

The Keadby 3 Low Carbon Gas Power Station Project

PINS Ref: EN010114

The Keadby 3 Low-Carbon Gas Power Station Order

**Land at and in the vicinity of the Keadby Power Station site,
Trentside, Keadby, North Lincolnshire**

Preliminary Environmental Information (PEI) Report Volume II - Appendix 11C: Preliminary Ecological Appraisal Report

The Planning Act 2008

**The Infrastructure Planning (Environmental Impact Assessment)
Regulations 2017**

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GLOSSARY

Abbreviation	Description
CIEEM	Chartered Institute of Ecology and Environmental Management
CRoW	Countryside and Rights of Way Act
DBH	Diameter at breast height
EcIA	Ecological Impact Assessment
Edaphic	Meaning of, produced by, or influenced by the soil
Ha	Hectare
LBAP	Local Biodiversity Action Plan
LDF	Local Development Framework
LERC	Lincolnshire Environmental Records Centre
LNR	Local Nature Reserve
LWS	Local Wildlife Site
MAGIC	Multi-Agency Geographic Information for the Countryside
NERC	Natural Environment and Rural Communities Act
NPPF	National Planning Policy Framework
NPPG	National Planning Policy Guidance
NPS	National Policy Statement
OS	Ordnance Survey
OMH	Open Mosaic Habitat
PEA	Preliminary Ecological Appraisal
S41	Section 41 of the NERC Act
SAC	Special Area of Conservation
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
WCA	Wildlife & Countryside Act
WFD	Water Framework Directive

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1.0 INTRODUCTION

1.1 Overview

1.1.1 This report describes the approach and findings of the Preliminary Ecological Appraisal (PEA) undertaken in support of the ecological impact assessment (EclA) of the Proposed Development. The terms of reference used to describe the Proposed Development in this report are broadly consistent with those defined within the main chapters of the Preliminary Environmental Information (PEI) Report (Volume I) and for clarity include:

- The Proposed Development Site which encompasses an area of approximately 88.1 hectares (ha) of which approximately 17.7ha of land is currently under evaluation to determine the suitability for potential construction laydown. It is noted that not all of this land will be required and will be refined through ongoing studies and assessment prior to submission of the Application;
- The Proposed PCC Site, which comprises:
 - an area of approximately 13.5ha of the Keadby Power Station site that is located within Keadby Common on which the power generation (CCGT), carbon capture and compression (CCP) and associated stacks will be developed (herein referred to as the 'Main Site');
 - overhead electricity transmission lines associated with the existing National Grid 400kV Substation which bisect the Proposed PCC Site; and
 - A further 1.6ha of land to the south of these overhead lines for administration/ control room/ warehouse buildings and car parking areas within the Proposed PCC Site.

1.1.2 The purpose of the PEA has been to define the baseline ecological conditions associated within the potential zone of influence of the Proposed Development (based on the study areas defined later in this report), and to determine the need for further survey work to inform the subsequent EclA. This appendix therefore informs **Chapter 11: Biodiversity and Nature Conservation** (PEI Report Volume I) and provides a record of the work undertaken and the supporting rationale. This report also clarifies which ecological features are and are not considered relevant to the EclA of the Proposed Development. Geological features of nature conservation importance are excluded from the remit of this PEA as they are addressed in **Chapter 13: Geology, Hydrogeology and Land Contamination** (PEI Report Volume I).

1.1.3 The approach applied when undertaking this PEA accords with current best practice guidelines for PEA published by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2019). The PEA addresses relevant wildlife legislation and planning policy as summarised in the next section of this report.

1.1.4 In order to deliver the PEA, a desk study and an extended Phase 1 Habitat survey have been undertaken by appropriately experienced ecologists, to identify ecological features within land required for construction, operation and decommissioning of the Proposed Development and its wider potential zone of influence. The potential zones of influence relevant to different ecological features are considered and defined within the Methods section of this PEA report when defining the desk study and field survey areas to be applied.

- 1.1.5 The PEA has been informed by previous habitat and protected species surveys undertaken on behalf of the Applicant in 2017 (AECOM, 2017), as the survey data remains relevant and supports the robust identification of relevant biodiversity constraints and opportunities. The results of these previous surveys are included as annexes to this PEA report. Where required, additional surveys (2020) undertaken to ground truth the 2017 survey findings are described.
- 1.1.6 The objectives of this PEA report are to:
- identify statutory and non-statutory biodiversity nature conservation designations within the potential zone of influence of the Proposed Development;
 - identify and categorise all habitats present within the land required for the Proposed Development, and adjacent areas where there might be potential for direct or indirect effects;
 - carry out an appraisal of the potential of the habitats recorded to support protected or notable species of fauna and flora;
 - identify requirements for follow-up habitat and species surveys to define the ecological baseline;
 - provide an evaluation of the relative nature conservation value of the identified nature conservation designations, habitats and species to inform the EclA, where possible based on available information; and
 - provide figures showing the locations of the identified ecological features.
- 1.1.7 The following figures are provided to support this PEA:
- **Figure 11C.1** – Statutory Nature Conservation Designations;
 - **Figure 11C.2** – Non-statutory Nature Conservation Designations
 - **Figure 11C.3** – Phase 1 Habitat Survey Map; and
 - **Figure 11C.4** – Location of Key Constraints.
- 1.1.8 The following annexes are provided to support this PEA:
- **Annex 11A:** Phase 1 Habitat Survey Target Notes (excluding watercourses – see Annex 11D);
 - **Annex 11B:** Photographs;
 - **Annex 11C:** Trees with Features of Potential Suitability for Roosting Bats;
 - **Annex 11D:** Descriptions of Relevant Watercourses and Assessment of their Suitability for Riparian Mammals, Fish and Aquatic Invertebrates;
 - **Annex 11E:** Botanical Survey Report;
 - **Annex 11F:** Reptile Survey Report;
 - **Annex 11G:** Terrestrial Invertebrate Survey Report; and
 - **Annex 11H:** Breeding Bird Survey Report.

2.0 RELEVANT LEGISLATION, PLANNING POLICY AND GUIDANCE

2.1 Legislation

2.1.1 The following legislation relating to biodiversity conservation in England is potentially relevant to the Proposed Development:

- The Conservation of Habitats and Species Regulations 2017 (as amended) ('the Habitats Regulations');
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (WFD);
- Wildlife and Countryside Act 1981 (as amended) (the WCA);
- The Hedgerow Regulations 1997;
- Countryside and Rights of Way (CROW) Act 2000 (as amended);
- Natural Environment and Rural Communities (NERC) Act 2006 (as amended);
- Protection of Badgers Act 1992 (as amended);
- Animal Welfare Act 2006;
- Wild Mammals (Protection) Act 1996;
- The Eels (England and Wales) Regulations 2009 (as amended);
- Salmon & Freshwater Fisheries Act 1975 (as amended);
- Environmental Protection Act 1990; and
- [Marine and Coastal Access Act 2009](#).

2.1.2 The above legislation has been considered when planning and undertaking this PEA using the methods described in Section 3, when identifying potential constraints and making recommendations for further survey described in Section 4. Compliance with legislation may require the attainment of relevant protected species licences prior to the implementation of the Proposed Development.

2.1.3 Further information on the requirements of the above legislation is provided as **Appendix 11A: Legislation and Planning Policy** (PEI Report Volume II). This should be referred to when reading this PEA report.

2.2 Planning Policy

[National Policy](#)

2.2.1 The Government's policy for delivery of major energy infrastructure is set out in the following relevant National Policy Statements (NPS):

- Overarching NPS for Energy (EN-1) (DECC, 2011a); and
- NPS for Fossil Fuel Electricity Generating Infrastructure (EN-2) (DECC, 2011b).

- 2.2.2 The policies set out in the National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government, 2019) are also important and relevant matters. The NPPF sets out the Government's planning policies for England and how these are expected to be applied and identifies overarching environmental objectives such as protecting and enhancing our natural environment and improving biodiversity. It introduces additional considerations including definitions of and requirements in relation to irreplaceable habitats which must be addressed in the development design and assessment process. Further information on the relevant parts of the NPPF is provided within **Appendix 11A** (PEI Report Volume II).

Local Plan Policy

- 2.2.3 The Proposed Development is located entirely within the administrative area of North Lincolnshire Council (NLC). Therefore, the following planning policies are potentially relevant to the Proposed Development:

- Policy CS17: Biodiversity of the NLC Local Development Framework Core Strategy adopted 2011 (North Lincolnshire Council, 2011), which sets out requirements to achieve effective stewardship of the biodiversity of North Lincolnshire; and
- Saved Policies LC1, 2, 3, 4, 5, 6 and 12 of the North Lincolnshire Local Plan adopted 2003 (North Lincolnshire Council, 2003), which set out requirements in regard to nature conservation designations, species and habitats and the protection of trees, woodlands and hedgerows.

- 2.2.4 There is also emerging policy as NLC is preparing a new Local Plan to 2036 (North Lincolnshire Council, 2020). Once agreed (formally adopted), it will replace the current North Lincolnshire Local Plan and the Core Strategy. NLC undertook their Regulation 18 'Preferred Options' consultation between February and March 2020. The policies consulted on and of potential relevance to biodiversity and nature conservation are:

- Policy DQE3p: Biodiversity and Geodiversity, which updates requirements to achieve effective stewardship of the biodiversity of North Lincolnshire, including nature conservation designations, sites that meet criteria for the selection of Local Wildlife Sites (LWS), habitats and species; and
- Policy DQE8p: Climate Change and Low Carbon Living, which expects that all development proposals should be resilient to climate change and decrease the negative impacts of climate change on neighbouring areas, including through incorporation, where feasible, of multi-functional green infrastructure, which can help species adapt to climate change through preventing fragmentation or isolation of habitats.

Other Relevant Guidance

- 2.2.5 Additional guidance of potential relevance to the Proposed Development and/ or for interpretation of the above planning policy is given in the following documents:

- North Lincolnshire Supplementary Planning Guidance (SPG) 3: Design in the Countryside, which sets out additional considerations in relation to landscape plantings and biodiversity protection and enhancement (North Lincolnshire Council (2003a);

- Biodiversity 2020: A strategy for England's wildlife and ecosystem services (Defra, 2011);
- Lincolnshire Biodiversity Action Plan (Lincolnshire Biodiversity Partnership, 2011);
- Standing Advice issued by Defra, Natural England and the Forestry Commission; and
- National Character Area Profile 39 (NE339): Humberhead Levels (Natural England, 2014).

3.0 METHODS

3.1 Desk Study

- 3.1.1 A desk study was carried out to identify nature conservation designations and protected and notable habitats and species potentially relevant to the Proposed Development. As part of this, the results of previous surveys undertaken by AECOM in 2017 on behalf of the Applicant (refer to **Annexes 11E-H**) were reviewed for relevant information.
- 3.1.2 The desk study areas applied, and the data sources used are detailed in Table 1, and the identified designations are shown on **Figure 11C.1**.
- 3.1.3 A stratified approach was taken when defining the desk study area, based on the likely zone of influence of the Proposed Development on different biodiversity and nature conservation features, and an understanding of the maximum distances typically considered by statutory consultees. In defining appropriate desk study search areas, it was also recognised that much of the indicative Proposed Development Site boundary encompasses existing infrastructure that, as a worst-case, would require only relatively minor upgrade works and that would otherwise be utilised in a manner consistent with the existing purpose of these infrastructure. In comparison, construction, operation and decommissioning of the Main Site is more likely to affect biodiversity and nature conservation features, including features located at greater distance, but the Main Site is of relatively limited extent compared with the full indicative Proposed Development Site boundary.
- 3.1.4 To address the disparity between the extent of the indicative Proposed Development Site boundary and the location and extent of potential sources of impacts that would have potential to give rise to likely significant effects, desk study search areas for nature conservation designations were applied with reference to the location of the Main Site. For habitats and species, the search area was set at 1km from the Proposed Development Site boundary. The likely zone of influence for construction and decommissioning activities for the Proposed Development is unlikely to exceed 1km out from the Proposed Development Site boundary (and in most cases would be much less than this) for all relevant ecological features. In comparison, operational air quality impacts and effects could potentially arise over a much greater distance.
- 3.1.5 Accordingly, and as set out in Table 1, all statutory nature conservation designations within 15km of the Main Site have been identified to meet maximum good practice requirements for assessment of the potential air quality effects of operation of the Proposed Development. However, non-statutory nature conservation designations have been identified over a shorter distance (2km of the Main Site) because this is considered to be the worst-case zone of influence, and good practice guidance does not necessitate air quality assessment of more distant non-statutory nature conservation designations. This approach was sufficient to meet the data needs for assessment of the Proposed Development Site as a whole.

Table 1: Desk study data sources and study areas

Type of ecological feature Title	Desk study area	Data sources
International nature conservation designations e.g. Special Areas of Conservation (SAC), Special Protection Area (SPA), Ramsar site	15km from Main Site	Multi-Agency Geographic Information for the Countryside (MAGIC) website (www.magic.gov.uk) (accessed February 2020)
National statutory nature conservation designations e.g. Site of Special Scientific Interest (SSSI)	15km from Main Site	MAGIC website (accessed February 2020)
Local statutory and non-statutory nature conservation designations (biodiversity) e.g. Local Nature Reserve (LNR), LWS, Site of Importance for Nature Conservation (SINC), ancient woodland	2km from Main Site, otherwise 1km from Proposed Development Site	Lincolnshire Environmental Records Centre (LERC) (data received February 2020)
Ancient and veteran trees	1km from Proposed Development Site	LERC (data received February 2020) Ancient tree inventory website (https://ati.woodlandtrust.org.uk/tree-search) (accessed July 2020)
Protected and notable habitats and species (Note 1)	1km from Proposed Development Site	Lincolnshire Environmental Records Centre (LERC) (data received February 2020) Previous ecological survey information for Keadby Ash Tip collected by AECOM in 2017. This information covers: <ul style="list-style-type: none"> • habitats; • protected and notable flora; and • protected and notable fauna: great crested newt, reptiles, badger, bats, water vole, otter, breeding birds, terrestrial invertebrates and aquatic invertebrates. Previous ecological survey information covering the Proposed Development Site and adjacent land contained within reports to Applicant for Keadby 2 Power Station and Keadby Wind Farm. The Environment Agency Ecology and Fish Explorer Database (accessed May 2020)

Type of ecological feature Title	Desk study area	Data sources
<p>Note 1 Protected and notable habitats and species include those listed under Schedules 1, 5 and 8 of the WCA; Schedules 2, 4 and 5 of The Habitats Regulations; and species and habitats of Principal Importance for nature conservation in England listed under Section 41 of the NERC Act. Records of non-native controlled weed species were also collated; such species are listed under Schedule 9 of the WCA.</p>		

3.2 Field Survey

Phase 1 Habitat Survey

- 3.2.1 A Phase 1 Habitat survey was undertaken by appropriately experienced AECOM ecologists on 22nd April 2020 in accordance with the standard survey method (Joint Nature Conservation Committee, 2016). Botanical data was topped up through targeted survey on 15th July 2020 and has been incorporated into this PEA report. This latter survey encompassed land within Keadby Common and Keadby Ash Tip, as well as relevant sections of the Stainforth and Keadby Canal and the River Trent.
- 3.2.2 Phase 1 Habitat survey is a standard method of environmental audit. It involves categorising different habitat types and habitat features within a defined field survey area. The information gained from the survey can be used to determine the likely ecological value of a site, and to direct any more specific survey work which may need to be carried out prior to the submission of an application for consent.
- 3.2.3 Subject to the limitations described in Section 3.3, the field survey area comprised all land within the Proposed Development Site, and adjacent land to a maximum distance of 50m out from the Proposed Development Site where safely accessible and land access permission had been granted.
- 3.2.4 All habitat types present within the field survey area were recorded and mapped. Typical and notable plant species were recorded for different habitat types and reflect the conditions at the time of survey. This was not intended to be a detailed inventory of the plant species present in the Survey Area, as this is not required for the purposes of Phase 1 Habitat survey. In addition, robust data was available from all of the most notable habitats present as a result of detailed surveys completed by AECOM on behalf of the Applicant in 2017. This previous survey data has been reviewed for its ongoing relevance and has been used to supplement the results of the current survey where relevant and valuable to do so. Requirements for additional more detailed botanical survey are also identified later in this PEA report with reference to the survey work completed in 2017.

Appraisal of Potential Suitability of Habitats to Support Protected and Notable Species

- 3.2.5 The Phase 1 Habitat survey was 'extended' to include an appraisal of the potential suitability of the habitats present to support protected and notable species of plants or animals (as defined in Table 1). Field signs, habitat features with potential to support protected or notable species and any sightings or auditory evidence were recorded when encountered, but no detailed protected species surveys were carried out for the purposes of this PEA, other than those described in the bullet points below.

3.2.6 Specific surveys were undertaken for the following protected or notable species as part of the PEA:

- assessment of the suitability of any waterbodies present for great crested newt (*Triturus cristatus*);
- badger survey – see **Appendix 11D: Confidential Badger Report** (PEI Report Volume II) for the approach taken and the results of the survey;
- assessment of the suitability of any trees present for roosting bats – see the separate method statement provided below, the survey results are provided in this PEA report. There were no buildings or structures in the zone of influence of the Proposed Development requiring similar appraisal; and
- invasive non-native plant species listed on Schedule 9 of the WCA – these were recorded as encountered and the results are provided in this PEA report.

3.2.7 Table 5 of this report clarifies any further requirements for species surveys based on the information gathered for this PEA report, including reference to the detailed surveys completed by AECOM in 2017.

Assessment of Trees for their Suitability for Roosting Bats

3.2.8 A visual inspection was made of all trees on land covered by the Phase 1 Habitat survey for their potential suitability as bat roosts. This inspection was made at the same time as the Phase 1 Habitat survey.

3.2.9 The purpose of the survey was to identify any potential roost features for bats (rot holes, damaged limbs, woodpecker holes, peeled bark) or evidence indicating the presence of bats (scratching, droppings, feeding remains or dead bats). Where trees were clearly unsuitable following an initial visual appraisal then they were discounted, and no attempt was made to record details of the appraisal of these trees. Instead survey effort was focussed on those trees with features of potential suitability, and all such trees were recorded. Features of potential suitability for bats were rated for based on their relative suitability (Low, Moderate or High) using the approach described in Collins (2016).

3.2.10 The inspection was carried out from ground level with the aid of close-focussing binoculars. If follow-up bat surveys are considered appropriate based on this appraisal, then this is advised in this PEA. Further surveys are only recommended if potentially suitable trees, and any associated bat roosts, would be likely to be affected by the Proposed Development (noting that care has been taken to avoid woodland and trees as far as reasonably practicable during the design of the Proposed Development to date).

3.3 Limitations

3.3.1 The aim of a desk study is to help characterise the baseline context of the Proposed Development and provide valuable background information that would not be captured by a single site survey alone. Information obtained during the course of a desk study is dependent upon people and organisations having made and submitted records for the area of interest. As such, a lack of records for a particular habitat or species does not necessarily mean that the habitats or species do not occur in the desk study area. Likewise, the presence of records for particular habitats and species does not

automatically mean that these still occur within the area of interest or are relevant in the context of the Proposed Development.

3.3.2 With the exception of the areas identified below, all land within the Proposed Development Site was fully accessible and was subject to field survey. The following areas were not surveyed:

- the potential water discharge option within the Water Connection Corridor (the 'Potential Discharge Option'), as this is an existing buried pipeline which is proposed will be used by the Proposed Development. No construction works are proposed within the Water Connection Corridor with the exception of (a) an option to upgrade the discharge structure on the bank of the River Trent which is under consideration, and (b) extension of the existing pipeline near it's point of origin at Keadby 1 Power Station to connect into the PCC Site These areas were inspected during the PEA;
- private residential properties and associated buildings along the Water Connection Corridor. The Proposed Development would not affect these properties, as the existing buried pipeline infrastructure would be used;
- the Waterborne Transport Off-loading Area on the River Trent. This is a secure operational area and was not accessible at the time of survey. This area is entirely under hard landscaping. Any use for the Proposed Development would be consistent with the existing operational use of this area;
- the secure Northern Powergrid compound off Chapel Lane, Keadby which instead was viewed through the boundary fence and observed to be hardstanding with a sparse cover of ephemeral plant species; and
- The existing National Grid 400kV substation and the land between this and the laydown area currently being used during construction of Keadby 2 Power Station. There was no requirement to enter the substation, and the land between it and Keadby 2 Power Station is within the land required for the construction of Keadby 2 Power Station.

3.3.3 The exclusion of the above areas from the survey is not considered a limitation on this PEA for the reasons given above. Enough information was collected, e.g. through inspection at distance, to understand the ecological context and relevance of these areas.

3.3.4 All habitats were surveyed at a suitable time of year (April 2020) for the identification of typical plant species within the habitats concerned, and the quality of the survey data collected was further assured through completion in July 2020 of a targeted top-up survey of land within Keadby Common and former Keadby Ash Tip, as well as relevant sections of the Stainforth and Keadby Canal and the River Trent in July 2020. All habitats have therefore been subject to an appropriate level of survey and botanical appraisal.

3.4 Evaluation of Ecological Features

3.4.1 The value of nature conservation designations and habitats identified within this PEA has been defined with reference to the following geographic scale:

- International (generally this is within a European context, reflecting the general availability of good data to allow cross-comparison);
 - National (Great Britain, but considering the potential for certain ecological features to be more notable (of higher value) in an England context relative to Great Britain as a whole);
 - Regional (East Midlands);
 - County (Lincolnshire);
 - District (North Lincolnshire);
 - Local (ecological features that do not meet criteria for valuation at a District or higher level, but that have sufficient value at the site level to merit retention or mitigation); and
 - Negligible (common and widespread ecological features that have very low value at the site level and which do not require retention or mitigation at the relevant location to otherwise maintain a favourable nature conservation status, or to deliver wider relevant biodiversity objectives).
- 3.4.2 This has been undertaken to inform the EclA presented in **Chapter 11: Biodiversity and Nature Conservation** of the PEI Report (Volume I). By so doing, the impact assessment can restrict its focus to relevant ecological features likely to experience significant effects as a result of the Proposed Development. Further information on the approach to the evaluation of ecological features is provided in **Appendix 11B: Ecological Impact Assessment Methods** of the PEI Report (Volume II).
- 3.4.3 Relevant species features are not assigned a nature conservation value in this report and instead are valued in **Annexes 11E to H** where survey work is completed or will be valued later within species-specific survey reports where further survey is necessary.

4.0 RESULTS

4.1 International and National Statutory Nature Conservation Designations

- 4.1.1 There are six international statutory nature conservation designations (Natura 2000 sites) and 23 national statutory nature conservation designations within the defined search area (which takes account of a maximum search area of 15km from the Main Site to meet requirements for air quality assessment, as detailed in **Chapter 11: Biodiversity and Nature Conservation** of the PEI Report Volume I). These designations are detailed in Table 2 and shown on **Figure 11C.1**.
- 4.1.2 Most of the identified designations (Table 2) are distant from the Proposed Development Site; but have been scoped in to meet the requirements of consultees for the assessment of potential air quality impacts and effects, as set out in **Chapter 8: Air Quality** (PEI Report Volume I).

Table 2: International and national nature conservation designations in the potential zone of influence of the Proposed Development.

National designation	Reason for designation	Location relative to the closest part of the Proposed Development Site	Location relative to operational air quality emissions from the Main Site
Humber Estuary Ramsar site	The River Trent at this location forms part of this near-natural estuary system. It is designated as it supports a range of internationally and nationally important species assemblages. This includes grey seal (<i>Halichoerus grypus</i>), natterjack toad (<i>Bufo calamita</i>) with important assemblages of non-breeding waterfowl including five species of passage birds and seven species of wintering birds. It is also designated for the migration route of both river lamprey (<i>Lampetra fluviatilis</i>) and sea lamprey (<i>Petromyzon marinus</i>).	Within the land required by the Proposed Development, the River Trent has been identified as a potential water abstraction and discharge location, and during construction the existing infrastructure associated with the Waterborne Transport Off-loading Area on the River Trent may be used to facilitate offloading of	1.3km east
Humber Estuary SAC	The River Trent at this location forms part of the Humber Estuary SAC. It is designated for its mudflats and sandflats which are not covered by seawater at low tide. This area also supports other important habitats including sandbanks,	Abnormal Indivisible Loads (AIL) as is undertaken for Keadby 2 Power Station construction.	

