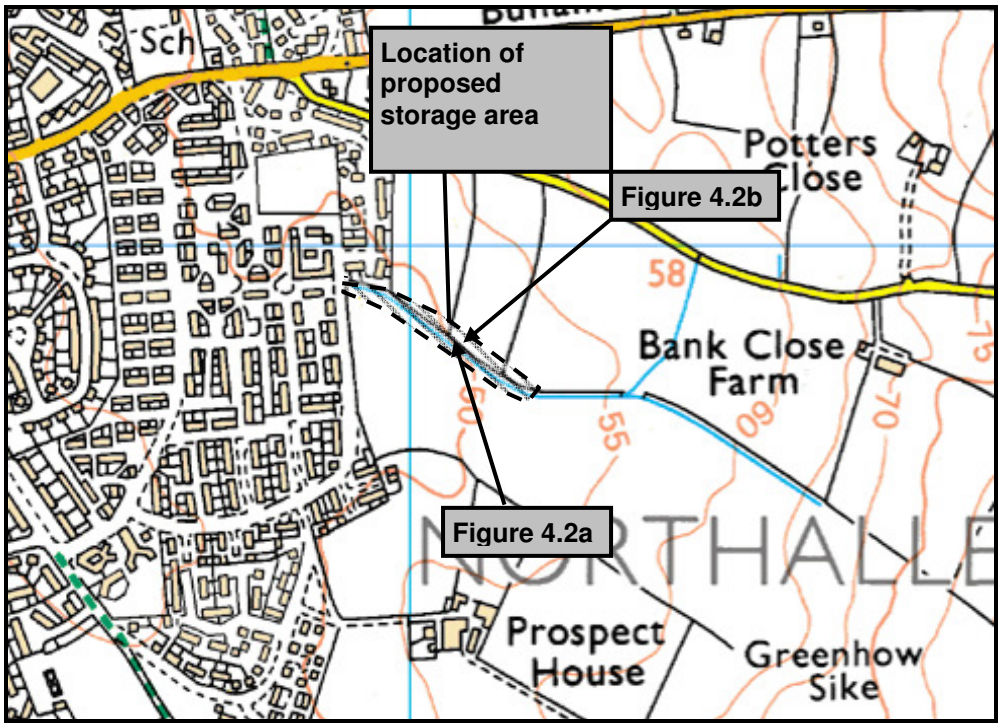


Figure 4.2: Photographs of Sun Beck looking downstream (a) and a detailed view of the bed (b).

4.2 Flood Risk

The open channel upstream of Northallerton (Bankhead Road) (Figure 4.2a) is overtopped on its left bank from a 10% AEP (1 in 10 years) event (Jacobs, 2010). During larger flood events, the out-of-bank flows inundate properties through Northallerton as far as Valley Road (Jacobs, 2010). The Croft / Bullamoor Road culvert also surcharges, flooding onto Bullamoor Road where it combines with flood waters from Turker Beck. During a 2% AEP (1 in 50 year) event, the flood waters from upstream reach Bullamoor Park and combine with the other flood flows from culvert surcharging on Sun Beck and the flood waters from Turker Beck.

4.3 FCRM Option

The proposed FCRM option is to create online storage by diverting the channel of the watercourse immediately upstream from the urban area of Northallerton. This would involve closing off the Bankhead Road culvert and creating a new length of open two-stage channel. In order to alleviate the flood risks for Sun Beck the pass-forward flow must be limited to $0.7m^3s^{-1}$ (Jacobs, 2010).

The flood storage area would consist of a stretch of two-stage channel that is 120m in length along the new watercourse alignment. Creation of the two-stage channel would involve the creation of an existing low/normal flow channel with wider shelving banks. In addition, a 40m section of the existing channel would be regraded.

The completed channel would have a low flow channel with a bed width of 1m which is similar to the existing channel. The bed would be composed of mixed coarse sediments (gravel/cobbles).

4.4 Impact of option upon hydromorphology

This section of Sun Beck does not lie within the Willow Beck Catchment water body and as a result the channel modification would not directly impact on the Willow Beck Catchment water body.

4.4.1 Hydrology

Hydraulic modelling revealed that to alleviate flood risk downstream the pass forward flow would need to be limited to $0.7m^3s^{-1}$ (Jacobs, 2010). This flow is designed to prevent culvert surcharging. This would have a limited impact on the flow conveyed through the channel (and culverts) downstream of the proposed

storage area as this is currently limited by surcharging. Therefore the option would have no significant effect on in-channel flow variation downstream. The FCRM option would not alter connectivity to groundwater.

4.4.2 Morphology

(a) Direct Impact

The channel morphology would be directly altered by modification over a distance of 160m, involving the removal of a culvert, creation of open channel and regrading of a section of existing channel. This lies entirely outwith of the Willow Beck Catchment water body. The channel would be modified by creating a new open channel with a wide crest at the top of the channel whilst maintaining a smaller normal flow channel. The existing culvert would be blocked off. The completed normal flow channel would have a similar channel planform (straight) to that existing at present and a similar cross-sectional shape and bed composition (gravel). The FCRM option would involve replacing a culverted section of channel with a larger section of open channel. This would potentially improve the channel morphological diversity from that existing at present.