National designation	Reason for designation	Location relative to the closest part of the Proposed Development Site	Location relative to operational air quality emissions from the Main Site
	coastal lagoons, Atlantic salt meadows and embryonic shifting dunes.		
Humber Estuary SSSI	The River Trent at this location forms part of Humber Estuary SSSI. This nationally important estuary supports sand dune and standing water habitats. Furthermore, it also supports nationally and internationally important assemblage of breeding, wintering and passage birds, grey seals, and river and sea lamprey.		
Crowle Borrow Pits SSSI	Mosaic of habitats including alder (<i>Alnus glutinosa</i>) carr, scrub, fen and open water. The site supports a range of uncommon plant species.	1.2km west of the proposed highway improvement works at site entrance of A18	2.8km south-west
Hatfield Chase Ditches SSSI	Area of former marsh and wetland which has been extensively drained. However, the ditches support a rich assemblage of aquatic and emergent plants, nationally scarce invertebrates, and water vole (<i>Arvicola amphibius</i>).	1.4km south-west of the proposed highway improvement works at site entrance of A18	3.3km south-west
Eastoft Meadow SSSI	Herb-rich hay meadow.	3.6km north-west of the Main Site	3.6km north-west
Thorne and Hatfield Moors SPA	Used regularly by 2% of the UK's breeding nightjar (<i>Caprimulgus europaeus</i>) population.	5.5km north-west of existing access road via Pilsfey Bridge	6km north-west
Thorne Moor SAC	Degraded raised bog still capable of natural regeneration.		
Thorne, Crowle and Goole Moors SSSI	Largest extent of lowland raised mire in England which supports invertebrate fauna and is important for breeding and wintering bird populations.		

National designation	Reason for designation	Location relative to the closest part of the Proposed Development Site	Location relative to operational air quality emissions from the Main Site
Humberhead Peatlands NNR	The largest area of raised bog in lowland Britain.		
Belshaw SSSI	Supports an important colony of greater yellow-rattle (<i>Rhinanthus angustifolius</i>), a nationally rare species.	5.2km south-west of the proposed highway improvement works at site entrance of A18	7.7km south-west
Risby Warren SSSI	Largest surviving area of heathland developed over coversand in Lincolnshire.	7.6km north-east of water abstraction and discharge location on River Trent	9.0km north-east
Messingham Heath SSSI	Important example of coversand heathland, which is a rapidly dwindling habitat. Also noted for its population of grayling butterfly.	8.9km south-east of the Waterborne Transport Off-loading Area on the River Trent	9.9km south-east
Humber Estuary SPA	Designated for its regular use by populations of four species of breeding birds, 10 species of wintering birds and five species of passage birds	9.1km north-east of water abstraction location on River Trent	9.7km north-east
Epworth Turbary SSSI	An area of relict wetland habitat over peat. It is one of only three which remain in South Humberside.	7.4km south-west of the proposed highway improvement works at site entrance of A18	9.8km south-west
Hatfield Moors SSSI	Remnant of a once extensive lowland raised bog which is a nationally rare habitat.	8.2km south-west of the proposed highway improvement works at site entrance of A18	10.3km south-west
Hatfield Moor SAC	Degraded raised bog still capable of natural regeneration.		
Tuetoos Hills SSSI	Designated for its important mosaic of dry acid grassland vegetation including an inland example of acid dune grassland which is now rare in Lincolnshire and very restricted in its distribution nationally.	9.1km south-east of the proposed highway improvement works at site entrance of A18	10.4km south-east

National designation	Reason for designation	Location relative to the closest part of the Proposed Development Site	Location relative to operational air quality emissions from the Main Site
Messingham Sand Quarry SSSI	Designated for its mosaic of habitats supporting notable invertebrate and breeding bird assemblages.	8.9km south-east of the Waterborne Transport Off-loading Area on the River Trent	11.9km south-east
Manton and Twigmoor SSSI	Noted for its heathland, grassland and wetland on coversand deposits which are now limited in the area.	10.8km south-east of the Waterborne Transport Off-loading Area on the River Trent	12.1km south-east
Haxey Turbary SSSI	Relict bog with open wet heathland. Particularly valued for the occurrence of saw-sedge (<i>Cladium mariscus</i>) and royal fern (<i>Osmunda regalis</i>).	9.5km south-west of the proposed highway improvement works at site entrance of A18	11.9km south-west
Rush Furlong SSSI	Designated for its hay meadow which is a relict of the Isle of Axholme strip-farming system.	9.7km south-west of the proposed highway improvement works at site entrance of A18	11.9km south
Scotton and Laughton Forest Ponds SSSI	Designated for its wetland habitats, particularly base-poor fen/ mire with a characteristic suite of plant species that has formed on permanently wet acid soils.	11.3km south-east of the proposed highway improvement works at site entrance of A18	12.3km south-east
Hewson's Field SSSI	Designated for its neutral unimproved grassland which is rare in South Humberside.	10.5km south of the proposed highway improvement works at site entrance of A18	12.7km south-east
Broughton Far Wood SSSI	Designated for its botanically diverse woodland and limestone grassland habitats.	12.2km east of the potential water abstraction location on River Trent	13.6km east
Broughton Alder Wood SSSI	Designated for its spring-fed wet woodland.	12.5km east of the potential water abstraction location on River Trent	13.8km east

National designation	Reason for designation	Location relative to the closest part of the Proposed Development Site	Location relative to operational air quality emissions from the Main Site
Scotton Beck Fields SSSI	An extensive area of acidic unimproved grassland and is the only known grassland community of its type in the county.	13.0km south-east of the proposed highway improvement works at site entrance of A18	13.8km south-east
Scotton Common SSSI	One of the few extant areas of lowland heathland over coversands of north-west Lincolnshire.	13.0km south-east of the proposed highway improvement works at site entrance of A18	14.0km south-east
Laughton Common SSSI	Supports an extensive and diverse range of vegetation communities characteristic of North Lincolnshire coversands, including nationally notable areas of lowland acid grassland, inland dune grassland and lowland heath.	13.0km south-east of the proposed highway improvement works at site entrance of A18	14.3km south

4.2 Local Statutory and Non-statutory Nature Conservation Designations

- 4.2.1 Table 3 details the 11 local nature conservation designations identified by the desk study. The proximity of these to the Proposed Development is also identified in the table, and their locations are shown on **Figure 11C.2**. There are no ancient woodlands (as listed on the Ancient Woodland Inventory) in the desk study area.
- 4.2.2 All of the identified designations have been selected by the relevant organisations using standardised criteria, and therefore all should be regarded as being of county biodiversity value.
- 4.2.3 In addition, the Proposed Development Site is located within a landscape identified as the Humberhead Levels Nature Improvement Area (NIA). It is one of 12 NIA chosen by the Government to create joined up and resilient ecological networks at a landscape scale.

Table 3: Local nature conservation designations in the potential zone of influence of the Proposed Development

Local Designation	Reason for Designation	Location relative to the closest part of the Proposed Development Site	Location relative to operational air quality emissions from the Main Site
Keadby Warping Drain LWS	Aquatic habitats supporting a rich aquatic flora.	Crossed by the buried pipeline (Water Discharge Corridor) for the existing line of discharge from Keadby 1 Power Station	0.3km north
Stainforth and Keadby Canal Corridor LWS	Aquatic habitats supporting a rich aquatic flora. The canal is also designated for its mosaic of associated bankside habitats (rough grassland, reedbed and scrub).	If used, the Potential Canal Water Abstraction Option would take water from the LWS, also crossed by the access route over Pilfrey Bridge	0.5km south-east
Hatfield Waste Drain LWS	A rich aquatic, emergent and marginal flora within the drain, and adjacent neutral grassland.	Crossed by the proposed highway improvement works option at Proposed Development Site entrance of A18	2.3km south-east
Keadby Boundary Drain LWS	Aquatic habitats supporting a notable aquatic plant assemblage.	Adjacent, to the west of the Main Site	Adjacent, to the west
North Engine Drain, Belton LWS	Aquatic habitats supporting a rich aquatic flora, and a mosaic of neutral grassland and wetland habitats.	10m south of the proposed highway improvement works option at the Proposed Development Site entrance of A18	2.3km south-east
River Torne LWS	Aquatic habitats supporting a rich aquatic flora, neutral grassland, and a mosaic of associated grassland and wetland habitats.	20m south of the proposed highway improvement works option at the Proposed Development Site entrance of A18	2.3km south-east
South Soak Drain, Keadby LWS	Aquatic habitats supporting a rich aquatic flora.	30m south-east of the Potential Canal Water Abstraction	0.5km south-east

Local Designation	Reason for Designation	Location relative to the closest part of the Proposed Development Site	Location relative to operational air quality emissions from the Main Site
		Option on the Stainforth and Keadby Canal	
Keadby Wetland LWS	Designated for its mosaic habitat of willow scrub and wetland vegetation.	30m south-east of the Potential Canal Water Abstraction Option on the Stainforth and Keadby Canal	0.6km south-east
Keadby Wet Grassland LWS	Neutral grassland, marsh and swamp supporting a diverse flora.	50m south-east of the Potential Canal Water Abstraction Option on the Stainforth and Keadby Canal	0.7km south-east
Three Rivers LWS	Aquatic habitats supporting a rich aquatic flora, and a mosaic of scrub and neutral grassland habitats.	0.1km south (upstream) of the Waterborne Transport Off-loading Area on the River Trent	1km south
South Engine Drain LWS	Aquatic habitats supporting a rich aquatic flora and neutral grassland.	0.1km south of the proposed highway improvement works option at the Proposed Development Site entrance of A18	2.3km south-east

4.3 Habitats

- 4.3.1 The semi-natural habitats within the Proposed Development Site, and notable habitats in proximity to the Proposed Development Site, are described below and mapped on **Figure 11C.3**. Representative photographs are provided in **Annex 11B** of this PEA report.
- 4.3.2 The habitat mapping and assessment provided in this PEA report for the part of the Proposed Development Site coinciding with the former Keadby Ash Tip takes account of and references the findings of previous work undertaken by AECOM, particularly the detailed botanical appraisal summarised in **Annex 11E**. However, the current survey has also taken the opportunity to review and refine further this existing baseline data to ensure its accuracy for the purposes of the Proposed Development and Application. Given this, while the details of the habitats present within the former Ash Tip are consistent with preceding surveys, the identified locations and extent of specific habitats may differ from those reported in 2017. In particular, the relative extents of acid

grassland and ephemeral habitats have been reviewed (by the original surveyor) and amended with the benefit of further opportunity to inspect these habitats in 2020.

4.3.3 In addition to the land occupied by semi-natural habitats, large areas within the Proposed Development Site are occupied by hardstanding and buildings. While these areas are not of particular relevance to this PEA report, for purposes of clarity these areas comprise:

- Keadby 1 Power Station (Target Note 1 and Photograph 1);
- Keadby 2 Power Station (currently under construction, Target Note 1 and Photograph 2);
- Keadby 2 Construction Laydown Area (Target Note 8 and Photograph 3);
- Existing 400kV National Grid substation (Target Note 7 and Photograph 4);
- existing infrastructure at the Waterborne Transport Off-loading Area (Photograph 5);
- the existing water abstraction and discharge structures associated with the River Trent (Target Note 2 and 3, Photograph 6, 7 and 8); and
- the existing road access off the A18 via Pilfrey Bridge, as well as other surfaced roads e.g. Chapel Lane.

4.3.4 As the Proposed Development does not require the demolition of any existing buildings or structures, there is no requirement to consider any buildings further for their potential to be used by protected species e.g. as roosting sites for bats.

Arable Farmland

4.3.5 Most of land associated with the existing pipeline corridor for the Potential Discharge Option, the land associated with the proposed Emergency Vehicle Route, and land to either side of the existing access road from the A18 to Pilfrey Bridge is intensively managed for arable crop production. These fields are generally large, with boundaries delineated mostly by dry ditches and/ or wet drains and occasionally with associated scattered trees.

4.3.6 The Proposed Development may affect areas of intensively managed arable field margin habitat (but not of types covered by S41 of the NERC Act), but this would be small-scale in comparison with the total habitat resource in the local area and wider North Lincolnshire. Given the ubiquity of the habitat and its intensive management for agricultural production, it is considered that the fields associated with the Proposed Development Site are of negligible nature conservation value. Given this, no further consideration is given to arable habitat in this PEA report, other than for its potential to support relevant protected and notable species that might interact with the Proposed Development.

Bare Ground

4.3.7 At the time of survey, the southern half of Keadby Common was being used for temporary soil storage (Target Note 12) during construction of Keadby 2 Power Station (Photograph 9).

- 4.3.8 Another small area of bare ground was also present within the field to the south of Trent Road (the access road into Keadby 1 Power Station) which at the time of the survey was being used as a temporary abnormal loads access track during construction of Keadby 2 Power Station.
- 4.3.9 As these areas have arisen recently as a consequence of construction of Keadby 2 Power Station, they are highly disturbed and not subject to any ecological constraints. These areas require no further consideration in this PEA report.

Ephemeral/ Short Perennial

- 4.3.10 Sparse ephemeral/ short perennial vegetation occurs in association with an area of dis-used hardstanding in the Northern Powergrid compound off Chapel Lane, Keadby (Photograph 10 and Target Note 24). Given that the ground conditions are compacted and level and given the limited structural diversity of the vegetation present, this area of ephemeral/ short perennial vegetation does not equate to Open Mosaic Habitats on Previously Developed Land (OMH). Therefore, it is not a habitat type considered to be a Lincolnshire or national priority for nature conservation and instead is considered to be of negligible nature conservation value.
- 4.3.11 A more notable area of sparse ephemeral/ short perennial vegetation dominates parts of the former Keadby Ash Tip immediately adjacent to the Proposed Development Site, having developed over former railway sidings and other areas of long disused made ground. This habitat may have relevance to requirements for air quality impact assessment in **Chapter 8: Air Quality** of the PEI Report (Volume I). This species and flower-rich habitat has a sward that is generally low and open, with mats of mosses and lichens occurring locally. This habitat was subject to detailed botanical surveys during 2017 and a more detailed account of this habitat is provided as **Annex 11E**. Further species and habitat data from these surveys is provided in Target Note 4 (Photographs 11 to 14).
- 4.3.12 Typical plant species include sheep's fescue (*Festuca ovina*), creeping bent (*Agrostis stolonifera*), silvery hair-grass (*Aira caryophyllea*), biting stonecrop (*Sedum acre*), common centaury (*Centaurea erythraea*), viper's-bugloss (*Echium vulgare*), little mouse-ear (*Cerastium semidecandrum*), common centaury (*Centaureum erythraea*), selfheal (*Prunella vulgaris*), common mouse-ear-hawkweed (*Pilosella officinalis*), common whitlowgrass (*Erophila verna*), yellow-wort (*Blackstonia perfoliata*), parsley-piert (*Aphanes arvensis*), common cudweed (*Filago germanica*), thyme-leaved sandwort (*Arenaria leptoclados*), creeping cinquefoil (*Potentilla reptans*), common dog-violet (*Viola riviniana*), reindeer lichens (*Cladonia* spp.) and dog lichen (*Peltigera* sp.). This habitat also supports several notable plant species of conservation concern (see **Annex 11E**), including the Nationally Scarce species bearded fescue (*Vulpia ciliata* subsp. *ambigua*) and wall bedstraw (*Galium parisiense*), both in some abundance.
- 4.3.13 The ephemeral/ short perennial habitat is the primary component of a substantial area of OMH present across the former Keadby Ash Tip. OMH is not a discrete habitat for the purposes of Phase 1 Habitat survey, but instead is a matrix derived from a variety of different habitat types and associated vegetation and land-use features and characteristics, and edaphic conditions. It also includes facets of the neutral semi-improved grassland and scrub habitats described below where they occur in matrix with the ephemeral/ short perennial habitat. OMH is a priority habitat under S41 of the NERC Act and a Lincolnshire Local Biodiversity Action Plan (LBAP) habitat.

- 4.3.14 The previous detailed assessment made by AECOM in 2017 (refer to **Annex 11E**) valued the OMH and associated plant assemblage of the former Keadby Ash Tip as being of national importance. The populations of certain individual notable flora, including bearded fescue and wall bedstraw, were valued as regionally important.

Neutral Semi-improved Grassland

- 4.3.15 Neutral poor semi-improved grassland is present within the Proposed Development Site on the banks of the drains in Keadby Common, along some margins of the arable fields, within the construction site for Keadby 2 Power Station, on the road verges of Chapel Lane, at the location of the proposed highway improvement works at the turning off the A18, and at other scattered locations within the Proposed Development Site. These localised stands of grassland are grass dominated, predominantly false oat-grass and couch (*Elymus repens*). Associated species include cock's-foot (*Dactylis glomerata*), red fescue (*Festuca rubra*), yarrow (*Achillea millefolium*), creeping thistle (*Cirsium arvense*), teasel (*Dipsacus fullonum*), upright hedge-parsley (*Torilis japonica*), dandelion (*Taraxacum* agg.), daisy (*Bellis perennis*) and ribwort plantain (*Plantago lanceolata*). Given this, these grasslands have a relatively limited biodiversity value and could be readily substituted. This habitat is therefore evaluated as having negligible nature conservation value.

Acid Grassland

- 4.3.16 This habitat is not located within the Proposed Development Site but is present in adjacent areas of the former Keadby Ash Tip. The presence of this habitat is identified as it may have relevance to requirements for air quality impact assessment in **Chapter 8: Air Quality of the PEI Report (Volume I)**.
- 4.3.17 Detailed botanical surveys during 2017, which remain valid for assessment of the Proposed Development, confirmed the presence of species-rich acid grassland supporting a high cover of reindeer lichen within the former Keadby Ash Tip. This grassland was confirmed to be a priority habitat under S41 of the NERC Act and a Lincolnshire LBAP habitat. It was also found to support notable assemblages of flora and terrestrial invertebrates, such that it was assessed to be of national nature conservation value. A more detailed account of this habitat is provided as **Annex 11E**.

Improved Grassland

- 4.3.18 This habitat is present within the northern half of Keadby Common (Target Note 11 and Photograph 15), where it has been sown within the last five years and will be lost to the Proposed Development. The grassland is species-poor with the sward dominated by perennial rye-grass (*Lolium perenne*) and tall fescue (*Schedonorus arundinaceus*), with lesser contributions from Timothy (*Phleum pratense*), Yorkshire-fog (*Holcus lanatus*), cock's-foot, white clover (*Trifolium repens*), colt's-foot (*Tussilago farfara*), smooth tare (*Ervum tetraspermum*) and common ragwort (*Jacobaea vulgaris*).
- 4.3.19 Comparable habitat is also present on the floodbank of the River Trent at the locations of the existing water intake and outfall structures, where it is regularly mown.
- 4.3.20 Improved grassland is also present within agricultural fields along the Water Connection Corridors and as mown verges along the existing access road between the A18 and Pilfrey Bridge.

- 4.3.21 Improved grassland is a common habitat that is of limited biodiversity value and readily substituted. On this basis, this habitat is evaluated as having negligible nature conservation value.

Amenity Grassland

- 4.3.22 This species-poor grassland habitat is present along the main entrance road to and within Keadby 1 Power Station and is managed through regular mowing. Due to the habitat composition and structure, this grassland is of negligible biodiversity and nature conservation value. It is not anticipated that this grassland would be affected by the Proposed Development, so it does not require any further consideration in this PEA report.

Broad-leaved Woodland

- 4.3.23 A small stand of semi-mature plantation woodland is present north-east of Keadby 1 Power Station. The woodland is dominated by ash (*Fraxinus excelsior*) and common lime (*Tilia x europaea*). The shrub and ground layers are sparse and generally limited to elder (*Sambucus nigra*), brambles (*Rubus fruticosus* agg.) and common nettle (*Urtica dioica*), with areas of bare ground due to the high levels of shading. Locally there are small stands of bluebell (*Hyacinthoides x massartiana*) and garlic mustard (*Alliaria petiolata*) (Photograph 16). Given the small size, composition and relatively recent origin of this woodland it is assessed to have a local biodiversity value.
- 4.3.24 Further young semi-mature plantation woodlands are present along to Chapel Lane (Target Note 15 and Photograph 17) in proximity to the rear entrance to Keadby 2 Power Station. The woodland is a mix of Norway maple (*Acer platanooides*), hawthorn, ash (*Fraxinus excelsior*), field maple (*Acer campestre*) and elder. The ground layer supports tall ruderals including nettle, cleavers (*Galium aparine*), common hogweed (*Heracleum sphondylium*) with elder saplings. These woodlands are assessed to have local biodiversity value, as while they are currently relatively immature and artificial in character, they are likely to develop a greater quality and biodiversity value over time.

Scrub

- 4.3.25 The only extensive areas of dense scrub are restricted to adjacent areas of the former Keadby Ash Tip on the northern and southern edges of the former rail sidings. The scrub on the northern side of the former sidings (Target Note 13 and Photograph 12) is relatively species-poor and dominated by grey willow (*Salix cinerea*) with frequent young semi-mature silver birch (*Betula pendula*) of relatively uniform age and structure. The scrub on the southern side of the former sidings (Target Note 14) is more diverse in composition and structure. Typical species in this scrub include elder, common hawthorn (*Crataegus monogyna*), glandular dog-rose (*Rosa squarrosa*), common dog-rose (*Rosa canina*), hairy dog-rose (*Rosa corymbifera*), hybrid glaucous dog-rose (*Rosa x subcanina*), sweet-briar (*Rosa rubiginosa*), grey willow, sharp-stipuled willow (*Salix x mollissima*), brambles (*Rubus fruticosus* agg.).
- 4.3.26 This dense scrub within the former Keadby Ash Tip occurs in matrix with and is integral to the existing nature conservation value of the OMH within Keadby Ash Tip. Therefore, it is not valued separately, and the reader should refer to the above OMH description and evaluation.

- 4.3.27 There are also small dense stands of scrub on the banks of the River Trent at the locations of the existing water intake and outfall structures. The scrub on the banks of the River Trent is dominated by sharp-stippled willow growing with elder and sycamore (*Acer pseudoplatanus*). These small stands of species-poor scrub are assessed as having up to local nature conservation value.
- 4.3.28 Scattered scrub occurs within unmanaged areas of grassland within the Proposed Development Site and generally comprises hawthorn and dog-roses (e.g. Target Note 5 and Photograph 18). Such scrub is a common habitat type in the wider landscape in the areas not in arable production and is comprised of common and widespread tree and shrub species. Accordingly, it is of up to local nature conservation value.

Hedgerows and Free-Standing Trees

- 4.3.29 Four hedgerows were recorded within the boundary of the Proposed Development Site. These were:
- a recently planted hawthorn hedgerow, still in tree tubes, running for approximately 1km along the access road between the A18 and Pilfrey Bridge (Photograph 19); and
 - three species-poor hedgerows present along the northern, western and eastern boundaries of the field south of Trent Road (near Target Note 6). All were dominated by common hawthorn.
- 4.3.30 Given the recent origin and/ or limited woody species diversity of these hedgerows, none qualify as “important” under the Hedgerow Regulations 1997. However, all of the hedgerows, regardless of current species-diversity and condition, are examples of the ‘Hedgerows’ priority habitat type list on Section 41 of the NERC Act. Hedgerows remain a common feature of the landscape, with the Lincolnshire BAP estimating there to be over 26,000km which have been maintained/ restored/ planted since 2000. The composition of the hedgerows within the land required for the Proposed Development are species-poor and they have limited connectivity to the wider landscape. As such, although they will have some contribution to an ecological network, they can only be considered to be of local biodiversity value.
- 4.3.31 A number of free-standing semi-mature trees were recorded, all associated along the margins of Trent Road, most of which are non-native trees e.g. weeping willow (*Salix x sepulchralis*) and poplar (*Populus x canadensis*). Further information is provided in Target Note 6. No ancient or veteran trees were recorded at any location within or adjacent to the Proposed Development Site. The free-standing trees present are assessed individually to be of negligible biodiversity value, as they comprise fast-growing and/ or short-lived species, many of which are of non-native origin.

Watercourses, Canals and Drains

- 4.3.32 All watercourses within or adjacent to the Proposed Development Site that support permanent water or that hold water long enough to sustain wetland vegetation or fauna are summarised in **Annex 11D** of this report and shown on **Figure 11C.3** and those covered by either statutory or non-statutory nature conservation designations are shown on **Figure 11C.1** and **Figure 11C.2**. The watercourses have also been appraised for their suitability for riparian mammals, fish and aquatic invertebrates (see ‘Protected and Notable Species’ section below).

4.3.33 These watercourse habitats are representative of the Lincolnshire BAP habitat 'Rivers, canals and drains'. Further survey and assessment, to be reported as **Appendices 11F and 11G**, will determine the biodiversity value of the relevant watercourses.

4.3.34 The most relevant watercourses are summarised further below.

Drains

4.3.35 Keadby Common has a drain on each boundary (four drains in total), and a drain crosses the Common between the northern field and the southern area being used for soil storage during construction of the Keadby 2 Power Station. None of these drains have a formal name and have been numbered D1 to D5 in **Annex 11D**.

4.3.36 The most substantial of these drains (Drain D1, Photograph 20) is located on the northern boundary of Keadby Common with water levels of 50 to 80cm depth. This northern drain is connected at its western end to an off-Site drain designated as Keadby Boundary Drain LWS for its aquatic plant value. This drain has potential to support a comparable aquatic plant interest. At the time of survey in April 2002, the margins of the channel had narrow stands of common reed (*Phragmites australis*), reed canary-grass (*Phalaris arundinacea*) and greater pond-sedge (*Carex riparia*) but other flora was not well developed. Further survey is proposed to address this (see **Appendix 11G**, PEI Report, Volume II).

4.3.37 The other four drains contain minimal water (dry to 20 cm maximum depth). These drains are dominated by tall wetland grasses, primarily common reed, but also reed canary-grass and reed sweet-grass (*Glyceria maxima*).

River Trent

4.3.38 The River Trent (Photograph 21) has been identified as a potential water abstraction and discharge location. At the locations of the potential abstraction and discharge points (refer to **Figure 11C.3** in PEI Report Volume III), the River Trent is a large (approximately 150m wide), tidal watercourse and is subject to several statutory nature conservation designations. An engineered flood embankment is present along the eastern bank of the river which supports species-poor improved grassland and is regularly mown. At the time of the survey (April and July 2020) the water was very turbid due to suspended sediment, as would be expected for a tidal river reach. No aquatic plant species were observed within the channel of the river, with the exception of a few fronds of greater duckweed (*Spirodela polyrhiza*). No other in-channel higher plant species would reasonably be expected given this is a tidal reach of a very large river.

4.3.39 Along the margins of the River Trent (both banks), above the typical high tide water level, there are narrow strips of transitional vegetation dominated by common reed with abundant to occasional hemlock water-dropwort (*Oenanthe crocata*), hedge bindweed (*Calystegia sepium* subsp. *sepium*), wild angelica (*Angelica sylvestris*), great willowherb (*Epilobium hirsutum*), reed canary-grass and cleavers. At the base of this marginal vegetation but above the water line, the only plant species observed were New Zealand pigmyweed (*Crassula helmsii*) and creeping buttercup (*Ranunculus repens*). Below this zone is bare mud at low tide. This vegetation is not considered an example of transitional saltmarsh, as it is not present in association with any other saltmarsh communities. Regardless, this common reed dominated vegetation is very

species-poor and comprised of common plant species, and therefore it is of negligible nature conservation value.

Stainforth and Keadby Canal Corridor

- 4.3.40 The canal (Photograph 22) has also been identified as a Potential Abstraction Option, using the area directly adjacent to the infrastructure installed for Keadby 2 Power Station. This navigational canal links the inland Sheffield & South Yorkshire Navigation with the River Trent. The channel is approximately 35m wide and appears to be several metres deep with low vertical artificial banks formed of stone. Throughout the length inspected it is very uniform, with limited channel and bank variability and turbid water. This part of the canal falls within the boundary of the Stainforth and Keadby Canal Corridor LWS, which is designated for its aquatic flora and associated bankside habitats.
- 4.3.41 The canal was dominated by the invasive non-native plant species Nuttall's waterweed (*Elodea nuttallii*). Other typical aquatic flora included greater duckweed, rigid hornwort (*Ceratophyllum demersum*), spiked water-milfoil (*Myriophyllum spicatum*) and perfoliate pondweed (*Potamogeton perfoliatus*). The margins of the canal supported narrow stands of common reed with sweet-flag (*Acorus calamus*), hemlock water-dropwort and meadowsweet (*Filipendula ulmaria*). Additional information on the canal is provided as **Appendix 11G** of the PEI Report (Volume II).

4.4 Protected and Notable Species

- 4.4.1 Table 4 identifies species that are of potential relevance to the Proposed Development based on information gathered through a combination of desk study and field survey, consideration of their relative legal and conservation status, and their likelihood of presence in the zone of influence of the Proposed Development. Any requirements for further survey are identified in Table 5.
- 4.4.2 This assessment excludes badger, as this species is highly vulnerable to illegal persecution and it is not considered good practice to publish information on this species in reports with a wide circulation. Given this, further information on this species is provided in **Confidential Appendix 11D: Badger Survey**.

Table 4: Protected and notable species relevant or potentially relevant to the Proposed Development

Species	Status	Desk study records	PEA surveys indicate likely or potential presence	Suitable habitat in zone of influence?	Relevant to the Proposed Development?			Supporting comments
					Further survey needed?	Requires further assessment of legal/policy implications?	Potential for significant adverse effects	
Badger	Protected	-	-	✓	x	-	-	See Confidential Appendix 11D . All necessary survey work has been completed.
Bats	Protected, S41, LBAP	✓	✓	✓	✓	✓	Unlikely but needs further assessment	<p>The desk study returned 11 records of bats between 2010 and 2012, including one pipistrelle bat recorded within the Proposed Development Site boundary.</p> <p>Previous surveys by AECOM of the former Ash Tip (provided with survey data for 2020 in Appendix 11E of the PEI Report (Volume II)) recorded only low levels of bat activity. Given that the former Ash Tip represents the most optimal habitat resource available to bats, it is unlikely that the wider land required for the Proposed Development will support notable bat populations or assemblages. The potential importance of habitats on Keadby Common, as a habitat corridor between potential roost sites in Keadby village and the former Keadby Ash Tip, merits further assessment.</p> <p>There is limited potential for roosting due to the lack of mature trees, however five trees were noted with features that may be utilised by roosting bats (including trees with bat boxes). These were all associated with the area surrounding Trent Road, the access road to Keadby 1 Power Station (near Target Note 5). Further information on each of these trees, including representative photographs, is included in Annex 11C of this</p>

Species	Status	Desk study records	PEA surveys indicate likely or potential presence	Suitable habitat in zone of influence?	Relevant to the Proposed Development?			Supporting comments
					Further survey needed?	Requires further assessment of legal/policy implications?	Potential for significant adverse effects	
								report. The construction, operation and decommissioning of the Proposed Development will not affect these trees, so further survey to confirm the presence/ absence of roosts is not required.
Nesting birds: barn owl (<i>Tyto alba</i>)	Protected	x	x	✓	x	x	x	There are habitats suitable for use by barn owls for foraging as part of a large network of suitable habitat in the surrounding landscape. However, there are no features on or adjacent to the Proposed Development Site that are suitable for nesting or roosting. As such, barn owl is not considered a constraint to the Proposed Development.
Nesting birds: kingfisher (<i>Alcedo atthis</i>)	Protected	✓	✓	✓	x	x	x	The desk study returned one record of kingfisher from 2010 located at the Stainforth and Keadby Canal adjacent to the Proposed Development Site. As such, kingfisher may utilise this area for foraging, however the proposed abstraction intake from the canal (under consideration) will not impact foraging habitat quality for kingfisher. The watercourses associated with the Proposed Development Site do not provide suitable nesting habitat. The banks of the Stainforth and Keadby Canal are concrete with the remaining drains either having banks that are heavily overgrown, or that have an unsuitable bank structure and maintenance regimes (see Annex 11D of this report). Therefore, kingfisher is not considered a constraint to the Proposed Development.

Species	Status	Desk study records	PEA surveys indicate likely or potential presence	Suitable habitat in zone of influence?	Relevant to the Proposed Development?			Supporting comments
					Further survey needed?	Requires further assessment of legal/ policy implications?	Potential for significant adverse effects	
Nesting birds: little ringed plover (<i>Charadrius dubius</i>)	Protected	x	✓	✓	x	✓	x	Surveys undertaken in 2017 identified a single pair nesting within the area of the former Ash Tip (assessed as county value), outside the Proposed Development Site (see Annex 11H of this report). There is no habitat suitable for this species within the Proposed Development Site. Little ringed plover is therefore not a likely constraint.
Nesting birds: marsh harrier (<i>Circus aeruginosus</i>)	Protected, S41	✓	x	x	x	x	x	This bird species was assessed in detail for the Keadby Wind Farm project, as a species at risk from collision with wind turbines. The agreed mitigation/ enhancement approach for the Keadby Wind Farm project included establishment of a marsh harrier enhancement area to the south of, and at relative distance from, the wind farm. This is well beyond likely disturbance distances arising from the Proposed Development. In comparison, the Proposed Development Site and adjacent land is not likely to be used for breeding given proximity to existing infrastructure (Keadby Wind Farm, National Grid 400kV substation, Keadby 1 and 2 Power Stations etc.) and associated sources of human disturbance. Marsh harrier is not anticipated within the zone of influence given the existing baseline conditions, and enhancement and sensitive management of land elsewhere for the species.

Species	Status	Desk study records	PEA surveys indicate likely or potential presence	Suitable habitat in zone of influence?	Relevant to the Proposed Development?			Supporting comments
					Further survey needed?	Requires further assessment of legal/policy implications?	Potential for significant adverse effects	
Nesting birds: other	Protected, S41	✓	✓	✓	x	✓	✓	Breeding bird surveys were undertaken by AECOM in 2017 and recorded 50 species from the adjacent former Keadby Ash Tip, of which 39 were breeding (refer to Annex 11H of this report) and mainly associated with scrub habitats. In comparison, the Proposed Development will use land previously disturbed for construction of Keadby 2 Power Station, with permanent additional habitat losses largely restricted to species-poor grassland on Keadby Common of limited value to nesting birds. Given this, breeding birds will be a legal constraint to construction, but significant adverse effects are considered unlikely.
Birds: wintering	Protected, S41	x	x	x	x	x	x	Given the defined habitat context, it is considered highly unlikely that the Proposed Development Site or adjacent land will have a specific value for passage and wintering birds. Based on review of the assessment provided in the Keadby Wind Farm Extension Environmental Impact Assessment Scoping Report (Jacobs, 2015) the surrounding farmland is not likely to be of high importance for Humber Estuary SPA, Ramsar site and SSSI bird species. Regardless, works proposed would be unlikely to disturb birds using farmland in the wider landscape. The narrow band of marginal mudflat habitat along the banks of the River Trent may be used by low numbers of birds at low tide, but the habitat

Species	Status	Desk study records	PEA surveys indicate likely or potential presence	Suitable habitat in zone of influence?	Relevant to the Proposed Development?			Supporting comments
					Further survey needed?	Requires further assessment of legal/policy implications?	Potential for significant adverse effects	
								resource is of very limited extent in comparison with the resource of comparable habitat around the margins of the Humber Estuary. Therefore, bird species associated with the Ramsar site and SSSI are not likely to occur in significant numbers or be adversely affected by the Proposed Development. In considering this, it is relevant here that the primary bird designation applied to the Humber Estuary; the Humber Estuary SPA, does not encompass the River Trent and is located 9.1km north of the Proposed Development Site. This designation captures all habitats considered to be of significance for the wintering bird assemblage of the Humber Estuary, and does not encompass the section of the River Trent adjacent to the Proposed Development Site. While habitats outside the SPA may be of functional importance for some bird species, this is not likely to include minor mudflat habitat at the tidal limit of the River Trent given the extent of comparable habitats located closer to the SPA.
Brown hare (<i>Lepus europaeus</i>)	S41	x	✓	X	x	x	x	Hares have been observed previously during the surveys undertaken by AECOM in 2017. The semi-natural habitats within the Proposed Development Site provide suitable cover and foraging habitat for this species, complementing arable habitats in the wider landscape. This species would not be dependent on the habitats within the Proposed Development Site given the small area of suitable habitat present relative to the surrounding habitat

Species	Status	Desk study records	PEA surveys indicate likely or potential presence	Suitable habitat in zone of influence?	Relevant to the Proposed Development?			Supporting comments
					Further survey needed?	Requires further assessment of legal/ policy implications?	Potential for significant adverse effects	
								resource in the wider landscape. As such, it requires no further consideration except in relation to legal requirements for animal welfare.
Common toad (<i>Bufo bufo</i>)	Protected, S41	✓	✓	✓	x	x	x	Toad was previously recorded during surveys for Keadby Wind Farm (SKM Enviros, 2012). Toad may use the drains associated with Keadby Common for breeding, but these drains are of relatively low quality (refer to Annex 11D of this report), with only one (the northern boundary drain) having sufficient open water suitable to sustain any more than opportunistic use. Similar and higher quality drains and semi-natural habitats occur within the wider landscape, and therefore toad will not be dependent on the habitats within the Proposed Development Site. As such, this species requires no further consideration.
Fish: European eel (<i>Anguilla anguilla</i>)	Protected, S41, LBAP	✓	✓	✓	x	✓	Unlikely given legal requirement for eel screens	It is noted that NPS EN-1 (DECC, 2011a) states that developments should be assessed under “the assumption that the relevant pollution control regime and other environmental regulatory regimes, including ... water abstraction ..., will be properly applied and enforced by the relevant regulator.” This principle will be applied in the subsequent EclA for the Proposed Development. The small-scale upgrades to the existing discharge/ abstraction options within the River
Fish: lamprey species	Protected, S41, LBAP (river lamprey only)	✓	✓	✓	x	✓	Unlikely given legal requirement for eel screens, but needs further assessment	

Species	Status	Desk study records	PEA surveys indicate likely or potential presence	Suitable habitat in zone of influence?	Relevant to the Proposed Development?			Supporting comments
					Further survey needed?	Requires further assessment of legal/policy implications?	Potential for significant adverse effects	
Fish: other	Protected, S41, LBAP	✓	✓	✓	x	✓	Unlikely given legal requirement for eel screens	<p>Trent (a very large river) are not likely to adversely affect the conservation status of any fish species within the River Trent, including migratory species. Regard will still be needed to requirements for legal compliance during the necessary upgrade in the Water Connection Corridor. There is already a commitment to install eel screens as part of the Proposed Development as designed. These screens need to protect all eel life stages, so offer good protection to all other fish species.</p> <p>Potential thermal and biocide effects need to be assessed further, but survey is not required to permit this as the Trent is of known importance for eel and lampreys (amongst other fish species) and therefore it must be assumed these species are present. If surveys were completed and did not detect these species, it would still be necessary to assume presence.</p> <p>Similarly, additional abstraction under consideration from the Stainforth and Keadby Canal (adjacent to the approved abstraction for Keadby 2 Power Station), if used as the water supply, is unlikely to result in adverse effects for fish. Migratory species (except eel) are not likely to use the canal, any abstraction would be subject to the necessary permits, and the approved abstraction infrastructure would use appropriate fish/ eel screens.</p>
Fish: salmon (<i>Salmo salar</i>)	Protected, S41, LBAP	✓	✓	✓	x	✓	Unlikely given legal requirement for eel screens	

Species	Status	Desk study records	PEA surveys indicate likely or potential presence	Suitable habitat in zone of influence?	Relevant to the Proposed Development?			Supporting comments
					Further survey needed?	Requires further assessment of legal/policy implications?	Potential for significant adverse effects	
Flora: notable native species	Red Data List, S41	x	✓	x	✓	✓	✓	<p>The botanical surveys undertaken by AECOM in 2017 (refer to Annex 11E of this report) demonstrate that the adjacent land within the former Keadby Ash Tip supports high quality species-rich acid grassland, OMH and freshwater habitats. A diverse range of native plant species were recorded, including notable plant species, some of which occur within the Proposed Development Site. The results of the above study remain valid, and therefore further surveys are not required within the former Ash Tip.</p> <p>However, there is currently no botanical data for the drains on Keadby Common. As nearby drains are of known nature conservation value for aquatic flora, there is potential for the drains on Keadby Common to have a similar value. Further surveys are therefore proposed to determine this.</p> <p>The River Trent at the location of the Proposed Development Site is not suitable to support aquatic higher plants, given the size of the river at this location and particularly because it is tidal. The river can reasonably be expected to support an assemblage of algae and diatoms typical of brackish and estuarine habitats, but given the size of the river and the wider habitat resource in the Humber Estuary relative to the limited requirements of the Proposed Development during construction, operation and decommissioning stages, these are not a relevant consideration and survey is not required. Baseline data is not</p>

Species	Status	Desk study records	PEA surveys indicate likely or potential presence	Suitable habitat in zone of influence?	Relevant to the Proposed Development?			Supporting comments
					Further survey needed?	Requires further assessment of legal/policy implications?	Potential for significant adverse effects	
								required to inform proportionate impact assessment or to meet regulatory requirements.
Great crested newt	Protected, S41, LBAP	x	x	✓	x	x	x	No desk study records were returned. All the standing waters in the potential zone of influence have been surveyed previously for this species. In 2010 (AECOM, 2010), all waterbodies within the former Ash Tip were surveyed and confirmed to dry up by July; no great crested newts were found. AECOM staff re-confirmed this in 2017, when all former Ash Tip waterbodies were found to be dry by July. In 2012 and 2015 (SKM, 2012; Jacobs, 2016) the waterbodies within the adjacent Keadby Wind Farm were surveyed, and great crested newt was not found. Based on the series of prior surveys, the 2016 report concluded: <i>"that this species is [likely to be] absent from the local area."</i> Natural England has also surveyed other ponds in the surrounding landscape recently (as shown in the MAGIC website) and great crested newt has not been detected. The sum of all available evidence permits the conclusion that great crested newt is not present in the zone of influence and no further survey work is required.
Harvest mouse (<i>Micromys minutus</i>)	S41	x	✓	✓	x	x	x	There is potential for this species to use marginal vegetation along watercourses. However, these habitats are common within the wider landscape, and therefore harvest mouse is unlikely to be dependent on the habitats within the Proposed Development Site. Given the construction,

Species	Status	Desk study records	PEA surveys indicate likely or potential presence	Suitable habitat in zone of influence?	Relevant to the Proposed Development?			Supporting comments
					Further survey needed?	Requires further assessment of legal/policy implications?	Potential for significant adverse effects	
								operation and decommissioning requirements of the Proposed Development, this species requires no further consideration.
Hedgehog (<i>Erinaceus europaeus</i>)	S41	x	✓	✓	x	x	x	There is potential for this species to use semi-natural habitats associated with the Proposed Development Site. However, hedgehog is unlikely to be dependent on the habitats within the Proposed Development Site and as such it requires no further consideration.
Invertebrates: aquatic	Red Data List, S41,	x	✓	✓	✓	✓	✓	Surveys undertaken by AECOM in 2017 (provided with survey data gathered in 2020 as Appendix 11G in PEI Report Volume II) demonstrated that Keadby Boundary Drain LWS supports a diverse invertebrate community. Therefore, there is potential for adjoining drains within Keadby Common to have a similar value. Further survey is proposed to investigate this.
Invertebrates: terrestrial	Red Data List, S41,	x	✓	✓	x	✓	✓	Richard Wilson Ecology Ltd undertook surveys within the former Keadby Ash Tip in 2017 and identified a notable assemblage dependent on the notable OMH and acid grassland habitats present. Richard Wilson Ecology Ltd inspected Keadby Common in July 2020 and was satisfied that further surveys were not required at this location. The results of this previous study therefore remain valid (Annex 11G of this report). There are no other habitats associated with the Proposed Development that are likely to support notable terrestrial invertebrates. But the notable

Species	Status	Desk study records	PEA surveys indicate likely or potential presence	Suitable habitat in zone of influence?	Relevant to the Proposed Development?			Supporting comments
					Further survey needed?	Requires further assessment of legal/policy implications?	Potential for significant adverse effects	
								assemblage of the former Keadby Ash Tip may be indirectly affected by any changes in the quality of its habitats as a result of emissions to air from the Proposed Development. No further terrestrial invertebrate surveys are considered necessary to inform impact assessment.
Otter (<i>Lutra lutra</i>)	Protected, S41, LBAP	x	✓	✓	✓	✓	u	The Proposed Development Site has limited potential to impact this species. The most suitable habitat occurs along the Stainforth and Keadby Canal. Further assessment is required to demonstrate legal compliance, but an impact on nature conservation status would not reasonably be anticipated. Watercourses requiring survey for otter are identified in Annex 11D of this report and the results provided in Appendix 11F (PEI Report Volume II).
Reptiles	Protected, S41	x	✓	✓	x	✓	x	The desk study returned recent records for grass snake (<i>Matrix helvetica</i>) and these are closely associated with wetland habitats (primarily those subject to LWS designations). Extensive AECOM surveys across the former Keadby Ash Tip in 2017 (refer to Annex 11F of this report) recorded a single juvenile grass snake in rough grassland habitat near the drain on the western boundary of the former Ash Tip. Given the most optimal habitats for reptiles were surveyed by AECOM in 2017, the findings of these surveys, and the desk study information returned, reptiles are not likely to occur (other than on a transitory basis) in

Species	Status	Desk study records	PEA surveys indicate likely or potential presence	Suitable habitat in zone of influence?	Relevant to the Proposed Development?			Supporting comments
					Further survey needed?	Requires further assessment of legal/policy implications?	Potential for significant adverse effects	
								association with the Proposed Development Site. Given this, grass snake still needs appropriate regard to ensure legal compliance at construction, but further survey is not required to inform specification of legally compliant mitigation measures.
Water vole	Protected, S41, LBAP	✓	✓	✓	✓	✓	✓	The desk study returned 25 records of water vole between 2010 and 2020. The closest of these records was within 10m of the Proposed Development Site. AECOM surveys undertaken in 2017 (provided in combination with data for 2020 in Appendix 11F of PEI Report Volume II) also identified field signs within a drain connected to Keadby Boundary Drain LWS. Therefore, there is potential for this species to be present on drains within the Proposed Development Site around Keadby Common and further survey is required/ ongoing to investigate this. Further information on each of these drains, including representative photographs are included in Annex 11D of this report.
White-clawed crayfish (<i>Austro-potamobius pallipes</i>)	Protected, S41, LBAP	x	x	x	x	x	x	There are no records of white-clawed crayfish in the desk study area. The only remaining known Lincolnshire population occurs in the upper reaches of the River Witham (Lincolnshire BAP, 2011). There are no grounds to expect this species within any of the watercourses associated with the Proposed Development. Given this, further survey is not required.

4.5 Invasive Non-native Species

Invasive Fauna

- 4.5.1 The desk study identified that routine watercourse sampling by the Environment Agency in 2007 recorded the presence of non-native Dreissenidae mussels within the Stainforth and Keadby Canal, approximately 500m downstream of the potential water abstraction from the Stainforth and Keadby Canal that is under consideration for the Proposed Development. The only British members of this group of mussels are the invasive non-native species zebra mussel (*Dreissena polymorpha*) and quagga mussel (*Dreissena bugensis*). Although neither is listed on Schedule 9 of the WCA, both species are highly invasive and can cause significant damage to water abstraction and transmission infrastructure (e.g. by blocking pipes and screens), and in so doing, increase frequency and requirements for maintenance and repair to maintain the operational function of affected infrastructure.
- 4.5.2 Given the known presence of non-native Dreissenidae mussels but uncertainty over the relevant species present, further invasive species surveys are proposed to clarify this and to inform development design and mitigation options (see **Appendix 11G**, PEI Report Volume II). Beds of these species can also provide habitat for other invasive non-native invertebrates (often referred to as ‘Ponto-Caspian’ species in reference to the common geographic origin for these species), and where present these may also represent constraints to the effective operation of the Proposed Development.