(b) Consequential Impacts

The impoundment of flows greater than $0.7m^3s^{-1}$ would be likely to increase the potential for siltation along the channel within the flood storage area. Flow impoundment would reduce velocities to negligible levels and lead to sediment deposition on the channel bed. Flows below $0.7m^3s^{-1}$ would be unlikely to be able to flush this sediment from the bed. This would result in smothering of the gravel bed with silt and sand and potentially also significant vegetation colonisation within the channel. Coarse sediment transport along this section channel is already negligible and would be unlikely to be impacted by the flood storage option.

Field evidence indicates that the channel is already subject to extensive fine sediment accumulation (siltation) which promotes dense in channel vegetation (Figure 4.2b). Further siltation would not alter the morphological character of this section of channel. However, elevated rates of siltation could lead to a reduction in the capacity of the low flow channel over time.

An increase in siltation within the storage reservoir would potentially reduce the fine sediment load of the watercourse downstream and could lead to some minor reductions in channel siltation. However, as Sun Beck is already extensively modified downstream (including extensive culverting), this is not likely to generate any appreciable improvement in channel morphology.

4.4.3 Potential Mitigation Options

The blocking of the existing culvert to be replaced with open channel may contribute to Mitigation Measures in-line with those recommended for the Willow Beck Catchment water body (Preserve and, where possible, restore historic aquatic habitats, and Removal or replacement of redundant structures). However as the Sun Beck is not within the Willow Beck Catchment water body this would not be a direct contribution to the Mitigation Measures.

The potential for channel siltation could be reduced by promoting awareness of measures which could be undertaken by land owners/managers in the upper catchment to reduce soil erosion and fine sediment ingress to the channel.

5 Conclusion

This Level 1 Hydromorphology Assessment of FCRM options in Northallerton based on the guidance given in Defra (2009) has found that potential adverse changes to the hydromorphology of the Willow Beck catchment water body due to the FCRM options would be restricted to the Turker Beck Storage Area. These impacts consist of:

- Direct impacts associated with channel engineering, and
- Consequential impacts of changes in flow on sediment transport.

Changes to channel morphology in the location of the Turker Beck Storage Area would consist of:

- 240m of channel enlargement (1% of water body);
- A high likelihood of channel siltation over this length.

Changes to channel morphology in the location of the Sun Beck Storage Area would consist of:

- 184m of channel enlargement;
- A high likelihood of channel siltation over this length.

The impacts of these modifications on the water body are not considered to represent changes to the hydromorphology likely to be of sufficient magnitude to reduce the morphological diversity from that existing at present. This is because:

1. The existing channel modifications mean many of the channel modifications would not lead to significant changes from the existing situation.

2. Adverse changes to channel morphology are restricted to 240m of potential channel siltation at Turker Beck (1% of the water body).

3. The changes to channel morphology along Sun Beck would not lead to any impact on the Willow Beck Catchment water body, and culvert decommissioning/open channel design would be seen as a beneficial measure for hydromorphology.

4. Mitigation Options have been recommended to reduce the impacts in each location.

It is not considered to be necessary to undertake a Level 2 Assessment.

6 References

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7 Glossary

Biological Quality Elements	Under the WFD The biological quality elements are phytoplankton, macroalgae, macrophytes, benthos and fish.
Ecological Potential	Under the WFD a measured deviation from the optimal ecological condition of a Heavily Modified Water Body
Ecological Status	Under the WFD a measured deviation from the optimal ecological condition of a Water Body
Mitigation Measures	Measures defined in the River Basin Management Plan to ensure a Heavily Modified Water Body meets good ecological potential.
Morphological Diversity	Variation in the form (morphology) of a watercourse channel. Generally the greater the morphological diversity the greater degree to which the channel can support Biological Quality Elements.
Re-sectioning	Alterations to channel cross-sectional form through sediment and vegetation removal