Invasive Flora

- 4.5.3 Surveys have found three controlled weed species listed under Schedule 9 of the WCA, and it is an offence to cause these species to spread in the wild.
- 4.5.4 AECOM surveys in 2017 (refer to **Annex 11E** of this report) found two small bushes of wall cotoneaster (*Cotoneaster horizontalis*) on land adjacent to the Proposed Development Site within the former railway sidings (at SE 8172 1169) of the former Keadby Ash Tip. AECOM surveys in 2020 to inform this report re-found wall cotoneaster in the same area of the former Keadby Ash Tip but at grid reference SE 8187 1168. It is therefore possible that this species may have established within the Proposed Development Site by the time of construction.
- 4.5.5 In addition, surveys in 2017 of drains to the immediate north and west of the former Keadby Ash Tip were found to support Nuttall’s waterweed, and this species was considered likely to be present in other nearby watercourses including those associated with the Proposed Development Site. During the current survey, Nuttall’s waterweed was found to be abundant within the Proposed Development Site where this coincides with the Stainforth and Keadby Canal and the drain on the northern boundary of Keadby Common (Drain D1).
- 4.5.6 During the current survey, New Zealand pigmyweed was recorded on the lower bank of the River Trent at SE 8361 1211 and SE 8367 1224, coinciding with the location of the existing water outfall structure within the Proposed Development Site.
- 4.5.7 No other invasive non-native species were recorded during the PEA.

4.6 Identification of Potential Biodiversity Constraints

4.6.1 A constraints plan is provided as **Figure 11C.4** to show the locations of the main habitat and species constraints of relevance to the Proposed Development (designations are mapped separately on **Figure 11C.1** and **Figure 11C.2**), except where these data need to be kept confidential (i.e. badger). The relevant constraints mapped encompass:

- woodland and mature scrub;
- watercourses;
- OMH on previously developed land;
- acid grassland;
- trees suitable for use by roosting bats; and
- invasive non-native species.

4.6.2 A review of relevant constraints and any requirements for further survey to address these is provided below.

4.7 Constraints and Requirements for Further Survey: Designations

International and National Statutory Nature Conservation Designations

4.7.1 The River Trent, which is part of the Humber SAC, Ramsar site and SSSI, is located within the land required for the construction, operation and decommissioning of the Proposed Development as shown on **Figure 11C.1**. Specifically, it is the location of Potential Discharge and Abstraction Options, as well as the Waterborne Transport Off-loading Area. While the Proposed Development is unlikely to affect the integrity of these large designations, there remains potential for localised impacts and effects. An assessment of this is presented in **Chapter 11: Biodiversity and Nature Conservation** of the PEI Report (Volume I), and a Habitat Regulations Assessment – Likely Significant Effects Report will also be provided to accompany the DCO Application and will address the above two Natura 2000 sites.

4.7.2 Most of the species for which the Ramsar and SSSI designations are considered important are not likely to occur in association with the Proposed Development Site, as they are largely coastal and marine species. Wintering bird surveys have been scoped out, see Table 4. However, adult lamprey species need to (given their known presence upstream) migrate along the River Trent to access headwater watercourses used for breeding, and juveniles will migrate from breeding habitats downstream to access marine habitats where they will mature into adults. Therefore, there is potential for lamprey species to be affected during construction, operation and decommissioning if this coincides with the timing of upstream and downstream migrations past the Proposed Development Site. This will require further assessment, including consideration of potential barrier effects, and the risk of impingement and entrainment (although the latter can potentially be avoided with an appropriate specification for the committed fish screens and associated water intake velocities).

4.7.3 The next closest international or national statutory designation is the nationally designated Crowle Borrow Pits SSSI located 1.2km to the west of the Proposed Development Site. Given this distance, neither Crowle Borrow Pits SSSI or any of the other additional and even more distantly located statutory nature conservation

designations presented in Table 2 could be directly affected by the Proposed Development. However, further assessment of potential indirect impacts and effects, particularly from emissions to air during operation of the Proposed Development will be undertaken and reported in the Environmental Statement (ES). Preliminary assessment of impacts is provided in **Chapter 8: Air Quality**. None of the identified additional designations are located within the 1km study area applied in **Chapter 12: Water Resources and Flood Risk** of the PEI Report (Volume I) for the assessment of potential hydrological impacts and effects, so no further assessment is required in relation to this.

- 4.7.4 Relevant Natura 2000 designations will also be addressed in the Habitat Regulations Assessment – Likely Significant Effects Report which will also be provided to accompany the DCO Application.
- 4.7.5 No further ecological surveys are considered necessary to assess potential impacts and effects on relevant international and national statutory nature conservation designations.

Local Statutory and Non-statutory Nature Conservation Designations

- 4.7.6 There are no local statutory designations and 11 local non-statutory local nature conservation designations within the defined desk study area for the Proposed Development Site (see **Figure 11C.2**). Most of the identified non-statutory designations are associated with, or dependent on connectivity with, the aquatic environment. However, most also have some associated terrestrial habitat interest features.
- 4.7.7 The only local designations that could be directly affected by the Proposed Development are the Stainforth and Keadby Canal Corridor LWS, as the Proposed Development may utilise the canal as a water supply via the Potential Abstraction Option, and the Hatfield Waste Drain LWS as this is crossed by the access road off the A18 and the existing bridge over the LWS may need to be upgraded. Work is ongoing to determine the feasibility of using existing infrastructure for Keadby 1 and Keadby 2 Power Stations. This work will determine the requirement for any new construction works for the Proposed Development and therefore the requirement for impact assessment of direct and indirect construction impacts and effects. A preliminary assessment is provided in the PEI Report.
- 4.7.8 Any operational abstraction of water from the Stainforth and Keadby Canal Corridor LWS would be subject to relevant permits, which would set requirements to ensure maintenance of appropriate water levels and quality within the canal. No adverse impacts and effects from water abstraction during operation of the Proposed Development are likely, as statutory regulatory requirements have been set to prevent this and would need to be met. Given this regulatory context, there is no requirement for further ecological assessment of adverse impacts and effects arising from water abstraction. This is consistent with the requirements of NPS EN-1 which states “*The IPC should work on the assumption that the relevant pollution control regime and other environmental regulatory regimes, including ... water abstraction ..., will be properly applied and enforced by the relevant regulator.*”
- 4.7.9 All of the identified local designations need further assessment for potential indirect impacts and effects. All of the local designations (with the exception of Keadby Warping Drain LWS and Three Rivers LWS) are within the potential zone of influence for construction and decommissioning water quality and hydrological impacts defined in

Chapter 12: Water Resources and Flood Risk of the PEI Report (Volume I), and therefore require further consideration in relation to this. In addition, emissions to air during operation could affect all of the identified local designations, as all are located within 2km of the Main Site.

- 4.7.10 Keadby Boundary Drain LWS is located adjacent to the Proposed Development Site. AECOM established an aquatic plant and invertebrate baseline for Keadby Boundary Drain LWS, adjacent to the Proposed Development Site, in 2017 (refer to **Annex 11E** of this report) and this remains suitable to meet assessment requirements for the Proposed Development. Surveys are required/ ongoing in 2020 to obtain aquatic plant and invertebrate data to inform proportionate assessment (as informed by existing regulatory regimes that if applied correctly by regulators are sufficient to prevent adverse effects), particularly in terms of clarifying the status of potentially damaging non-native aquatic flora and fauna. No other ecological surveys are considered necessary to assess potential impacts and effects on relevant local nature conservation designations.

4.8 Constraints and Requirements for Further Survey: Habitats

- 4.8.1 The former Keadby Ash Tip, which is located adjacent to the Proposed Development Site, contains OMH, acid grassland and watercourse habitats that are priorities for nature conservation in England and/ or in Lincolnshire. The OMH and grassland habitats are of particularly high (national) nature conservation value. These low nutrient early successional habitats, and associated flora including an abundance of reindeer lichens, are potentially vulnerable to indirect impacts from emissions to air once the Proposed Development is operational. The relevant watercourses, including one of county value, may also experience indirect effects due to connectivity with watercourses elsewhere within the Proposed Development Site. All of these habitats require assessment of impacts and effects in relevant chapters of the PEI Report (Volume I).
- 4.8.2 The other semi-natural habitats likely to be affected by the Proposed Development are not of priority types, and in most cases have been assessed as having negligible to local nature conservation value. The aquatic habitats of the River Trent and Stainforth and Keadby Canal have a higher nature conservation value, but no likely significant effects are anticipated given existing statutory regulatory regimes and the small-scale of the relevant impacts relative to the scale of the total comparable habitat resource within these watercourses. Impact assessment is still required, but it is considered that these other habitats are of much lesser relevance to assessment of the Proposed Development than the above habitats in the former Keadby Ash Tip.
- 4.8.3 The information collected during the PEA, in addition to the previous habitat surveys undertaken by AECOM in 2017 (**Annex 11E** of this report), is considered sufficient to fully characterise the terrestrial habitats and most of the aquatic habitats present. Given this, no further targeted surveys of terrestrial habitats or previously surveyed aquatic habitats other than those stated as ongoing is required to inform the EclA.
- 4.8.4 Construction of the Proposed Development will directly affect several minor watercourses (field drains) within Keadby Common that have not been surveyed in detail for this PEA or previously, and potentially the Stainforth and Keadby Canal also. As these have not been subject to detailed habitat surveys, further work is proposed to determine their relative nature conservation interest and value.

4.9 Constraints and Requirements for Further Survey: Species

- 4.9.1 A number of protected or notable species have been identified as potentially present within the Proposed Development Site, based on the review provided above in Table 4.
- 4.9.2 Table 5 summarises the species scoped into the EclA for the Proposed Development provided as **Chapter 11: Biodiversity and Nature Conservation** of the PEI Report (in some cases only for purposes of demonstrating legal compliance), and any requirements for further survey to inform the EclA. Cross-references to the relevant PEI Report appendices providing the survey methods and results are also provided in the table.

Table 5: Requirements for further species survey, cross-referenced to the relevant survey report

Species scoped in (based on Table 4)	Further survey needed to inform impact assessment	Survey scope (where relevant)	Methods and results provided in Annex to this report or PEI Appendix (Volume II)
Badger	Yes – survey complete	Presence/ absence survey	Confidential Appendix 11D
Bats	Yes – surveys in progress	Bat activity surveys	Appendix 11E
Barn owl	No – additional data not needed to inform assessment/ legal compliance	-	Annex 11H of this report (Appendix 11C).
Breeding birds	No – additional data not needed to inform assessment/ legal compliance	-	Annex 11H of this report (Appendix 11C).
Flora: notable native species	Yes – survey complete	Aquatic plant survey of the drains on Keadby Common	Annex 11E and Appendix 11G
Fish	No – additional data not needed to inform assessment/ legal compliance	-	Table 4 this report
Great crested newt	No – scoped out, not relevant	-	Table 4 this report
Invertebrates: aquatic	Yes – survey complete	Aquatic invertebrate survey of the drains on Keadby Common	Appendix 11G
Invertebrates: terrestrial	No – additional data not needed to inform assessment/ legal compliance	-	Annex 11G of this report (Appendix 11C).

Species scoped in (based on Table 4)	Further survey needed to inform impact assessment	Survey scope (where relevant)	Methods and results provided in Annex to this report or PEI Appendix (Volume II)
Invasive non-native specie (INNS)s surveys	Yes – aquatic survey pending	Presence/ absence surveys within Stainforth and Keadby Canal and the drains on Keadby Common	This report (terrestrial INNS) and Appendix 11G (aquatic INNS)
Otter	Yes – survey complete	Survey of all relevant watercourses with suitable habitats	Appendix 11F
Reptiles	No – additional data not needed to inform assessment/ legal compliance	-	Annex 11F of this report (Appendix 11C).
Water vole	Yes – spring survey complete, summer/autumn survey pending	Survey of all relevant watercourses with suitable habitats	Appendix 11F

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FIGURES

Figure 11C.1 – Statutory Nature Conservation Designations

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- ## NOTES

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Figure 11C.2 –Non-statutory Nature Conservation Designations

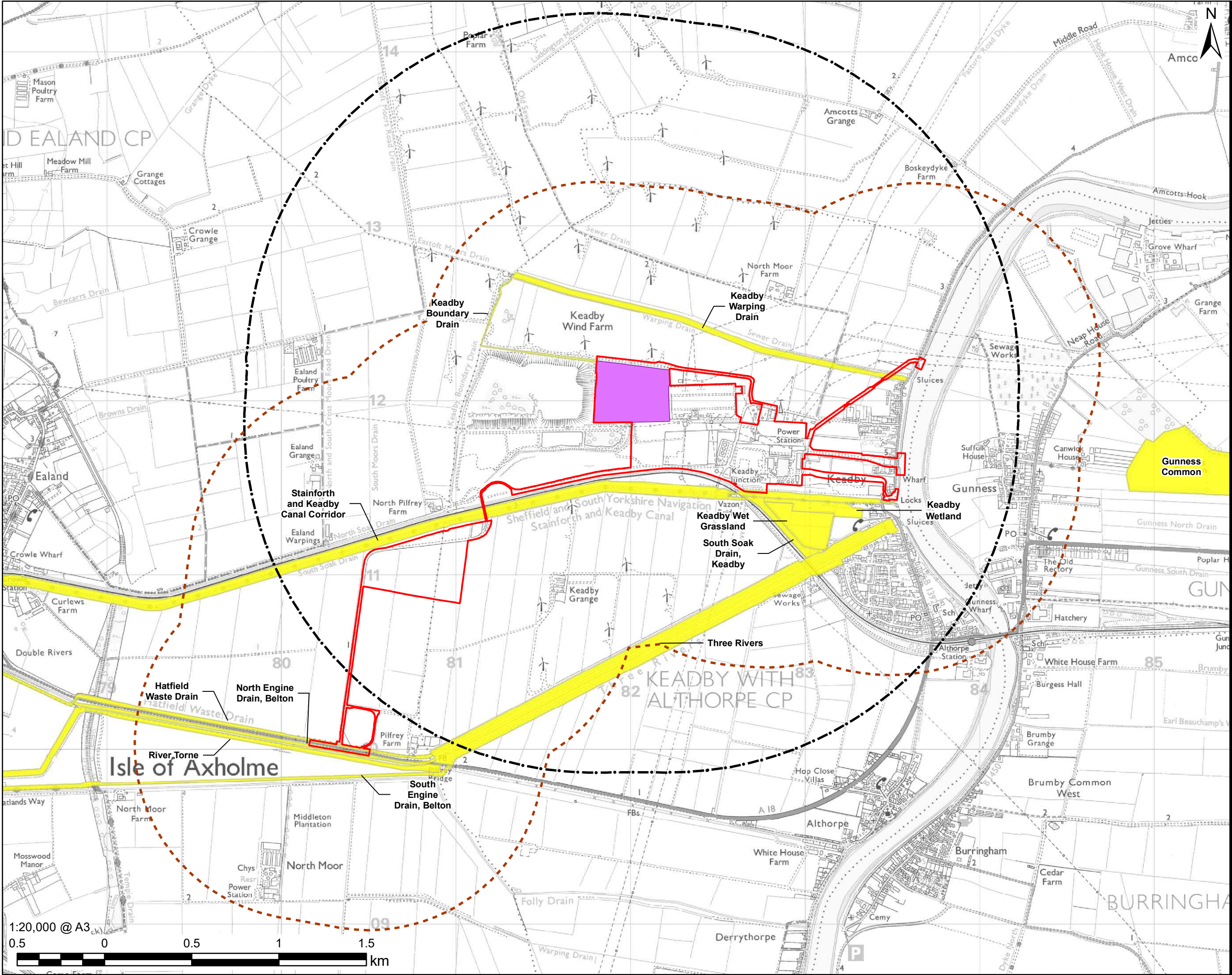
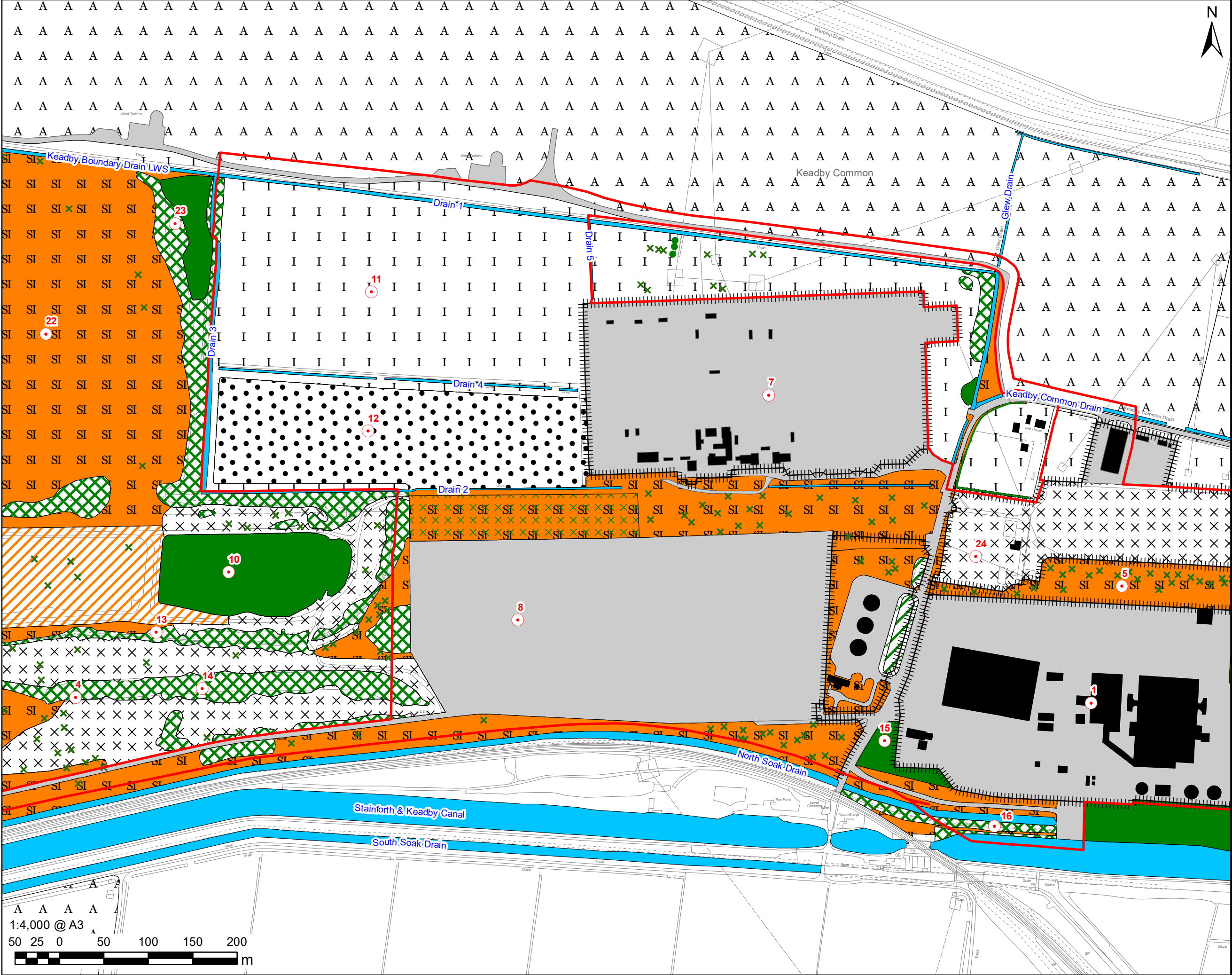


Figure 11C.3 – Phase 1 Habitat Survey Map

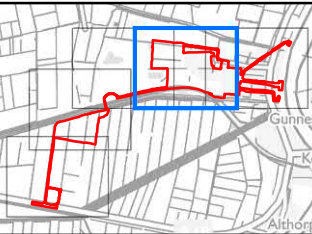


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- LEGEND**
- Proposed Development Site
 - Broadleaved Parkland/Scattered Tree
 - Scrub - Scattered
 - Target Note
 - Defunct Hedge - Species-poor
 - Dry Ditch
 - Fence
 - Intact Hedge - Native Species-rich
 - Intact Hedge - species-poor
 - Soft Cliff
 - Acid Grassland - Unimproved
 - Bare Ground
 - Broadleaved Woodland - Plantation
 - Broadleaved Woodland - Semi-natural
 - Buildings
 - Cultivated/Disturbed Land - Amenity Grassland
 - Cultivated/Disturbed Land - Arable
 - Cultivated/Disturbed Land - Ephemeral/Short Perennial
 - Hardstanding
 - Improved Grassland
 - Introduced Shrub
 - Marginal and Inundation - Marginal Vegetation
 - Neutral Grassland - Semi-improved
 - Not Surveyed
 - Other Tall Herb and Fern - Ruderal
 - Poor semi-improved grassland
 - Running Water
 - Scrub - Dense/Continuous
 - Spoil



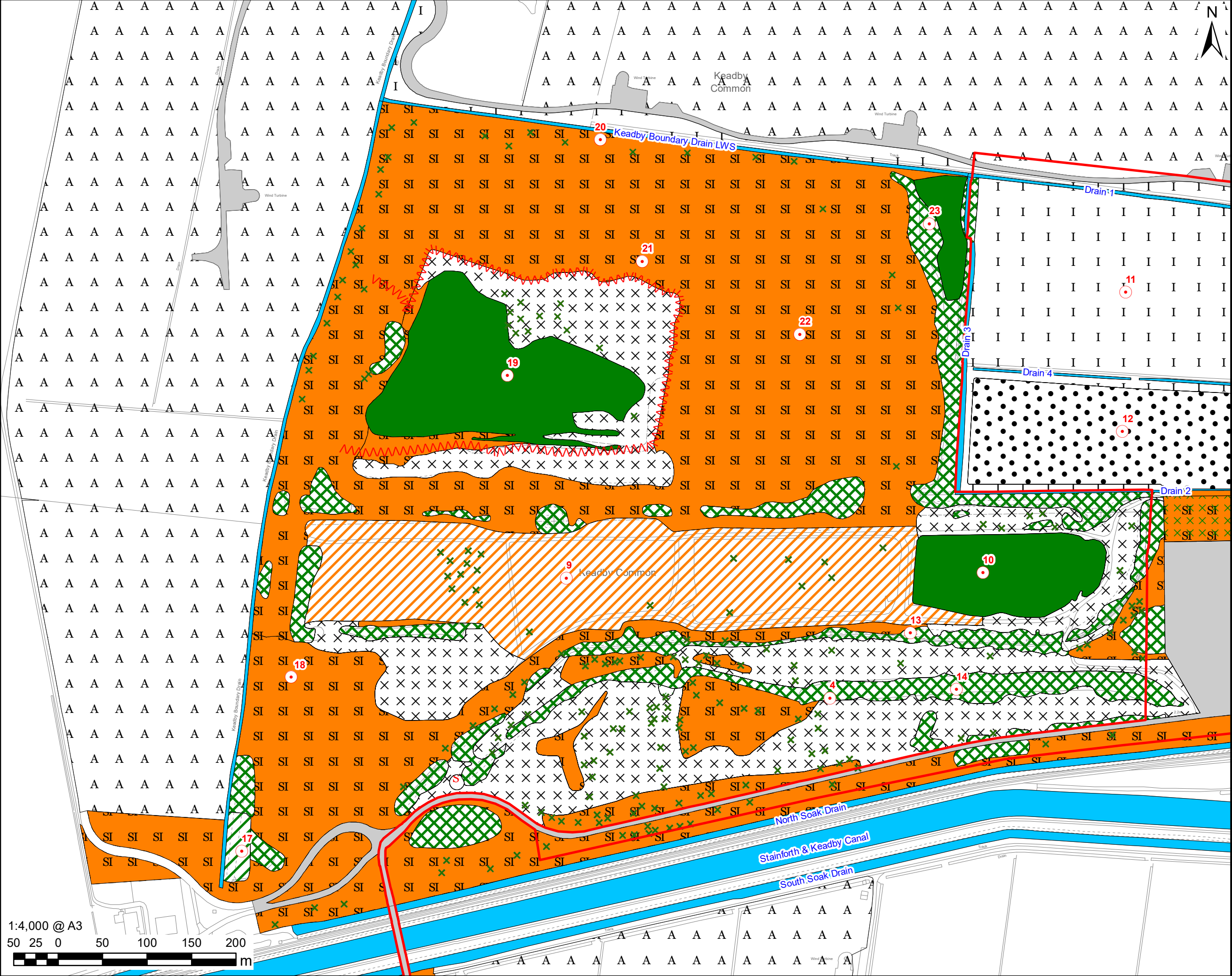
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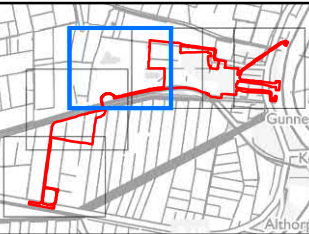


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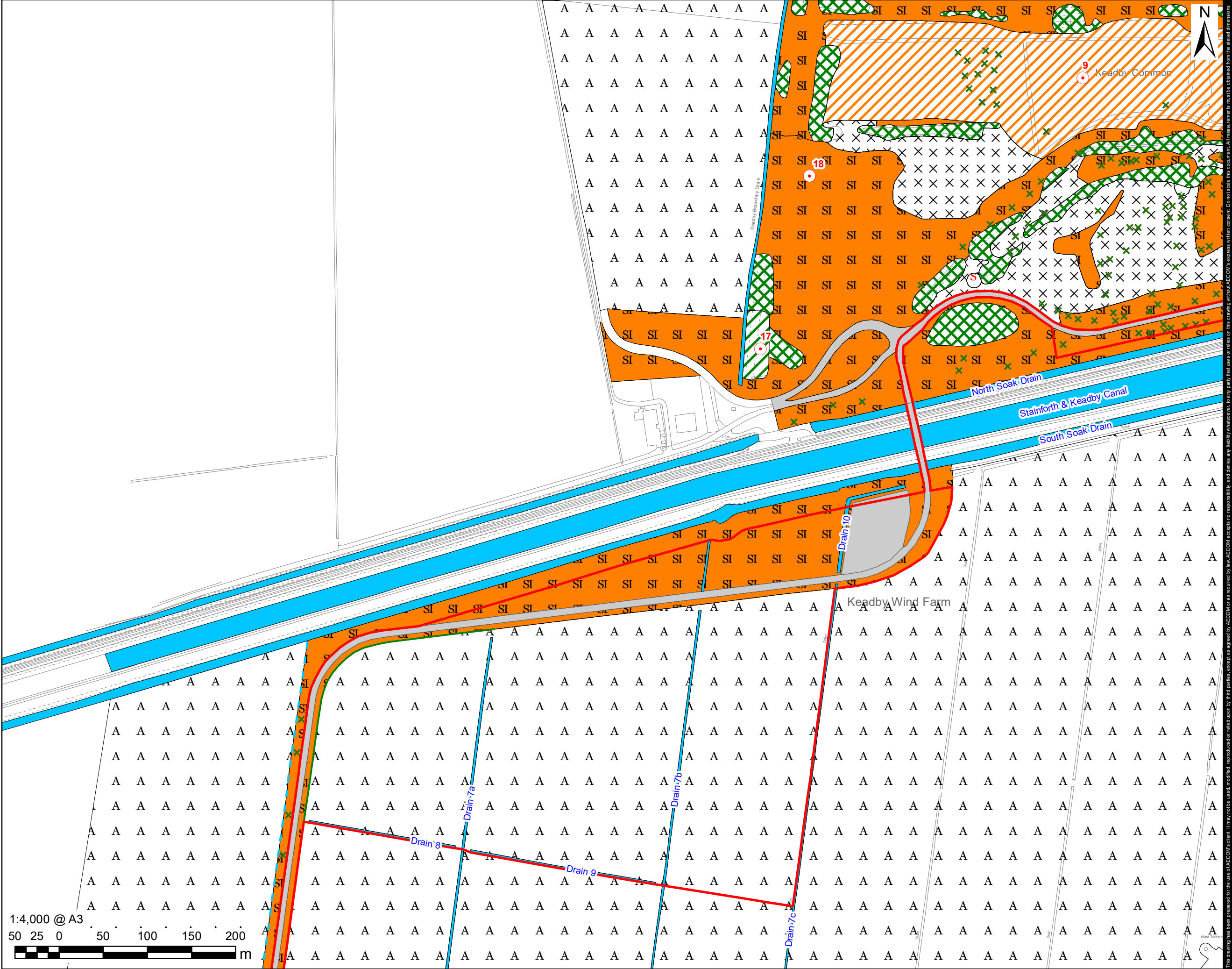
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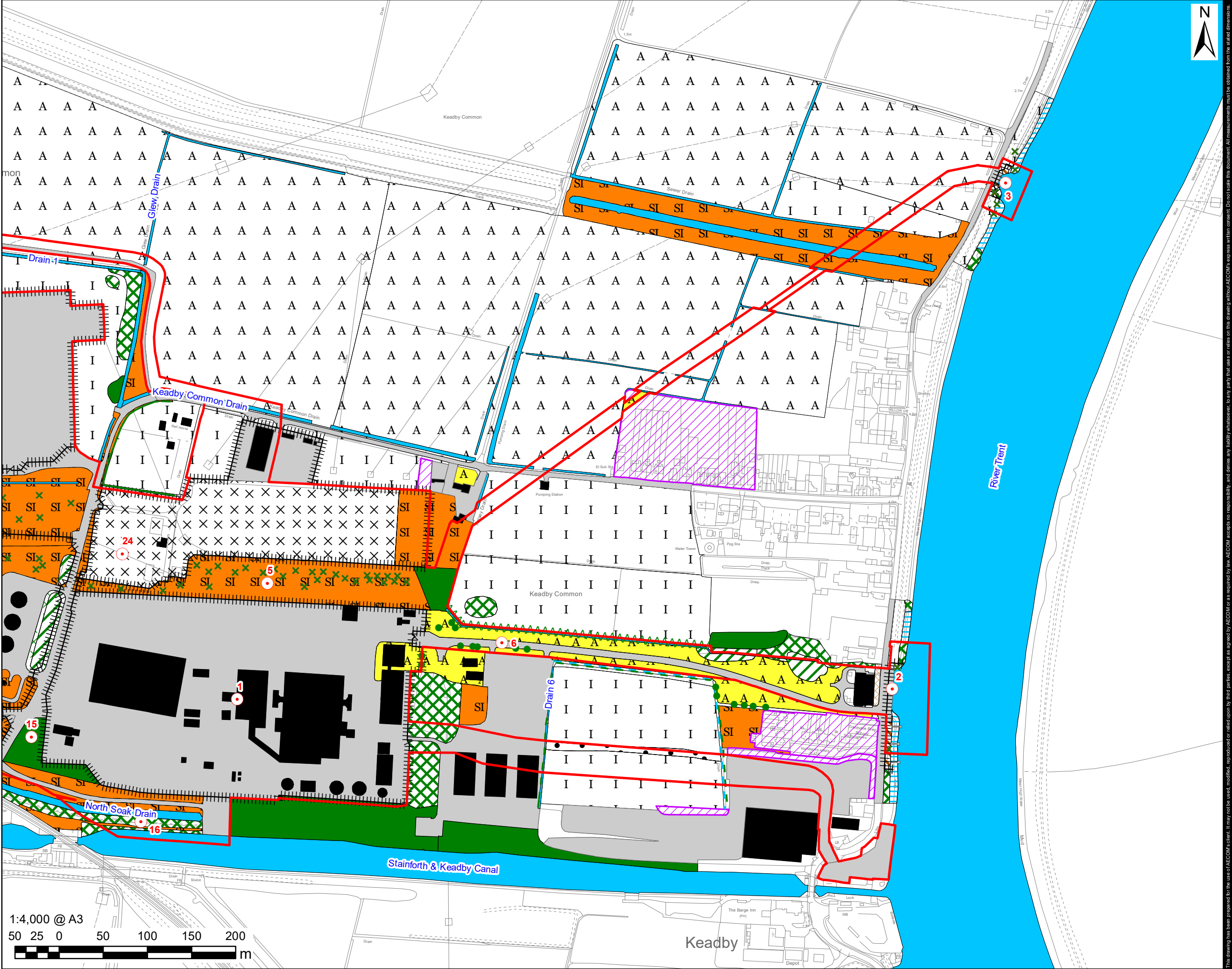
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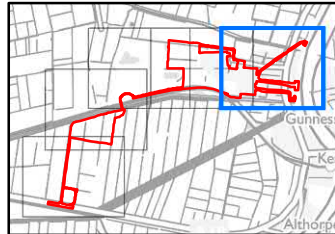
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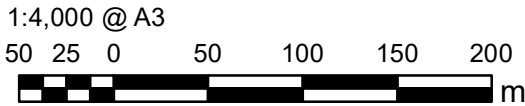
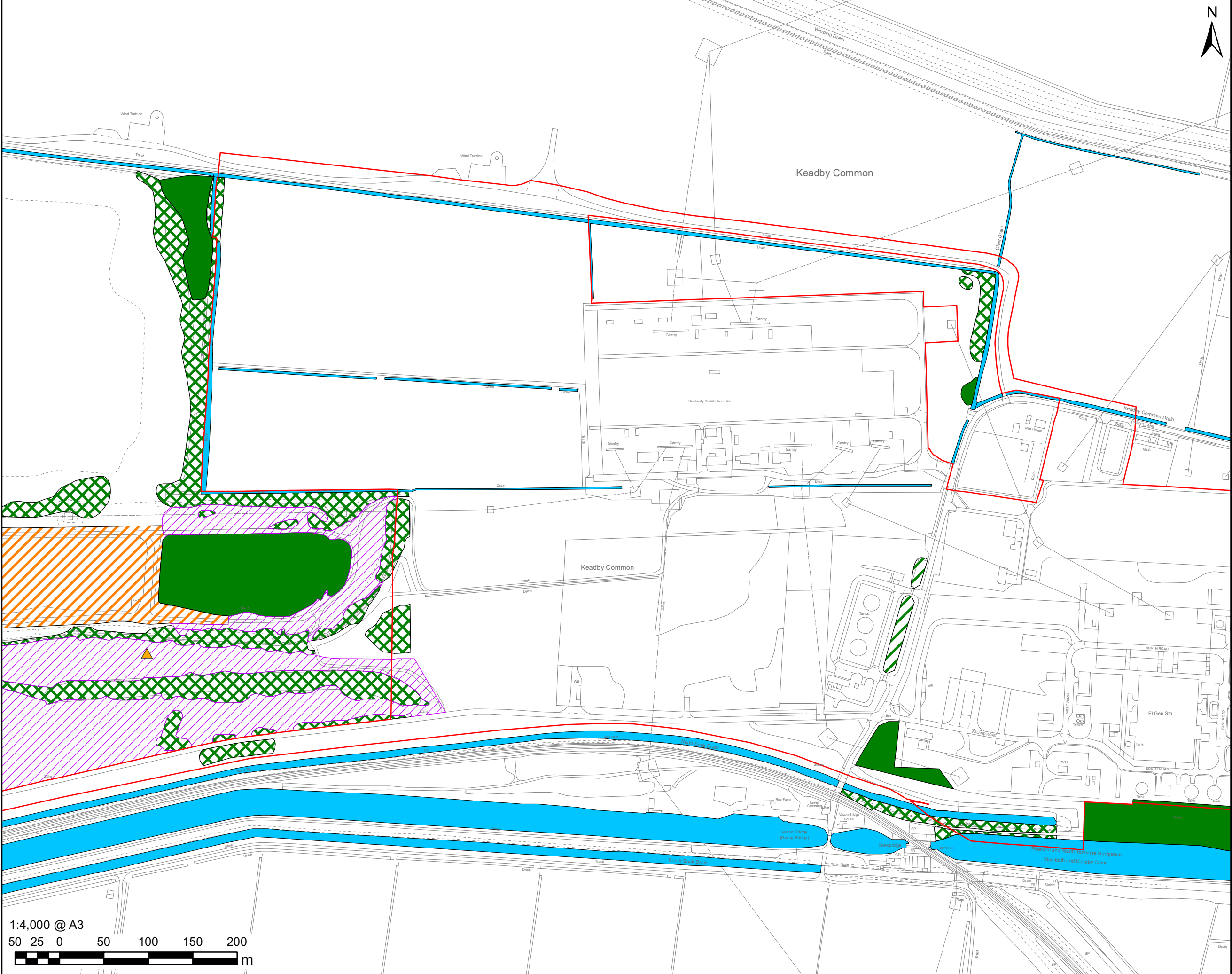


Figure 11C.4 – Location of Key Constraints





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LEGEND

- Proposed Development Site
- Trees suitable for roosting bats
- Wall Cotoneaster (Cotoneaster Horizontalis)
- Open Mosaic Habitat
- Acid grassland - unimproved
- Broadleaved woodland - plantation
- Broadleaved woodland - semi-natural
- Running water
- Scrub - dense/continuous

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LEGEND

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-  Trees suitable for roosting bats
-  Wall Cotoneaster (*Cotoneaster Horizontalis*)
-  Open Mosaic Habitat
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-  Running water
-  Scrub - dense/continuous

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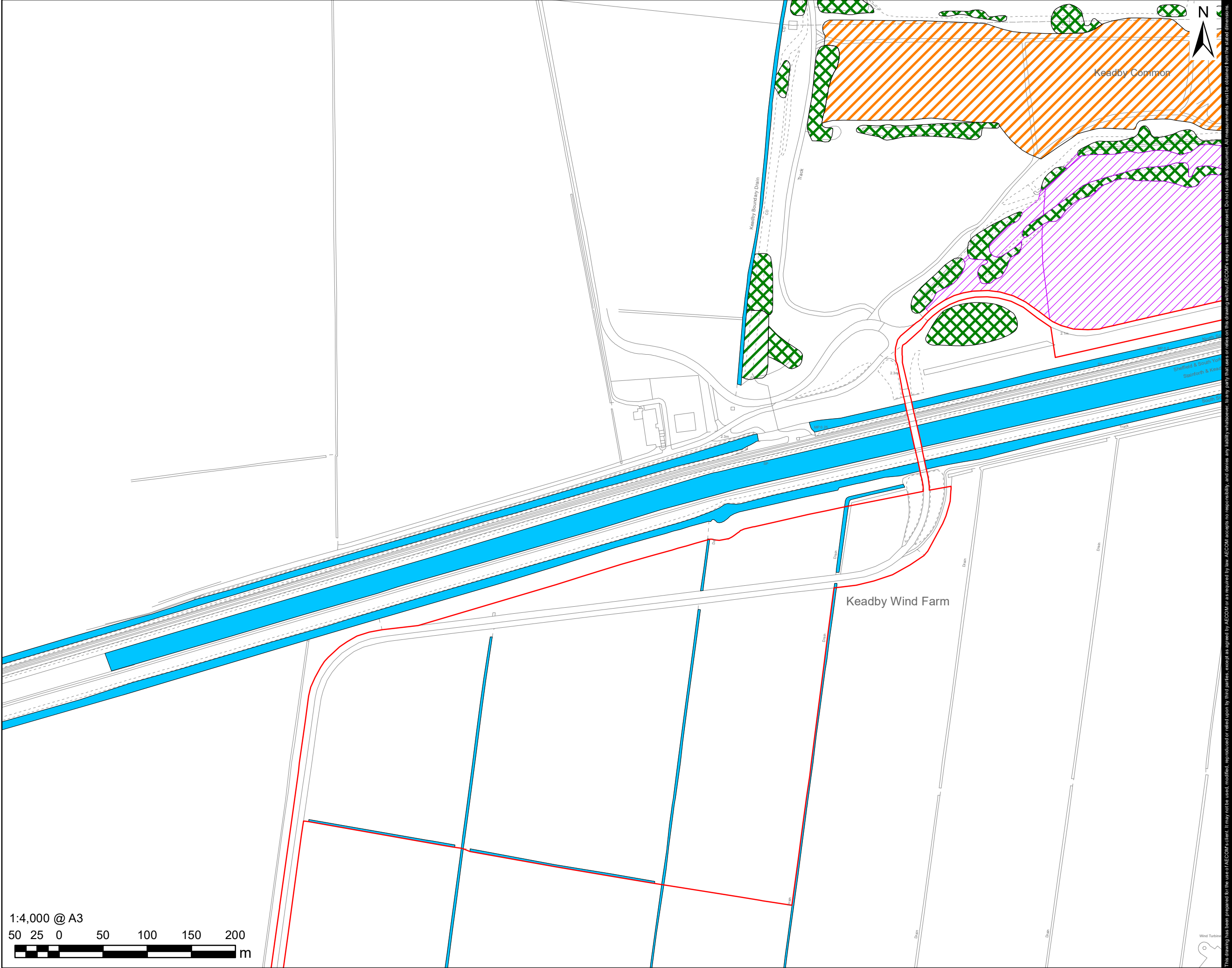
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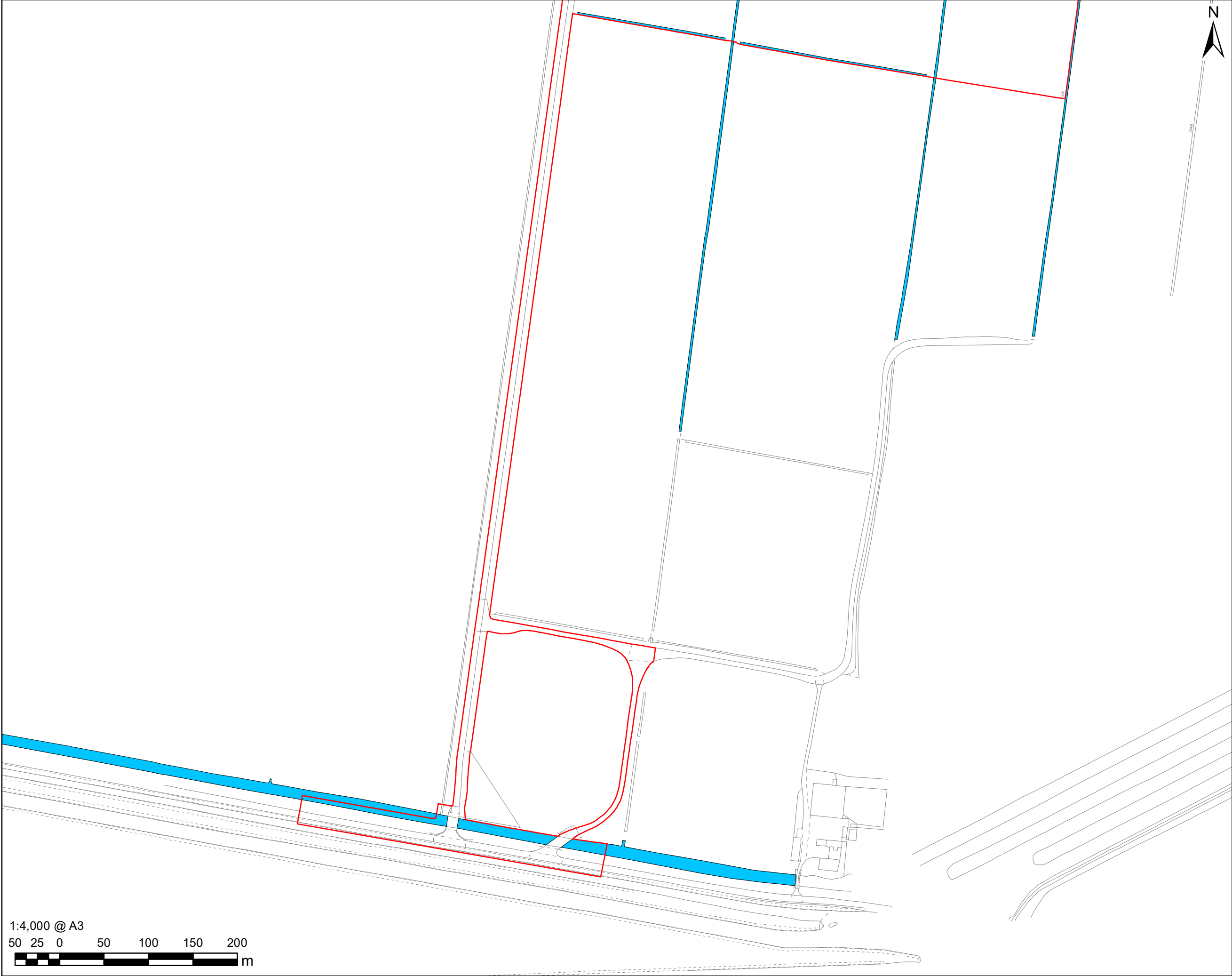
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- Running water

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Figure 11C.4

ANNEX 11A – PHASE 1 HABITAT SURVEY TARGET NOTES (EXCLUDING WATERCOURSES, SEE ANNEX 11D)

Target Note	Description
1	The Keadby 1 Power Station site. Dominated by hardstanding, buildings and associated infrastructure. Within the main boundary fence, semi-natural habitats are limited to small strips of regularly mown amenity grassland. Immediately adjacent to the west is Keadby 2 Power Station which is under construction.
2	The existing concrete water abstraction structure on the River Trent. The banks of the River Trent to either side are mown improved grassland associated with the flood bank. At the water line, where not hard engineered, there are stands of common reed with hemlock water-dropwort. There are also associated small stands of sharp-stippled willow with elder.
3	The existing concrete water discharge structure on the River Trent. Adjacent habitats are comparable to those described for Target Note 2. The banks of the river at this location support the controlled weed species New Zealand pigmyweed.
4	This area is species-rich ephemeral/ short perennial and supports a diverse range of plant species. The sward was generally low, but was patchy or gappy in places, providing opportunity for a range of ephemeral plant species to occur. Typical plant species observed in these areas included sheep's fescue, creeping bent, biting stonecrop, common centaury, viper's-bugloss, little mouse-ear, common whitlowgrass, parsley-piert, thyme-leaved sandwort, silverweed, common dog-violet and northern marsh-orchid. Locally there were stands of wood small-reed. Notable plant species include small cudweed (<i>Logfia minima</i>), bearded fescue, common cudweed, wall bedstraw and smooth cat's-ear (<i>Hypochaeris glabra</i>).
5	Area of scattered bramble and rose scrub over rank semi-improved grassland outside the northern boundary of Keadby 1 Power Station.
6	Scattered semi-mature trees and small plantation woodland copses along the alignment of Trent Road on the approach to Keadby 1 Power Station. These include hybrid poplar, common hawthorn, rowan (<i>Sorbus aucuparia</i>), Norway maple, wild cherry (<i>Prunus avium</i>), Swedish whitebeam (<i>Sorbus intermedia</i>) and London plane (<i>Platanus x hispanica</i>).
7	Existing National Grid 400kV substation.
8	Temporary laydown area for Keadby 2 Power Station. All vegetation cleared and put down to hardstanding.
9	Species-rich mature acid grassland that has developed over the site of previous settlement lagoons and on adjacent land. The vegetation generally comprises a short tight sward, but in places it is more patchily developed and there are areas of bare ground. It is grass dominated, including frequent to abundant sheep's fescue, but locally wood small-reed (<i>Calamagrostis epigejos</i>) is prominent. The grassland is also notable for the abundance of reindeer lichen (particularly <i>Cladonia portentosa</i>), dog lichen (<i>Peltigera</i> sp.) is also present locally. The acid

Target Note	Description
	grassland supports a range of ephemeral herb species. Ephemerals present include common stork's-bill, parsley-piert, little mouse-ear, common whitlow-grass, common centaury, common cudweed, blue fleabane (<i>Erigeron acris</i>) and viper's-bugloss (<i>Echium vulgare</i>). Perennial herbs are rare in the sward, with common ragwort (<i>Senecio jacobaea</i>) and biting stonecrop the most frequently encountered species. Northern marsh-orchid (<i>Dactylorhiza</i> sp.) occurs locally as well as being in adjacent neutral grasslands. Notable plant species include small cudweed, bearded fescue, common cudweed, wild pansy (<i>Viola tricolor</i> subsp. <i>tricolor</i>) and smooth cat's-ear (<i>Hypochaeris glabra</i>). See Annex E for further information on the flora present.
10	Semi-mature secondary woodland dominated by silver birch established in a former pulverised fuel ash (PFA) settling lagoon.
11	Keadby Common, former arable farmland now put down to species-poor improved grassland.
12	Temporary soils storage areas of Keadby 2 Power Station. Bare ground and soil mounds with some minor establishment of ephemeral ruderal plant species.
13	Dense mature scrub dominated by grey willow with frequent semi-mature trees of silver birch. Of relatively uniform age and structure.
14	Species-rich scrub of variable structure. Typical species in this scrub include common hawthorn, glandular dog-rose, common dog-rose, hairy dog-rose, hybrid glaucous dog-rose, sweet-briar, grey willow, sharp-stipuled willow, brambles and elder.
15	Young semi-mature broad-leaved plantation woodland. Similar plantings occur to the immediate north along Chapel Lane.
16	Dense bramble scrub on banks of North Soak Drain.
17	Mature planting of grey poplar (<i>Populus x canescens</i>) on top of slope. There is a shrub layer of elder and the ground layer is dominated by common nettle.
18	An area of previously disturbed ground that is re-establishing as rank grassland. Grasses include false oat-grass, creeping bent and Yorkshire-fog. Ruderals are abundant and include teasel (<i>Dipsacus fullonum</i>), willowherbs (<i>Epilobium</i> spp.), common ragwort, spear thistle (<i>Cirsium vulgare</i>) and hard rush (<i>Juncus inflexus</i>). Northern marsh-orchid has been translocated into this area as part of ecological commitments for Keadby 2 Power Station. There are also some temporary pools of standing water.
19	Young semi-mature semi-natural broad-leaved woodland predominantly comprised of silver birch. The woodland occupies an abandoned quarry dating from construction of the M181 in the late 1970's. Typical tree diameters are in the order of 10-15cm. The sub-canopy of the woodland also includes grey willow and goat willow. At the margins and in open areas there is semi-improved neutral grassland, while along the northern and eastern margins acid grassland is in early stages of establishment from an initial ephemeral/ short perennial vegetation developed over exposed PFA substrates.