Appendix B: Fisheries Survey Results

Table 1. River Wiske System Fisheries Sites 2006

Water	Location	NGR	Comments	Possible Limiting Factors
R.Wiske	Nr A19 (Ingleby Cross)	NZ438005	Silty, compacted substrate	Road and arable field run-off
R.Wiske	East Rounton	NZ422032	Very silty over gravel substrate	Land use (arable run-off?)
R.Wiske	West Rounton	NZ413033	Silty, compacted substrate	Land use (arable run-off?)
R.Wiske	Appelton Wiske	NZ391043	Very silty, abundant fil. algae	Land use, water quality. Eutrophic
R.Wiske	Little Smeaton	NZ349037	Good habitat, but fil. algae, abundant stickleback	water quality? Eutrophic.
R.Wiske	Birkby Top	NZ329024	Silty, compacted substrate, fil. algae, abundant stickleback	"yellow pike" – indicative of poor water quality
R.Wiske	Danby Wiske	SE337987	Good habitat, but over abundant macophytes. Herbicide used extensively on riparian and instream.	Eutrophic. Chronic poor water quality?
R.Wiske	Yafforth	SE346945	Good habitat, very sparse fish stocks. Four dead dogs in river near bridge.	Water quality.
R.Wiske	Howden Bridge	SE351922	Water turbid, grey smelling of sewage. Silty.	"yellow pike" – indicative of poor water quality
R.Wiske	Nr Nth Otterington	SE362894	Not sampled due to over-abundant macrophytes.	Eutrophic – land use. High nutrient inputs WWTW?
R.Wiske	Newby Wiske	SE370876	Silty, abundant macrophytes. Localised gross organic pollution.	Eutrophic – land use. High nutrient inputs WWTW, septic tank?
R.Wiske	Kirby Wiske	SE377846	Silty, abundant macrophytes.	Eutrophic – land use. High nutrient inputs WWTW?
Trenholme Stell	A19	NZ442036	Not sampled in 2006	
The Stell	Nr East Cowton	NZ304032	Very low flows, silty, excessive macrophyte growth blocking watercourse	Low flows, high nutrients.
Winton Beck	D/s Hallikeld Farm	SE392970	Good habitat, but fishless	Some evidence of slurry input. Low flows
Brompton Beck	Stobthorn Farm level crossing	SE388988	Over abundant macrophytes and only pollution tollerant stickleback present	High nutrients, poor water quality, low flows
Brompton Beck	Top of Brompton Village	SE382966	Gross organic pollution, anoxic silt.	Water quality, low flows
Brompton Beck	Northallerton	SE365946	Very silty, excessive macrophyte. Herbicide used instream.	Chronic poor water quality, high nutrients.
Willow Beck	Romanby village	SE358936	Organic enrichment, silty, compacted substrate	Water quality, low flows. SSO?
Willow Beck	Romanby WWTW	SE354929	Heavy fil. algae growth, very silty. Sewage fungus	High nutrient status. Chronic poor water quality.
Otterington Beck	A167	SE360906	Very silty, extensive sewage fungus	Poor water quality, low flows
Sike Stell	A167	SE382840	Deep, anoxic silt. Organic inputs?	Land use some poor water quality inputs.

Table 2. River Wiske System Fisheries & Biology Classifications

Water	Location	NGR	2006	2003	2000	1995	1993	1992	1990	1988	1984
R.Wiske	Nr A19 (Ingleby Cross)	NZ438005	D				D			D (B)*	
R.Wiske	East Rounton	NZ422032	B/C				C			C/D (B)*	
R.Wiske	West Rounton	NZ413033	D				D			D (B)*	
R.Wiske	Appelton Wiske	NZ391043	D				D			D (B)*	
R.Wiske	Little Smeaton	NZ349037	D/C				D/E			C (B)*	
R.Wiske	Birkby Top	NZ329024	C/B				D			C (B)*	
R.Wiske	Danby Wiske	SE337987	D				C/B			D (C)*	
R.Wiske	Yafforth	SE346945	C	(C)	(B)	(C)	D		(C)	C (C)*	
R.Wiske	Howden Bridge	SE351922	C/B			(C)	C		(D)	D/E (D)*	(D)
R.Wiske	Warlaby	SE355907		(C)	(C)	(C)			(C)		
R.Wiske	Nr Nth Otterington	SE362894	Not sampled			(C)	C			D (D)*	
R.Wiske	Newby Wiske	SE370876	B				C			D (D)*	(D)
R.Wiske	Kirby Wiske	SE377846	B/C		(B)	(C)	C		(C)	D (D)*	
Trenholme Stell	A19	NZ442036	Not sampled				E	(D)		D/E (B)*	
The Stell	Nr East Cowton	NZ304032	D/E				E/D	(D/E)		E (B)*	
Winton Beck	D/s Hallikeld Farm	SE392970	E				D	(C)		D (C)*	(D)
Brompton Beck	Stobthorn Farm level crossing	SE388988	D/E				D			D/E (B)*	(D)
Brompton Beck	Top of Brompton Village	SE382966	E/D				D	(D)		D (C)*	(D)
Brompton Beck	Northallerton	SE365946	D				D			D (C)*	(D)
Willow Beck	Romanby village	SE358936	D/C				D/C			E (C)*	(D)
Willow Beck	Romanby WWTW	SE354929	D/C				C/B			E (E)*	(D/E)
Otterington Beck	A167	SE360906	D				C/B	(C/D)		D (B)*	
Sike Stell	A167	SE382840	D				C/B			D (B)*	

(Figures in parenthesis indicate Biology classification - *1987 data) X – improvement since 1988 X – Deterioration since 1988

X Biological data obtained from River Wiske water quality report

X Biological data classified using the Yorkshire Biological Water Quality Index (converted to the A,B.C… for ease of comparison)

Gross organic pollution c.100m upstream of Newby Wiske Bridge

Newby Wiske showing abundant macrophytes typical of the Wiske system.

Brompton Beck d/s ford in Brompton village showing acute low flows and abundant filamentous algae from over enrichment. NB. brown instream vegetation suggests treatment with herbicide.

Brompton Beck u/s ford in Brompton village. Substrate: extensive covering of black ,anoxic silt.

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