Target Note	Description
20	Rank unmanaged species-poor semi-improved neutral grassland at the foot of the tip adjacent to the boundary drains. The grassland is grass dominated and herb-poor. It is comparable to that described for target note 10, but extensive areas coincide with drainage impeded ground. In these wetter areas, stands of common reed, reed canary-grass and greater pond-sedge occur.
21	Sparse ephemeral/ short perennial vegetation developed over exposed PFA deposits in the former quarry. The composition of this community is in the process of moving towards acid grassland. As such, most of the species listed under Target Notes 4 and 9 are present in this area. Locally patches of grassland are well established, while elsewhere very bare substrates occur due to slumping of cliffs after heavy rainfall, and human disturbance. See Annex E for further information on the flora present.
22	Relatively species-poor semi-improved neutral grassland dominates the top and slopes of the old ash tip, although patches or more species-rich ephemeral/ short perennial vegetation, as well as more botanically diverse areas of grassland, occur locally in matrix with this predominate grassland type. Most of the grassland is rank in character, but locally the substrate and rabbit grazing results in a shorter sward. The sward is typically dominated by a limited suite of tussock forming grass species and herbs are rare. This grassland is typical of the wider semi-improved neutral grassland within the site. Grasses include tall fescue, cock's-foot, Yorkshire-fog and false oat-grass. Herbs are generally restricted to common ragwort and teasel.
23	A small area of young semi-mature secondary wet woodland (including scrub for the purposes of Phase 1 habitat survey) on drainage impeded ground at the base of the tip slope. The canopy is grey willow, and there is elder in the understorey. The ground layer is not very diverse and includes abundant common nettle, and local yellow iris (<i>Iris pseudacorus</i>), cleavers (<i>Galium aparine</i>) and water figwort (<i>Scrophularia auriculata</i>). Locally there are small shallow pools of temporary standing water. On drier ground there is a small area of young semi-mature silver birch woodland. Again, common nettle dominates the ground layer.
24	An area of compacted stone hardstanding (Northern Powergrid compound), not currently in use. In early stages of colonisation by ruderal plant species, particularly willowherbs (<i>Epilobium</i> spp.) and young bushes of grey willow and brambles.

ANNEX 11B – PHOTOGRAPHS



Photograph 1 – The existing Keadby 1 Power Station buildings complex



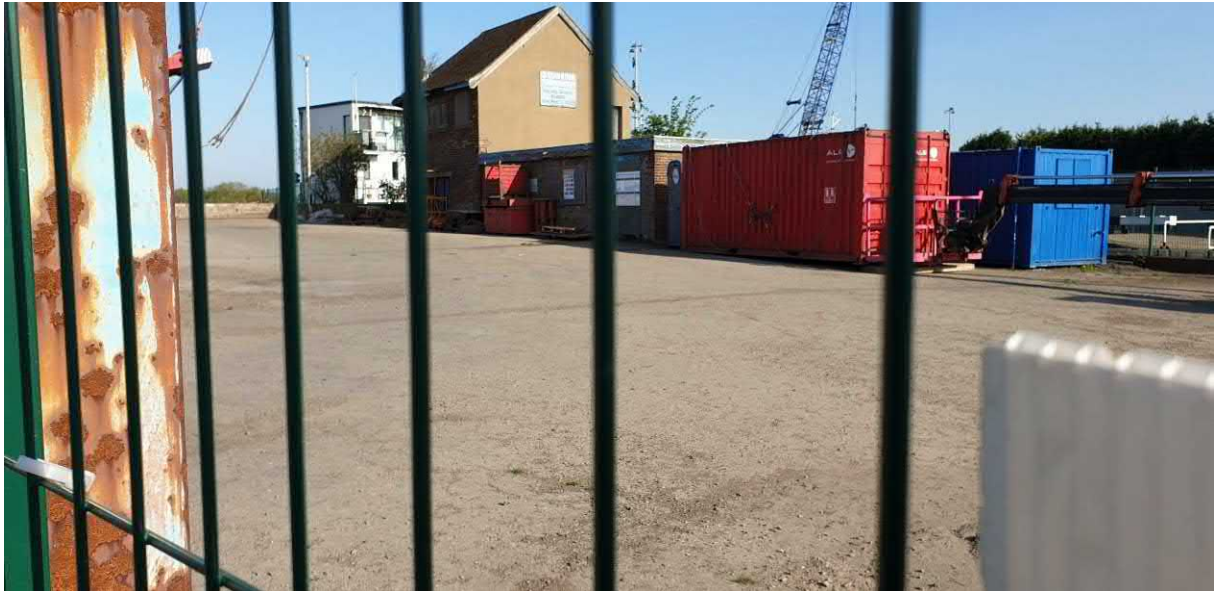
Photograph 2 – Keadby 2 Power Station, currently under construction



Photograph 3 - Keadby 2 Laydown Area immediately east of the former Keadby Ash Tip



Photograph 4 – The existing 400kV National Grid substation



Photograph 5 – The Waterborne Transport Off-loading Area



Photograph 6 – The existing water abstraction structure on the River Trent



Photograph 7 – The existing water outfall structure on the River Trent



Photograph 8 – Stand of common reed at the margin of the River Trent by the outfall structure



Photograph 9 – Looking towards the southern half of Keadby Common, showing its current use for temporary soil storage for Keadby 2 Power Station (under construction)



Photograph 10 – Ephemeral, short perennial vegetation within the Northern Powergrid compound off Chapel Lane Keadby



Photograph 11 - Ephemeral/ short perennial habitats associated with the former railway sidings in the former Keadby Ash Tip



Photograph 12 – Former railway sidings within the former Keadby Ash Tip, supporting OMH



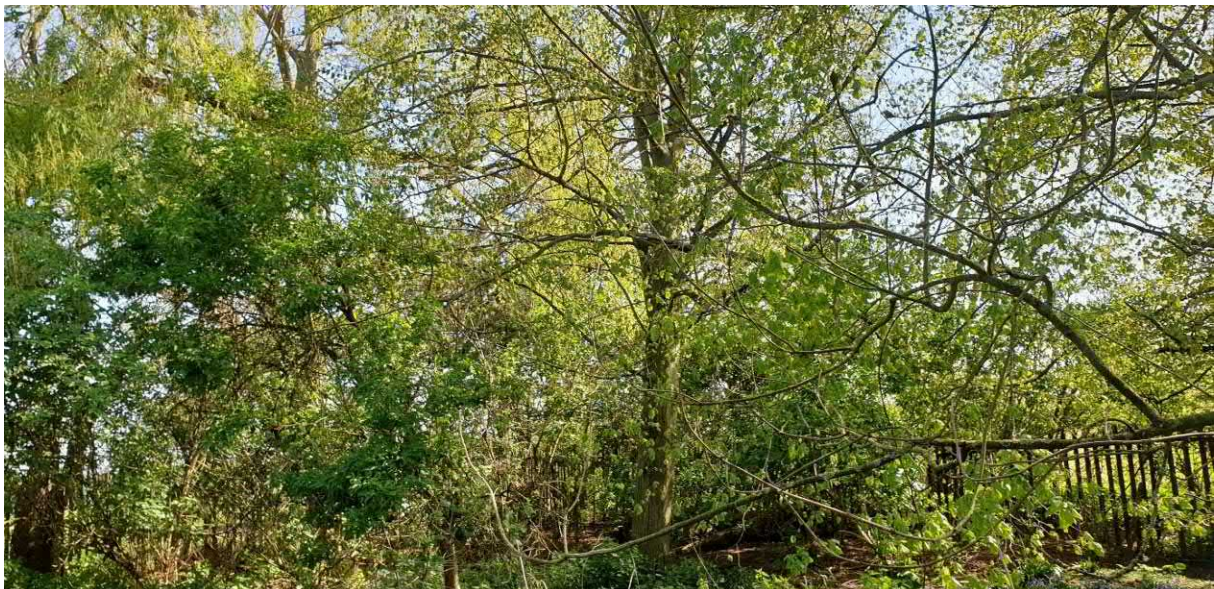
Photograph 13 – Flower-rich OMH within the former Keadby Ash Tip



Photograph 14 – Flower-rich OMH within the former Keadby Ash Tip



Photograph 15 – Keadby Common



Photograph 16 – Broad-leaved plantation woodland, north east of Keadby 1 Power Station



Photograph 17 – Broad-leaved plantation woodland on Chapel Lane at the rear entrance to Keadby 1 and Keadby 2 Power Stations



Photograph 18– Scattered bramble and rose scrub over rank semi-improved grassland, north of Keadby 1 Power Station



Photograph 19 – The recently planted hawthorn hedgerow adjacent to the existing access road from the A18 to Pilfrey Bridge



Photograph 20 – Drain on the northern boundary of Keadby Common



Photograph 21 – River Trent at the location of the existing water outfall structure, a large tidal river reach







Photograph 22 – Stainforth and Keadby Canal looking towards the construction site for the Keadby 2 Power Station water intake




Photograph 23 – Stainforth and Keadby Canal looking over the construction site for the Keadby 2 Power Station water intake (November 2020).


ANNEX 11C – TREES WITH FEATURES OF POTENTIAL SUITABILITY FOR ROOSTING BATS


Tree ref.	Description	Grid reference and location	Bat Roost Potential features	Suitability rating	Photo Reference
T1	Weeping willow Diameter at breast height (DBH): 1m, height of tree: 15m	SE 83029 11787 Located north of Trent Road.	Tree has four woodpecker holes varying from 1 to 12m above the ground. The rest of the tree is in a good general condition. The tree forms part of the woodland north east of Keadby 1 Power Station.	Moderate	
T2	Pollarded ash DBH: 1m, height of tree: 10m	SE 83023 11722 Located within the improved grassland, north of Trent Road near to the entrance to Keadby 1 Power Station	No natural features present. There are two bat boxes present on the tree, one located 7m above ground on the eastern aspect and one 8m above ground on the southern aspect.	High	


Tree ref.	Description	Grid reference and location	Bat Roost Potential features	Suitability rating	Photo Reference
T3	Pollarded poplar DBH: 1m, height of tree: 10m	SE 83426 11670 Tree Tag No. 0565 Located within the improved grassland, north of Trent Road.	There is one decay hole 6m above ground on the western aspect. There are also two bat boxes, one 6m above ground on the northern aspect and one 9m above ground on the northern aspect.	High	
T4	Pollarded poplar DBH: 1m, height of tree: 10m	SE 83439 11665 Tree Tag No. 0567 Located within the improved grassland, north of Trent Road.	One rot hole located 5m above ground on the southern aspect.	Moderate	


Tree ref.	Description	Grid reference and location	Bat Roost Potential features	Suitability rating	Photo Reference
T5	Pollarded poplar DBH: 1m, height of tree: 10m	SE 83431 11679 Tree Tag No. 0569 Located within the improved grassland, north of Trent Road.	One rot hole located 8m above ground on the tree's southern aspect.	Moderate	


ANNEX 11D – DESCRIPTIONS OF RELEVANT WATERCOURSES AND ASSESSMENT OF THEIR SUITABILITY FOR RIPARIAN MAMMALS, FISH AND AQUATIC INVERTEBRATES



Drain (see Figure 11C.3 for locations)	Description	Photograph and Location Details	Potential for water vole	Potential for otter	Potential fish/ aquatic invertebrate value
D1	Field drain which is designated as a LWS. The drain is over-deepened and is subject to periodic dredging. The channel width is approximately 2m. Water depth is variable, but the average is around 50cm. The substrate within the drain is equal part clay to silt. Supports a moderately diverse flora.	 <p>This drain runs along the northern boundary to Keadby Common.</p>	<p>Optimal habitat conditions, including extensive food plants. Surveys undertaken by AECOM in 2017 within this drain, did not record any evidence of water vole, however some limited field signs were recorded within an adjoining drain (at SE 8109 1211). High Potential</p>	<p>There is insufficient cover along the banks to provide suitable areas for holts or lying-up. Surveys undertaken by AECOM in 2017 within this drain, did not record any evidence of otter. However, it is connected to a wider drain network so it may be explored by otter if present in the wider area. Low Potential</p>	<p>Fish This small drain has the potential to support some minor and common fish species e.g. three-spined stickleback (<i>Gasterosteus aculeatus</i>). Relevant to requirements for legal compliance, but no likelihood of notable species or assemblages. Low Potential</p> <p>Aquatic Invertebrates Surveys undertaken in 2017 by AECOM recorded a moderate diversity of aquatic invertebrates assemblage. In combination with aquatic plant data, the drain was considered to be of county value for its invertebrates and aquatic plants. High Potential</p>


Drain (see Figure 11C.3 for locations)	Description	Photograph and Location Details	Potential for water vole	Potential for otter	Potential fish/ aquatic invertebrate value
D2	Field drain approximately 2m wide and 50cm deep at time of spring survey. The channel was dominated by silt and the water surface was dominated by algae. Banks support semi-improved grassland and dense scrub. Common reed was dominant in the channel by July, except where overhung by scrub. Connected to other drains associated with Keadby Common.	 <p>This drain runs along the southern boundary to Keadby Common adjacent to the laydown area for Keadby 2 Power Station</p>	Sub-optimal due to heavy shading and limited food plants, however may be used as overspill habitat if present in Keadby Boundary Drain. Low Potential	Sub-optimal due to minimal food resource but does provide some cover and might be used by otters if present in local area. Low Potential	<p>Fish This drain has the potential to support some minor and common fish species e.g. three-spined stickleback. Relevant to requirements for legal compliance, but no likelihood of notable species or assemblages. Low Potential</p> <p>Aquatic Invertebrates This drain is likely to support a range of common species found within drain habitats. Unlikely to support a notable invertebrate community due to the uniform habitat and lack of macrophyte diversity. However, given connection and proximity to Keadby Boundary Drain (which is known to support a diverse community), some species may also utilise this drain. Moderate Potential</p>


Drain (see Figure 11C.3 for locations)	Description	Photograph and Location Details	Potential for water vole	Potential for otter	Potential fish/ aquatic invertebrate value
D3	Field drain approximately 1m wide with spring water depth approximately 20cm deep. The channel was dominated by silt. Banks support semi-improved grassland and dense scrub. Common reed was the dominant plant species within the channel. Connected to the rest of the drains associated with Keadby Common.	 <p>This drain runs along the western boundary to Keadby Common.</p>	<p>Sub-optimal due to heavy shading and limited food plants, however may be used as overspill habitat if present in Keadby Boundary Drain. Low Potential</p>	<p>Sub-optimal due to minimal food resource but does provide some cover and might be used by otters if present in local area. Low Potential</p>	<p>Fish This drain has limited potential (because of water depths) to support some minor and common fish species e.g. three-spined stickleback. Relevant to requirements for legal compliance, but no likelihood of notable species or assemblages. Negligible Potential</p> <p>Aquatic Invertebrates This drain is likely to support a range of common species found within drain habitats. Unlikely to support a notable invertebrate community due to the uniform habitat and lack of macrophyte diversity. However, given connection and proximity to Keadby Boundary Drain (which is known to support a diverse community), some species may also utilise this drain. Moderate Potential</p>


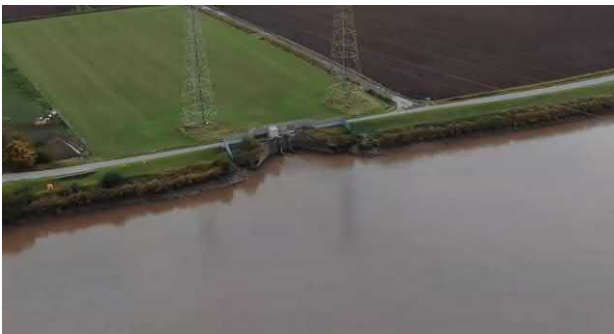
Drain (see Figure 11C.3 for locations)	Description	Photograph and Location Details	Potential for water vole	Potential for otter	Potential fish/ aquatic invertebrate value
D4	Field drain with water approximately 10cm deep and approximately 1m wide. The channel was dominated by silt. Banks support improved grassland. Common reed, reed canary-grass and reed sweet-grass are all abundant. Connected to the rest of the drains associated with Keadby Common.	 <p>This drain runs through the centre of Keadby Common</p>	<p>The channel was very shallow but supports suitable food plants but it prone to drying. Potential to be used as overspill habitat during wet years as there is suitable connection links to Keadby Boundary Drain. Low Potential</p>	<p>There is insufficient cover along the banks to provide suitable areas for holts or lying-up. The drain is very shallow so is sub-optimal for foraging. However, it is connected to more suitable habitat so may be explored by otter. Negligible Potential</p>	<p>Fish As this drain is likely subject to regular drying, fish are likely to be absent or only present on a transitory basis. Scoped out</p> <p>Aquatic Invertebrates This drain is likely to support a range of common early successional species found in temporary wet drain habitats. However, given connection and proximity to Keadby Boundary Drain (which is known to support a diverse community), some species may also utilise this drain. Low Potential</p>


Drain (see Figure 11C.3 for locations)	Description	Photograph and Location Details	Potential for water vole	Potential for otter	Potential fish/ aquatic invertebrate value
D5	Field drain with water depth in spring of approximately 10cm. Channel 1m wide. The channel was dominated by silt. Banks support improved grassland. Reed canary-grass dominates the channel. Connected to the rest of the drains associated with Keadby Common.	 <p>This drain runs along the eastern boundary to Keadby Common adjacent to the existing 400kV National Grid substation</p>	<p>The channel was very shallow and is prone to drying but supports suitable food plants. Might be used as overspill habitat during wet years as there is suitable connection links to Keadby Boundary Drain</p> <p>Low Potential</p>	<p>There is insufficient cover along the banks to provide suitable areas for holts or lying-up. The drain is very shallow so is sub-optimal for foraging. However, it is connected to more suitable habitat so may be explored by otter.</p> <p>Negligible Potential</p>	<p>Fish As this drain is subject to regular drying, fish are considered absent. Scoped out</p> <p>Aquatic Invertebrates This drain is likely to support a range of common early successional species found in temporary wet drain habitats. No notable species or assemblages are likely to occur. Scoped out</p>


Drain (see Figure 11C.3 for locations)	Description	Photograph and Location Details	Potential for water vole	Potential for otter	Potential fish/ aquatic invertebrate value
D6	Field drain with water depth approximately 50cm and 2m wide. Banks supported rank semi improved grassland and a hedgerow. Common reed present.	 <p>This drain runs along the eastern side of the field south of Trent Road (Near Target Note 6). It is therefore within the Proposed Development Site but distant from the land required for construction of the Proposed Development.</p>	Isolated from surrounding wet drains and is likely subject to high levels of disturbance. No likelihood of presence given lack of connectivity to other watercourses. Proposed Development will not affect. Scoped out	This drain is isolated from surrounding wet drains, is likely subject to high levels of disturbance and unlikely to provide suitable food sources. Proposed Development will not affect. Scoped out	<p>Fish This drain has the potential to support some minor and common fish species e.g. three-spined stickleback. Proposed Development will not affect. Scoped out</p> <p>Aquatic Invertebrates This drain is likely to support a range of common species found within drain habitats. Proposed Development will not affect. Scoped out</p>
D7a, b and c, 8, 9, 10	A network of small field drains (less than 2m wide by 0.5m deep) associated with arable fields proposed for use as temporary construction laydown. Banks rough grassland.	 <p>Typical example of the arable field drains within this network</p>	Habitat potentially suitably but sub-optimal due to shallowness and unreliability (as least in Drains 7b and 8) of water supply. Low Potential	There is insufficient cover along the banks to provide suitable areas for holts or lying-up. The drains are very shallow so is sub-optimal for foraging. However, it is connected to more suitable habitat so	<p>Fish These drains have limited potential (because of water depths) to support some minor and common fish species e.g. three-spined stickleback. Relevant to requirements for legal compliance, but no likelihood of notable species or assemblages. No impacts anticipated.</p>

Drain (see Figure 11C.3 for locations)	Description	Photograph and Location Details	Potential for water vole	Potential for otter	Potential fish/ aquatic invertebrate value
				may be explored by otter. Negligible Potential	Scoped Out Aquatic Invertebrates These drains are likely to support a range of common species found within drain habitats. Unlikely to support a notable invertebrate community due to the uniform habitat and lack of macrophyte diversity. No impacts anticipated. Scoped out
Keadby Common Drain, off Chapel Lane	The drain has been over-deepened, has steep banks, and these are bare earth in places. Elsewhere the banks are vegetated by rough grasses. The water is less than 0.5m deep, and channel width is less than 2m. The channel supports a limited diversity of aquatic and wetland plants typical of small drains. There is no shading from trees.	 <p>A small drain running parallel to Chapel Lane, Keadby. It is on a potential route for an electrical connection cable.</p>	Habitat suitable, although water levels generally rather shallow. Moderate Potential	There is insufficient cover along the banks to provide suitable areas for holts or lying-up. The drain is relatively shallow so is sub-optimal for foraging. However, it is connected to more suitable habitat so may be explored by otter. Negligible Potential	Fish Limited potential (because of water depths) to support some minor and common fish species e.g. three-spined stickleback. Relevant to requirements for legal compliance, but no likelihood of notable species or assemblages. Negligible impact relative to extent of available habitat (installation of electrical cable connection only). Scoped Out

Drain (see Figure 11C.3 for locations)	Description	Photograph and Location Details	Potential for water vole	Potential for otter	Potential fish/ aquatic invertebrate value
	The drain and its banks have clearly been affected by regular (annual?) vegetation clearance works.				Aquatic Invertebrates Likely to support a range of common species found within drain habitats. Unlikely to support a notable invertebrate community due to the uniform habitat and lack of macrophyte diversity. Negligible impact relative to extent of available habitat (installation of electrical cable connection only). Scoped Out
River Trent	The tidal reach of this large watercourse. Approximately 150m wide and subject to several statutory nature conservation designations.		The habitat conditions are not suitable for water vole Scoped Out	Otter may forage along the Trent. However, the Proposed Development has limited potential to impact this species. The intake/ outfall locations do not provide suitable cover for holts or lying-up. Scoped Out	Fish The river at this location will support a diverse fish assemblage typical of brackish waters. Requirements for construction of the Proposed Development (temporary coffer dams) will affect only a very small area of this very large river. Therefore, no meaningful impact on fish is anticipated during construction. Use of fish screens and other

Drain (see Figure 11C.3 for locations)	Description	Photograph and Location Details	Potential for water vole	Potential for otter	Potential fish/ aquatic invertebrate value
		 			<p>regulatory requirements will also manage the potential for adverse operational effects. Certain migratory fish, e.g. lampreys, are of potential relevance to the impact assessment. Survey is not needed to permit robust impact assessment of these species.</p> <p>High Potential but Surveys Scoped Out</p> <p>Aquatic Invertebrates The River Trent at this location will support a diverse assemblage typical of brackish waters. Requirements for construction of the Proposed Development (temporary coffer dams) will affect only a very small area of this very large river. Therefore, no meaningful impact on invertebrates is anticipated during construction. Regulatory requirements will also manage the potential for</p>

Drain (see Figure 11C.3 for locations)	Description	Photograph and Location Details	Potential for water vole	Potential for otter	Potential fish/ aquatic invertebrate value
					adverse operational effects. Scoped Out
Stainforth and Keadby Canal	Canal approximately 35m wide and several meters deep. Artificial banks formed of stone. Designated as an LWS.		The habitat conditions are not suitable for water vole. The banks are comprised of concrete and there is minimal food resource. Banks already affected by construction of Keadby 2 Power Station. Scoped Out	Otter may use the canal for foraging if present in the local area. There are suitable holt/ laying up locations within the woodland between the canal and Keadby 1 Power Station. However, there was no access during the PEA to assess habitats further. Moderate Potential	Fish The same rationale applies as for the River Trent (albeit freshwater), but lamprey will not be present. Compliance with legislation is not reliant on availability of survey data, and fish screens are committed. Given this, survey data is not required. Scoped out Aquatic Invertebrates The same rationale applies as for the River Trent (albeit freshwater). See also comments under fish. Desk study records indicate the presence of invasive mussel species that may affect operation of the Proposed Development. Data is needed to inform design and mitigation requirements.

Drain (see Figure 11C.3 for locations)	Description	Photograph and Location Details	Potential for water vole	Potential for otter	Potential fish/ aquatic invertebrate value
					High Potential for invasive species, otherwise Scoped Out

Drain (see Figure 11C.3 for locations)	Description	Photograph and Location Details	Potential for water vole	Potential for otter	Potential fish/ aquatic invertebrate value
North Soak Drain	Large drain approximately 10m wide and at least one metre deep. The channel was dominated by silt. Banks support semi-improved grassland and dense bramble scrub.		Not relevant, scoped out. No improvements or other works are required within or associated with this watercourse. As such, there is no potential for impacts.		

Drain (see Figure 11C.3 for locations)	Description	Photograph and Location Details	Potential for water vole	Potential for otter	Potential fish/ aquatic invertebrate value
Hatfield Waste Drain	Large drain approximately 10m wide and at least 1m deep. The margins support narrow stands of emergent species, and the banks rank grasses, tall herbs, and brambles.	 <p>Located at the proposed access off the A18 where there is an existing bridge that may need to be replaced.</p>	Habitat suitable. Water vole unlikely to be affected unless burrows are located immediately adjacent to the bridge to be removed and replaced. High Potential	The drain is suitable for use by foraging otter. However, there is insufficient cover along the banks to provide suitable areas for holts or lying-up. Proximity to the road may also impact habitat suitability for otter. Low Potential	<p>Fish Suitable for a diverse fish assemblage, but the proposed bridge works would not affect fish or their habitats. Scoped Out</p> <p>Aquatic Invertebrates Suitable for aquatic invertebrates, but the proposed bridge works would not affect fish or their habitats. Scoped Out</p>

ANNEX 11E - BOTANICAL SURVEY REPORT

Keadby Ash Tip

Botanical Survey Report

Keadby Generation Ltd

Project Number: 60538500

28 July 2017

Quality information

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Summary

This report provides the results of the following botanical surveys undertaken in 2017 at Keadby Ash Tip (the site), as part of a wider suite of surveys commissioned to determine the baseline ecological value of the site. The purpose of the detailed botanical surveys and this report is to:

- provide data on the botanical diversity and the relative abundances of identified plant species present in association with notable habitats associated with the site, specifically acid grasslands, open mosaic habitats (OMH) and freshwater (boundary drain) habitats; and
- provide the above data in a manner that allows the results to be used to support an assessment of relative nature conservation value, including review against relevant criteria (as defined in the main report); provide additional incidental botanical data for the wider site (where compatible with the main survey objectives as described above) to supplement the data presented in the PEA report.

The botanical surveys demonstrate that the site supports high quality species-rich acid grassland, OMH and freshwater habitats. A diverse range of native plant species were recorded from the site, including nine notable plant species. These notable flora are:

- Bearded fescue – Nationally Scarce, Lincolnshire rare.
- Common cudweed – Red Data List (RDL) Near Threatened;
- Small cudweed – RDL Near Threatened;
- Smooth cat's-ear – RDL Vulnerable;
- Wall bedstraw – Nationally Scarce, RDL Vulnerable, Lincolnshire rare;
- Wild pansy – RDL Near Threatened;
- Water-violet – RDL Vulnerable;
- Whorled water-milfoil – RDL Vulnerable; and
- Lesser spearwort – RDL Vulnerable;

The first six of the above plant species were strongly associated with the acid grassland and OMH habitats, and the first five occurred in very large numbers. Water-violet and whorled water-milfoil were both associated with the boundary drains and were present in good numbers. Lesser spearwort was observed in small numbers in association with drainage impeded ground.

The populations of bearded fescue, smooth cat's-ear and wall bedstraw associated with the site are assessed in this report as being of regional nature conservation value. This is based on considerations of national status, regional rarity, and the large numbers present. Small cudweed, water-violet, wild pansy and whorled water-milfoil are all assessed to be of county nature conservation value. The remaining two species, common cudweed and lesser spearwort, are considered to be of district value.

All of the acid grassland, OMH and freshwater habitats associated with the site exceed standard Lincolnshire criteria for the identification of sites of Local Wildlife Site (LWS) quality. Indeed, the northern boundary drain is already a designated LWS. Therefore these habitats are all of at least county nature conservation value. Following further assessment, as explained in more detail in the main report, the final nature conservation values attributed to each of these habitats is:

- Acid grassland – national value based on the quality and extent of the habitat present, the significance of this habitat in regional terms, and the relatively unique nature of the habitat present as a result of its association with an unusual substrate (the ash deposits).
- OMH – national value, for the same reasons as given above.
- Freshwater habitats (boundary drains) – county value, this conclusion aligns with previous third party assessments that resulted in designation of the northern boundary drain as a LWS.

1. Introduction

1.1 Background and Purpose

This report provides the results of the botanical surveys undertaken in 2017 at Keadby Ash Tip (the site), North Lincolnshire (centred on central grid reference SE 814 118). The botanical survey was one of a series of surveys commissioned to determine the baseline ecological value of the site.

The ecological surveys were commissioned following an initial Phase 1 Habitat survey and scoping of the ecological constraints and opportunities associated with the site by AECOM in March 2017. The findings of the habitat and scoping survey were compiled as a Preliminary Ecological Appraisal (PEA) report and included recommendations for further botanical surveys in the appropriate survey seasons to allow further define the relative nature conservation interest and value of the habitats and flora associated with the site. The recommended further surveys were:

- National Vegetation Classification (NVC) or similar detailed botanical appraisal (as appropriate, NVC is not a suitable method for all habitat types) of acid grasslands, and open mosaic habitats on previously developed land (OMH); and
- Aquatic plant surveys of the drains that border the site.

The methods employed when undertaking the above surveys are detailed in this botanical report, along with the results of these surveys. A nature conservation assessment is provided to allow the botanical features identified to be valued and placed in their appropriate geographic context.

1.2 Summary Habitat Conditions

The preceding PEA provides details of the habitats present in association with the site, including a supporting Phase 1 habitat map, photographs and target notes.

The site supports the following habitats, in approximate descending order of area occupied:

- **Semi-improved neutral grassland.** This grassland is typically species-poor and herbs make up only a very small component of the sward.
- **Semi-improved acid grassland.** This habitat is characterised further in this report. This is the dominant habitat in the centre of the Ash Tip on seasonally drought-stressed substrates derived from the historic use of the site for disposal of pulverised fly ash (PFA). PFA is of complex chemistry and can either be highly acidic or highly alkaline until ameliorated over time through weathering. This is reflected in the flora recorded for the site, with the acid grassland including a range of flora typical of acid substrates in juxtaposition with some species more typical of base-rich substrates. However, the prevailing interest as defined latter in this report is acid grassland. Elsewhere in the Ash Tip, particularly the former quarry, there is extensive ephemeral/ short perennial vegetation in the early stages of succession towards acid grassland. It is recorded as ephemeral/ short perennial vegetation in this report, consistent with its prevailing character, but it is acknowledged that at small-scale there are areas that might justifiably be called acid grassland.
- **Dense and scattered scrub.** Scrub is only of local distribution, and is primarily restricted to the boundaries of the site, although it does occur as a subsidiary component of other habitat types also.
- **Broad-leaved semi-natural woodland of recent secondary origin.** This semi-mature woodland has limited botanical and structural diversity and is dominated by silver birch (*Betula pendula*).
- **Ephemeral/ short perennial vegetation.** This habitat is characterised further in this report. This is essentially a transitional habitat resulting from colonisation of disturbed PFA and other substrates by ephemeral, ruderal and other plant species with requirements open habitats and minimal competition from more robust species of grassland and herbs. Locally mats of lichens and mosses occur at low to moderate cover mixed in with the ephemeral/ short perennial grasses and herbs. Depending on location it grades into acid grassland and/ or neutral grassland. Over much of the area, higher plants occur at relatively low cover, with peaks in plant

cover in mid to late-spring when there is a flush in growth of winter annual species and certain herb species with high biomass at flowering (particularly ground-ivy *Glechoma hederacea*), and a second peak in summer (rainfall permitting) when larger herbs become prominent e.g. viper's bugloss (*Echium vulgare*) and species of legume. Locally there are temporary areas of standing water that draw-down to wet mud in summer, and which support flora typical of such conditions in combination with other species that are more widespread in the habitat.

- **Broad-leaved plantation woodland.** This habitat is represented by a single small stand of mature grey poplar (*Populus x canescens*).
- **Tall herbs.** This is represented by a single stand of hemlock (*Conium maculatum*).
- **Cliff.** The centre of the site was quarried historically for PFA for use in construction of the M181 motorway. The boundaries of this historic quarry are demarcated by bare cliffs to a height of 8 to 10 m. Given the nature of the substrates present (fine PFA) the cliffs are susceptible to slippage and erosion after periods of heavy rainfall. The cliffs are largely un-vegetated.
- **Wet and dry ditches.** There are two permanently wet ditches (drains) on the boundary of the site. On the northern boundary is a drain that is part of Keadby Boundary Drain Local Wildlife Site (LWS). A section of Keadby Boundary Drain also forms the western boundary of the site but is excluded from the LWS. These drains are characterised further in this report, and referred to as Drains 1 and 2 respectively. Elsewhere within the site, there are ditches that only hold temporary water during the wetter winter months. For the purpose of habitat survey they are classifiable as dry ditches and are not considered further in this report.

Certain of the above habitats contribute to a **combined resource of OMH**. OMH is to a large extent a catch-all for a matrix of habitats and ancillary features that meet the following requirements (Table 1.1, after Maddock, 2011). Within the site it encompasses the early stages of acid grassland establishment in the former quarry (all areas of mature acid grassland were surveyed separately, see Section 2.4.1) and other areas of ephemeral/ short perennial vegetation, dry ditches, temporary standing water, scattered scrub and interfaces with dense scrub, tall herbs, and cliff. The woodland, neutral grassland and wet drains are considered to fall outside the OMH but are complementary to it and may contribute to the value of the OMH for fauna, particularly terrestrial invertebrates (reported separately).

Table 1.1. Summary of Criteria for the Recognition of OMH (all clauses must be met)

Criterion	Requirement	Criteria met for the site?
1	The area of open mosaic habitat is at least 0.25ha in size.	✓
2	Known history of disturbance at the site or evidence that soil has been removed or severely modified by previous use(s) of the site. Extraneous materials/substrates such as industrial spoil may have been added.	✓
3	The site contains some vegetation. This will comprise early successional communities consisting mainly of stress-tolerant species (e.g. indicative of low nutrient status or drought). Early successional communities are composed of (a) annuals, or (b) mosses/liverworts, or (c) lichens, or (d) ruderals, or (e) inundation species, or (f) open grassland, or (g) flower-rich grassland, or (h) heathland.	✓
4	The site contains un-vegetated, loose bare substrate and pools may be present.	✓
5	The site shows spatial variation, forming a mosaic of one or more of the early successional communities (a)–(h) above (criterion 3) plus bare substrate, within 0.25ha.	✓

2. Methods

2.1 Survey Objectives

The purpose of the surveys completed and the associated assessment made in this report is to:

- collect data on the botanical diversity and the relative abundances of identified plant species present in association with the previously identified acid grasslands, OMH and the boundary drains;
- collect the above data in a manner that allows the results to be used to support an assessment of relative nature conservation value, including review against relevant criteria (see Section 2.5 of this report); and
- collect additional incidental botanical data for the wider site (where compatible with the main survey objectives as described above) to supplement the data presented in the PEA report.

2.2 Study Area

The study area for the botanical surveys was the acid grassland, OMH and boundary drains located within or on the boundary of the site as shown on Figure 1.

As part of these surveys incidental data was collected for other habitats within the site, including areas of semi-improved neutral grassland, but these other habitats were not the primary focus of the botanical surveys. This is because these other habitats have been identified as species-poor and therefore additional detailed botanical survey is not required to understand the ecological interest and relative nature conservation value of these habitats, or the contribution they make to the wider ecological value of the site.

2.3 Desk Study

A desk study was undertaken as part of the PEA that was completed in advance of the botanical surveys and informed the scoping of requirements for further survey.

Desk study results of relevance to the assessment of botanical features have been carried forward into this report, and where appropriate this data is presented in more detail or re-interrogated for the needs of the current assessment.

2.4 Field Survey Approach

2.4.1 Terrestrial Habitats

The acid grassland and OMH were surveyed using the methods described below on 9th June 2017. Supplementary data (over and above that presented in the PEA) was collected for the wider site on the same date.

Additional supplementary botanical data was collected for all terrestrial habitats on 17th July 2017 when the site was revisited for the purposes of the aquatic habitat survey.

2.4.1.1 Acid Grasslands

Acid grassland is an extensive habitat within the site (Figure 1) and was surveyed using a combination of NVC survey and a walkover inspection by an expert botanist.

NVC survey alone was not considered appropriate for site appraisal, as this method involves only limited sampling of vegetation, sufficient only to support the assigning of the sampled vegetation to a specific community described in the NVC (this being the main relevance of the method for habitat appraisal, although it is not essential for this). As a consequence, NVC survey results in detailed data for relatively small areas of vegetation, and the downside of this is that a detailed understanding of the wider habitat is not gained and important species may be missed. In addition, the NVC approach is

less applicable to grassland habitats of relatively recent (non-ancient) origin, such as those associated with the site which have established only after the site fell into dis-use for ash disposal. This is because habitats of recent or unusual origin often do not closely match vegetation communities described in the NVC. In the context of this site, the main value of the NVC method was that it supported closer examination of the acid grassland sward for small ephemeral plant species that might otherwise have been over-looked during the walkover inspection. NVC survey also allowed the structure of the grassland sward to be quantified in terms of the relative abundance and contribution of individual plant species. The merits of NVC survey as a technique for appraisal of the site were limited beyond this, but the resultant data complements and supplements the data collected through the walkover inspection.

The NVC survey was undertaken in accordance with the standard methodology as detailed for grasslands in Rodwell (1992). This involved recording those plant species present in 2 x 2 m sample areas (quadrats) of acid grassland. In each discrete acid grassland community type (in this case the site supported just one acid grassland community), up to five randomly selected quadrats were recorded but with survey effort focussed towards areas of acid grassland that were most established and least disturbed. This was to maximise the quality and relevance of the resultant data. Each plant species present in a quadrat was given a 'by eye' estimate of percentage cover, and tree seedlings and bare ground were also recorded. Other typical and/ or noteworthy plant species present in the wider sward, but not picked up in the quadrats, were also recorded during the survey or otherwise recorded during the walkover inspection. Such species, even if rare within the sward, may be relevant for the classification of the associated NVC grassland community. The acid grassland type was assigned, where feasible, to its relative NVC community using the keys and descriptions given in the Rodwell (1992).

A detailed list was compiled for all other plant species observed in the acid grasslands. The relative abundance of each species present being recorded using the DAFOR scale as follows:

- D = Dominant (greater than 75% total cover);
- A = Abundant (51 to 75% total cover);
- F = Frequent (26 to 50% total cover);
- O = Occasional (11 to 25% total cover; and
- R = Rare (1 to 10% total cover).

The prefix L is used where species are Local (patchy) in distribution. If a species appears to be intermediate between two categories, it is generally assigned to the lower category.

2.4.1.2 Open Mosaic Habitats

The survey of the habitats of recent and/ or disturbed origin which together comprise the OMH component of the site involved walkover inspection by an expert botanist only. NVC was not an appropriate technique given the nature and origin of the OMH (as explained above for acid grassland).

2.4.1.3 Other Terrestrial Habitats

Botanical data for other terrestrial habitats, supplementary to the original Phase 1 Habitat survey as detailed in the preceding PEA report, was collected through walkover inspection by an expert botanist. This data was collected only after completion of the acid grassland, OMH and freshwater habitat surveys, so as to avoid distraction from the primary reasons for survey. That said, detailed appraisal of the site was possible and there are no limitations to the list of plant species compiled.

2.4.2 Freshwater Habitats

The boundary drains were surveyed on 17th July 2017 to record their associated emergent and aquatic flora. The survey was completed by an expert botanist who is also an aquatic plant specialist. The lead surveyor was supported by an assistant.

The survey was made by walking within the channel of both drains, where safely accessible and not obstructed by dense growth of emergent flora. These latter areas were bypassed as necessary before

re-entering the channel at the next available access point. A list of all emergent and aquatic plant species encountered was made for each drain and their relative abundance recorded using the DAFOR scale (as detailed in Section 2.4.1.1).

No attempt was made to assign freshwater vegetation to NVC communities. The NVC classification is not widely used for freshwater habitats as the original data suffers from small sample sizes and limitations associated with attempting to survey below the water line. As an example of the limited value placed on the NVC for freshwater habitats, it is generally not used by Natural England for monitoring and condition assessment of freshwater habitats. Natural England specialists have previously advised AECOM ecologists not to use the NVC when making assessments of freshwater habitats.

2.5 Nature Conservation Evaluation Approach

The method of evaluation that has been utilised has been developed with reference to the Chartered Institute of Ecology and Environmental (CIEEM) *Guidelines for Ecological Impact Assessment in the UK and Ireland – Terrestrial, Freshwater and Coastal – Second Edition* (CIEEM, 2016). These give advice on scoping and carrying out environmental assessments and place appraisal in the context of relevant policies. Data received through consultation, desk-based studies and field-based surveys are used to allow ecological features of nature conservation value or potential value to be identified, and the main factors contributing to their value described and related to available guidance. These data can also be used to identify other relevant values e.g. socio-economic or ecosystem services values, but this is beyond the remit of this report and requires the involvement of other relevant specialists.

Habitats, vegetation communities and other botanical assemblages, and individual plants species ('botanical features') can be of nature conservation value for a variety of reasons, and their relative value should always be determined on a case by case basis to demonstrate a robust assessment process. Value may relate, for example, to the uniqueness, quality or extent of habitats, or to the extent to which habitats or species are threatened throughout their range, or to their rate of decline. The value of habitats has been defined with reference to the geographical level at which the feature being assessed is considered to matter (Table 2.1). Relevant published national and local guidance and criteria can be used, where available, to inform the assessment of nature conservation value and to assist consistency in evaluation. Guidance and criteria of potential relevance to the botanical features being assessed is summarised in Table 2.1. The identified guidance and criteria is not definitive and other criteria have been applied as relevant and appropriate to reach a decision on relative nature conservation value.

In some cases it can be appropriate to value habitats with reference to their value for dependent fauna. For example, criteria for the evaluation of habitats in a Lincolnshire context (GNLP, 2013) allows for the assignment of county value to sites based on combined botanical and aquatic invertebrate data where botanical diversity alone is not sufficient to support county value. Where feasible, the evaluation provided in this report values habitats based on their botanical merits alone. Only where due regard needs to be given to other relevant criteria are other data sources taken into account to support robust assessment of relative nature conservation value.

Table 2.1. Geographic Scale Used to Qualify Relative Nature Conservation Value of Features

Geographic scale of value	Definition	Example supporting guidance and assessment criteria
International	Europe	Guidelines for the selection of Special Areas of Conservation (SACs) (McLeod <i>et al.</i> 2005)
National	Great Britain/ England	Guidelines for the selection of biological Sites of Special Scientific Interest (SSSIs) (Bainbridge <i>et al.</i> 2013; Jefferson <i>et al.</i> 2014)
Regional	East Midlands	No specific guidance available, professional judgement is to be used. It will encompass features clearly of greater than county value but not of sufficient merit to demonstrate national value.
County	Lincolnshire	Greater Lincolnshire Nature Partnership (GNLP, 2013), Joint Nature Conservation Committee (2010)
District	North Lincolnshire	No specific guidance available, professional judgement is to be used.
Local	Below district value	No specific guidance available, professional judgement is to be used.

2.6 Limitations

There are no material limitations to the survey work undertaken, and indeed site appraisal has benefited from the opportunity to make repeat visits to the site across the survey period of March 2017 (when the first site visit was made) to July 2017 (when the final botanical survey was completed).

All surveys were undertaken in appropriate favourable weather conditions, and in the appropriate seasons for the habitats being assessed. Access was possible to all relevant habitats, sufficient to allow the compilation of detailed botanical species lists in accordance with the objectives of the work undertaken.

All plant species found were identified to species level, where technically feasible based on the material available and the season of survey. Certain plant species cannot be identified reliably if they lack the features necessary to allow identification, for example mature fruit are required to allow identification of water-starwort (*Callitriche* agg.) and watercress (*Nasturtium officinale* agg.).

3. Legislation, Planning Policy and Related Guidance

The following wildlife legislation, planning policy and guidance is potentially relevant to the botanical features covered in this report (Table 3.1). At this stage of assessment, this legislation, policy and guidance is primarily listed to demonstrate that an appropriate level of survey and assessment has been undertaken to meet likely data requirements for future decision-making with regard to these material considerations. However, relevant Standing Advice has informed survey approaches, while the relevant National Character Area (NCA) profile has a bearing on the assessment of the nature conservation value of relevant botanical features.

Table 3.1: Summary of Relevant Legislation, Policy and Guidance

Document	Requirements/ Purpose
Wildlife and Countryside Act 1981 (as amended) (WCA)	Part 1 of the Act affords specific protection to flora listed on Schedule 8 (flora, fungi and lichens). In certain circumstances, licences can be granted to permit some actions prohibited under the Act.
Natural Environment and Rural Communities (NERC) Act 2006	Section 41 (s41) includes a list of habitats and species of principal importance for nature conservation in England which is to be used by decision-makers to guide the implementation of their duties under section 40 of the Act. Decision-makers are required to have regard to the conservation of biodiversity in England when carrying out their normal functions.
Water Framework Directive (WFD) 2000	Proposed developments or activities that have the potential to affect the water environment require a WFD Assessment. Compliance with the WFD means attainment of good ecological status, prevention of deterioration in status, and prevention of failure to achieve future attainment of good status where it is not already achieved within waterbodies. However, Article 4.7 provides legislation for exemption conditions that could allow implementation of schemes that cause deterioration in ecological status, for example for reasons of overriding public interest
National Planning Policy Framework (NPPF)	<p>Section 11 relates specifically to “Conserving and Enhancing the Natural Environment”. Paragraph 109 states that “<i>The planning system should contribute and enhance the natural and local environment by:</i></p> <ul style="list-style-type: none"> • <i>Protecting and enhancing valued landscapes, geological conservation interests and soils;</i> • <i>Recognising the wider benefits of ecosystem services; and</i> • <i>Minimising impacts on biodiversity and providing net gains in biodiversity where possible, ... including by establishing coherent ecological networks that are more resilient to current and future pressures; ...</i>” <p>Paragraph 113 adds to this and states: “<i>When determining planning applications, local planning authorities should aim to conserve and enhance biodiversity by applying the following principles:</i></p> <ul style="list-style-type: none"> • <i>if significant harm resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused; ...</i> • <i>planning permission should be refused for development resulting in the loss or deterioration of irreplaceable habitats, including ancient woodland and the loss of aged or veteran trees found outside ancient woodland, unless the need for, and benefits of, the development in that location clearly outweigh the loss; ...</i>”
Core Strategy	<p>Policy CS17 promotes effective stewardship of biodiversity resources by protecting national and international nature conservation designations, paying due regard to the presence of European and nationally protected species, protecting and maintaining features of biodiversity and geological interest, maintaining wildlife networks and green corridors, and ensuring ecological enhancement through good design.</p> <p>Policy CS21 states planning applications for mineral extraction should, where appropriate, contribute to the attainment of local biodiversity targets. [e.g. as detailed in the LBAP and NCA profile]</p>
Local Plan	<p>Policy LC4 affords protection for sites of local nature conservation importance.</p> <p>Policy LC5 prohibits development that would have an adverse impact on protected species, except where appropriate mitigation can be delivered.</p>
Standing Advice	The purpose of standing advice is to guide decision-makers on the determination of proposals with potential to affect protected species. The guidance sets out responsibilities and minimum requirements for survey and mitigation, including requirements for protected plant species.
NCA Profile 39	NCA profiles are guidance documents intended to help local decision-making. The information they contain supports the planning of conservation initiatives at a landscape scale, informs the delivery of Nature Improvement Areas and encourages broader partnership working through Local Nature Partnerships. Each profile includes a description of the relevant natural (habitat and species) features.

4. Results

4.1 Desk Study Results

The desk study identified that the drain on the northern (but not the western) boundary of the site is part of a non-statutory nature conservation designation known as Keadby Boundary Drain LWS. The LWS is designated for the botanical interest of its drain habitat and the semi-improved neutral grassland on its banks. The LWS was last surveyed in 2010. Limited information on the botanical interest of the LWS is included on the citation, but it notes that: “*Aquatic vegetation is abundant throughout, including water-starwort, Nuttall’s waterweed, and common and ivy-leaved duckweed, as well as the locally uncommon whorled water-milfoil, water-violet and needle spike-rush. Some of the many other wetland plants present are purple-loosestrife, water mint, water-plantain, water-cress, yellow iris, false fox-sedge, reed sweet-grass, reed canary-grass and common reed.*”

Other than the above designation, the desk study returned no additional botanical records of direct relevance to the site. As a consequence, the botanical surveys detailed in this report represent the best available information to qualify the relative botanical interest of the site, and interpret its value in a wider geographic context.

4.2 Field Survey Results

4.2.1 Summary of the Botanical Interest of the Site

All flora recorded from the site are detailed in Appendix A. The data is broken down by habitat and broad location as follows (see also Figure 1):

- Acid grassland – botanical species lists are provided for the acid grassland present in the former settling lagoons where the grassland is mature;
- OMH – botanical species lists are provided for:
 - the former rail sidings (as a discrete part of the site with developing grassland but with ground conditions characteristic of OMH, there are some acid grassland indicator species present but it is not otherwise typical of acid grassland); and
 - other OMH areas; and
 - the former quarry where the prevailing character is OMH, although moving towards acid grassland and supporting many of the acid grassland indicator species present in the mature acid grassland.
- Boundary wet drains – the botanical list is extracted from Appendix A and provided in more detail in Section 4.2.4; and
- Other areas – a botanical list is provided detailing the flora recorded from all other habitats within the site.

The site as a whole supports a diverse flora (237 higher plant species are listed in Appendix A) much of which is native in origin (comprising 209 native higher plant species and archaeophytes (naturalised plants introduced into Britain before 1500)). Several non-native garden escapes occur locally or in low numbers. This is not automatically relevant to interpretation of nature conservation value. Indeed in the context of OMH the presence of non-native species can be interpreted as beneficial e.g. because they increase the diversity and duration of provision of flower-rich vegetation for terrestrial invertebrates. In addition to higher plants, several lower plant species were identified where they contributed measurably to grassland swards or other habitats. These comprised one stonewort (common stonewort *Chara vulgaris*), one moss (Juniper hair-cap *Polytrichum juniperum*), and three species of lichen (reindeer lichen *Cladonia* species, the dominant over large areas being *C. portentosa* where it was characteristic of the mature acid grassland, and dog lichen *Peltigera canina*).

Several of the plant species recorded from the site are notable, most of which occur as large populations. Nine plant species are considered notable as clarified below in Table 4.1 (excluding columbine *Aquilegia vulgaris* for the reason given in the table). This is based on their national threat status and distribution as detailed in JNCC (2017a) and Stroh *et al.* (2015), supplemented with

consideration of their status at the county level where relevant and there is information available to determine this. In some cases, county value has been inferable from available public access national datasets (BSBI, 2017) and this compensates for gaps in county-level information published by the Greater Lincolnshire Nature Partnership (GNLP, 2013). The latter omits several species listed in Table 4.1 which reasonably would be considered to merit inclusion, and this probably reflects a lack of data for these species at the time of compilation, rather than being a true reflection of their perceived value in the county.

No plant species were recorded that receive specific legal protection via Schedule 8 of the WCA, or that are listed on Section 41 of the NERC Act as being of principal importance for nature conservation in England. This does not remove the need to further assess the plant species recorded for their nature conservation importance. There are other criteria for nature conservation value (see Table 2.1 for example), and legal protections do not always provide a true or current reflection of all species of nature conservation concern.

Table 4.1. Notable Plant Species Recorded from the Site

Common name	Latin name	Relevant national* and/ or local status	Comment on status and distribution within the site
Columbine	<i>Aquilegia vulgaris</i>	GLNP (2013) Notable Plant	A garden escape at this location which can be discounted as notable. A few plants occur along the former rail sidings, where they are associated with other species of garden origin.
Small cudweed	<i>Filago minima</i>	RDL Near Threatened (England and GB)	This species is occasional to frequent through all areas of OMH and acid grassland. While cover is relatively low, the site supports a population estimated to number in the 1000's.
Common cudweed	<i>Filago vulgaris</i>	RDL Near Threatened (England and GB)	This species is frequent in areas of OMH and acid grassland. While cover is relatively low, the site supports a population estimated to number in the 1000's.
Wall bedstraw	<i>Galium parisiense</i>	Nationally Scarce RDL Vulnerable (England and GB) Lincolnshire rare (inferred from BSBI, 2017)	Scattered through the acid grassland (particularly the former settling lagoons) and OMH, but very abundant along the former rail sidings and the OMH near the southern boundary road. The site supports a population estimated to number in the 1000's.
Water-violet	<i>Hottonia palustris</i>	RDL Vulnerable (England)	Occasional in Drain 1 and locally abundant in Drain 2. A healthy viable population occurs.
Smooth cat's-ear	<i>Hypochaeris glabra</i>	RDL Vulnerable (England & GB)	This species is frequent through all areas of OMH and acid grassland. While cover is low, the site supports a population estimated to number in the 1000's.
Whorled water-milfoil	<i>Myriophyllum verticillatum</i>	RDL Vulnerable (GB)	Occasional in Drain 1 where it is one of the reasons for designation of the LWS. A healthy viable population occurs.
Lesser spearwort	<i>Ranunculus flammula</i>	RDL Vulnerable (England)	A few plants were found in a temporary area of standing water in the former quarry, which is part of the OMH.
Wild pansy	<i>Viola tricolor</i> subsp. <i>tricolor</i>	RDL Near Threatened (England & GB)	Occasional in the acid grassland in the central part of the former settling lagoons. A healthy viable population occurs with at least forty plants present.
Bearded fescue	<i>Vulpia ciliata</i> subsp. <i>ambigua</i>	Nationally Scarce Lincolnshire rare (inferred from BSBI, 2017)	This species is frequent in areas of OMH and acid grassland. It is a very prominent part of the grassland sward in late spring and early summer. The site supports a population estimated to number in the 10,000's.

Common name	Latin name	Relevant national* and/ or local status	Comment on status and distribution within the site
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* Red Data Lists (RDL) have been published detailing the status of plant species at both the Great Britain (GB) (JNCC, 2017a) and England (Stroh *et al.* 2015) levels. In accordance with guidance in the latter, where the published status differs between the two 'regions' then assessments should defer to the geographic region where the status is least favourable. For example, where a plant species is Near Threatened in Britain as a whole but Endangered in England, then greater emphasis should be placed on the latter status.

4.2.2 Further Information on the Acid Grassland Interest of the Site

The broad characteristics of the acid grassland were defined in the preceding PEA report and this does not need to be revisited in this report. However, the more detailed botanical surveys have reinforced previous conclusions on the likely botanical interest of this grassland.

The mature acid grassland is species-rich and supports a diverse range of plant species, including six of the notable plant species listed above in Table 4.1, most of which occur in large numbers. The grassland is also notable for the abundance to local dominance of reindeer lichen (*Cladonia portentosa*), which affords a distinctive character to the acid grassland. This widespread lichen often dominates on nutrient-poor acidic substrates, particularly where subject to summer drought-stress. The grassland also supports a diverse range of ephemeral plants species that are only readily detected in spring, being winter annuals that flower early and die-back by early summer. Such species include wall bedstraw, little mouse-ear (*Cerastium semidecandrum*), hair-grass species (*Aira praecox* and *A. caryophyllea*), common whitlow-grass (*Erophila verna*), cornsalad (*Valerianella locusta*) and lesser chickweed (*Stellaria pallida*), amongst others. Two species of orchid occur locally both of which are common species of favourable nature conservation status. These are northern marsh-orchid (*Dactylorhiza purpurella*) and bee orchid (*Ophrys apifera*).

Based on the species data gathered, including the focussed NVC survey the data for which is provided in Appendix B, the mature acid grassland is considered a good fit for the U1 *Festuca ovina-Agrostis capillaris-Rumex acetosella* grassland community of the NVC. The habitat example present diverges a little in terms of typical species composition but this can be attributed to the origins of the grassland which has developed spontaneously on substrates of artificial origin. The site is also relatively isolated in the wider landscape (particularly in the context of the Humberhead Levels NCA) which may have limited opportunities for other flora typical of this community to reach and colonise the site from similar semi-natural habitats. There are some obvious affinities with the U1a, U1b and U1c sub-communities in particular, given the abundance of lichen in the mature acid grassland, and the abundance of ephemeral plant species across the acid grassland as a whole. However, given the origins of the acid grassland it is not considered constructive to state a close affinity with any one of the defined sub-communities as they do not align fully with the descriptions given for each sub-community in Rodwell (1992). Instead, the assemblage present is likely to be of relatively unique origin and composition, and is best assessed in this light and on its own merits.

In order to support the evaluation of nature conservation in Section 5 of this report, relevant grassland indicator species are identified and summarised in Table 4.2 based on GNLP (2013). Indicators for three grassland types are considered, acid, calcareous and neutral grassland types. While there is no doubt that the grassland is a variant of acid grassland, some of the flora present is also indicative of other grassland types and this is considered a reflection of the unusual (artificial) chemistry of the ash deposits.

From the summary results presented in Table 4.2, the acid grasslands are shown to support a high diversity of indicator species for this habitat and markedly exceed the total set in GNLP (2013) for the identification of notable acid grasslands.

Table 4.2. Summary of Indicator Species of Different Grassland Types Recorded from Acid Grassland Areas within the Site (based on GNLP, 2013)

Common name	Latin name	Acid grassland	Calcareous grassland	Neutral grassland
<i>Indicator of grassland type</i>				
Silvery hair-grass	<i>Aira caryophyllea</i>	✓	-	-
Early hair-grass	<i>Aira praecox</i>	✓	-	-
Slender sandwort	<i>Arenaria leptoclados</i>	✓	-	-
Common centaury	<i>Centaureum erythraea</i>	✓	✓	-
Little mouse-ear	<i>Cerastium semidecandrum</i>	✓	-	-
Viper's-bugloss	<i>Echium vulgare</i>	✓	-	-
Common stork's-bill	<i>Erodium cicutarium</i>	✓	-	-
Common whitlow-grass	<i>Erophila verna</i>	✓	-	-
Sheep's fescue	<i>Festuca ovina</i>	✓	✓	-
Small cudweed	<i>Filago minima</i>	✓	-	-
Common cudweed	<i>Filago vulgaris</i>	✓	-	-
Cat's-ear	<i>Hypochaeris radicata</i>	✓	✓	✓
Smooth cat's-ear	<i>Hypochaeris glabra</i>	✓	-	-
Heath wood-rush	<i>Luzula multiflora</i>	✓	-	-
Early forget-me-not	<i>Myosotis ramosissima</i>	✓	✓	-
Bee orchid	<i>Ophrys apifera</i>	-	✓	-
Common mouse-ear-hawkweed	<i>Pilosella officinarum</i>	✓	-	-
Smooth meadow-grass	<i>Poa pratensis</i>	-	-	✓
Cowslip	<i>Primula veris</i>	-	✓	✓
Wild mignonette	<i>Reseda lutea</i>	-	✓	-
Sheep's sorrel	<i>Rumex acetosella</i>	✓	-	-
Total		17	7	3
Number of scoring species required to meet GNLP (2013) criteria for LWS quality based		8	8	8

* The original requirement was thyme-leaved sandwort (*Arenaria serpyllifolia*) but this has recently been split into two species with similar habitat preferences. The named species was originally included in the circumscription of thyme-leaved sandwort so is treated as such for the purposes of data analysis.

4.2.3 Further Information on the OMH Interest of the Site

As with the mature acid grassland, the broad characteristics of the component habitats of the OMH were defined in the preceding PEA report and this does not need to be revisited in this report. However, the more detailed botanical surveys have reinforced previous conclusions on the likely botanical interest of the OMH. The structure of the habitat is varied. For the purposes of defining the main botanical interest of the OMH the survey focussed on the predominant habitat components and ignored interfaces with other habitats (with the plant species present recorded in the 'other habitat' category, Appendix A). Therefore the botanical list provided for the OMH in Appendix A covers areas of disturbed ground with a sparse cover of ruderals and pools of temporary standing water, sparsely or seasonally vegetated stony substrates associated with the alignment of the former rail sidings, and the open grassland with ephemerals and some of the component flora of the acid grassland that has developed on the stony substrates of the former rail sidings. The acid grassland component of the OMH is as described in Section 4.2.2. The structure of the acid grassland varied between the former quarry (treated as a component of the OMH as full grassland cover has not yet been achieved) and

the mature grassland of the former settling lagoons but these two areas were otherwise very similar in terms of the flora present, including the presence of notable flora listed in Table 4.1 of this report.

There are two main ways in which OMH might be valued and therefore the survey data needs to be presented in such a way as to facilitate this. This can be through (a) its value for flora (as described in this report) and fauna (as predominantly described and assessed in the terrestrial invertebrate survey report), and (b) through consideration of the diversity of the structural elements of the OMH which to a very large extent determine its associated floral and faunal value.

As noted above and detailed in Appendix A, the OMH supports a diverse range of flora. This includes seven species listed as notable in Table 4.1, most of which occur in large numbers in association with the OMH (and the acid grassland). The relative nature conservation value of these species is assessed further in Section 5, in addition to the formal appraisal of the relative nature conservation value of the OMH.

An approach for the assessment of the structural value of OMH is given in GLNP (2013). The relevant criterion (BM1) is detailed below to inform presentation of the relevant data to allow the criterion to be applied in Section 5 of this report. Criterion BM1 requires a '*brownfield mosaic at least 0.25 ha in extent with loose substrate or bare ground and at least two of the early successional communities in Table 15 and a minimum brownfield features index score of four using Table 16. At least one early successional community should be flower-rich.*' The tables referenced are given in GNLP (2013), but the associated communities and features are summarised below in Tables 4.3 and 4.4 along with summary information on the presence of these in the site. The site exceeds GNLP (2013) criteria for the identification of notable areas of OMH.

Table 4.3. Presence/ Absence of Early Successional Vegetation Communities Used to Identify Notable OMH (based on Table 15 of GNLP, 2013)

Brownfield early successional community	Definition	Present on site	Supporting comments
Relatively open bryophyte communities on the ground	A fine-grained mosaic. These should not form dense carpets that restrict other species.	x	Bryophytes are not prominent. There is patchy cover on disturbed ground in the west of the site, but this is not considered a 'fine-grained mosaic'.
Diverse or abundant lichen communities on the ground	To include foliose (leaf-like), crustose (crust) and/or fruticose (shrubby and branched) growth forms.	✓	The fruticose lichen <i>Cladonia portentosa</i> is widespread and locally abundant in the OMH and in the interfaces with mature acid grassland.
Inundation	Comprises plant species suited to periodic flooding, usually interspersed with bare areas of mud, e.g. marsh foxtail, toad rush, redshank, lesser spearwort.	✓	There is locally extensive bare mud in the OMH in the west of the site, where it coincides with drainage impeded ground supporting characteristic flora.
Sparse, short-sward grassland	Comprises mainly perennial stress-tolerant species amongst grass species and patches of bare ground, e.g. sheep's-fescue, cat's-ear, mouse-ear hawkweed, sheep's sorrel.	✓	Extensive in the former quarry and along the former rail sidings.
Annual colonisers (flower-rich)	Short sward. Comprises mainly stress-tolerant species suited to low nutrient availability and shallow soils, e.g. thyme-leaved sandwort, common centaury, fairy flax, hare's-foot clover.	✓	A diverse ephemeral flora is present, and is widespread and abundant.
Ruderal colonisers (flower-rich)	Comprises species that are usually the first to colonise disturbed ground; generally more typical of more nutrient-rich areas than the annual community described above, e.g. wild carrot, common toadflax, weld, common mallow, teasel, evening primrose.	✓	The OMH includes a ruderal element. Common ragwort and teasel are particularly frequent later in the season, but various other natives and garden escapes also contribute.
Flower-rich grassland (flower-rich)	Comprises a more mature, closed grassland sward with a high proportion of robust flowering herbs, e.g. common knapweed, common bird's-foot-trefoil, meadow buttercup, red clover.	x	A robust flowering herb component is generally absent, although marsh-orchids and common bird's-foot-trefoil are locally prominent. Tall herbs occur in the MG1 grassland but at low cover.

Brownfield early successional community	Definition	Present on site	Supporting comments
Heathland (flower-rich)	Comprises generally a more open structure and less plant litter than typical heath; may be interspersed with lichens, lower plants and grasses, e.g. heather (<i>Calluna</i>), wavy hair-grass, mat-grass, sheep's-fescue.	x	Not present
Number of criteria required		2 of 8 (including 1 of 4 flower-rich types)	
Number of criteria met		5 of 8 (including 2 of 4 flower-rich types)	

Table 4.4. Presence/ Absence of Brownfield Features Used to Identify Notable OMH (based on Table 16 of GNLP, 2013)

Brownfield feature	Definition	Present on site	Supporting comments
Variation in topography and substrate	Includes humps, hollows and depressions; piles/mounds of rubble, gravel, sand and ash; and significantly broken-up concrete and tarmac. These provide natural and artificial habitat variation at ground level.	✓	The whole site, including OMH areas, shows variation in topography. Substrates including ash, chipped stone on the beds of the former rail sidings, and other broken-up substrates of artificial origin occur locally.
South-facing slopes, banks and cliffs	Provide important basking and burrowing habitat for reptiles and invertebrates, receiving direct sunlight for a large proportion of the day.	✓	The former quarry includes extensive south-facing cliffs and banks.
Variation in sward height and structure; including tussocks of grass, rush or sedge	Areas of short sward, taller herb species and tussocks, providing structural diversity within the vegetation.	✓	There is a diverse sward height across the OMH, and this is supplemented by interfaces with other habitats.
Unmanaged areas of dead and dying plant matter	Includes stems, leaves, flower heads, seed heads, standing and fallen dead trees. These habitats are important for over-wintering and nesting insects.	✓	The OMH is unmanaged so dead vegetation is left standing. This is supplemented by interfaces with other habitats.
Areas of scrub	These should cover no more than 25% of the site and should not threaten detrimental encroachment into other habitats within the mosaic. Scrub should be structurally and/or botanically diverse.	✓	Scrub occurs at low abundance and shows variation in structure and composition.
Ephemeral wet/damp areas	Includes naturally occurring or artificially created damp areas that are at or close to the water table, marginal habitat surrounding standing water, and the seasonal accumulation of water on the ground.	✓	There are several areas of temporary standing water.
Permanent ponds/pools/wetlands	Provide (and should include) shallow margins, wide drawdown zones, a variety of water depths and emergent vegetation; all of which are important habitats for invertebrates.	✓	There is a small wet hollow with a stand of bulrush within the OMH. There are no other permanent standing waters or wetlands in the OMH, but the habitat interfaces with such habitats at the site boundary where there are drains and stands of wetland vegetation.
Activities that will maintain the bare substrate	Includes rabbit activity, or acceptable levels of human activity such as dirt-biking or quarrying. These should not be so intensive that irreparable damage is incurred.	✓	The site is long established and shows evidence of impeded succession which maintains bare and sparsely vegetated substrate. There is rabbit activity on site. The ash cliffs experience periodic slumping and this maintains open cliff faces. In dry weather there is likely to be some wind erosion of substrates.
Number of criteria required		4 (of 8)	
Number of criteria met		8 (of 8)	

4.2.4 Further Information on the Freshwater Habitat Interest of the Site

The two drains surveyed for emergent and aquatic flora are located on Figure 1. The habitat conditions present are also covered in the standalone aquatic invertebrate survey report for the site, where they described and qualified further.

Drain 1, part of Keadby Boundary Drain LWS, is over-deepened and is subject to periodic dredging, evidence of which was observed in March 2017 when surveys for the PEA found extensive arisings on the banks resulting from dredging in a previous season. The drain has steep banks to 2 m height on both sides. The channel width is approximately 2 m. Water depth is variable but in the order of 0.3 to 0.7 m depending on location and the effects of dredging. Sections of the drain are dominated by extensive stands of tall emergent species, particularly reed sweet-grass (*Glyceria maxima*) and common reed (*Phragmites australis*). Where these species dominant they tend to exclude other flora and therefore occur as mono-specific stands. Elsewhere open water occurs with extensive floating-leaved and submerged aquatic flora, or vegetation occurs as a matrix of emergent and aquatic flora. The bank within the site is dominated by rank unmanaged and species-poor semi-improved neutral grassland. The off-site bank was not accessible but appeared similar in character, however the top of the bank is likely to be mown periodically and therefore is likely to be more in keeping with the description of bank habitats provided on the LWS citation.

Drain 2 has no associated nature conservation designation but is hydrologically connected to Drain 1 which it drains into. It is similar in character to Drain 1. It differs in that channel width is approximately 1 m, and water depth is typically 0.1 to 0.4 m. Both banks support rank unmanaged and species-poor semi-improved neutral grassland. The emergent and aquatic flora is similar to Drain 1 but less diverse (see below), and most of the available open water is dominated by dense stands of water-starwort (*Callitriche* agg.).

The survey of Drains 1 and 2 identified a combined assemblage of 37 emergent and aquatic plant species. The plant species recorded are summarised in Table 4.5 and those species relevant to the identification of sites of importance for their aquatic plant interest (based on Table 11 and Criteria FW2 and FW3 of GNLP, 2013) are identified. The plant species recorded include two considered notable, as summarised above in Table 4.1 of this report. These species are water-violet which is present in both drains, and whorled water-milfoil which was recorded from Drain 1 only.

Drain 1 was found to support a greater diversity of emergent and aquatic plant species (31 species excluding algae) than Drain 2 (20 species excluding algae), reflecting the greater length and larger size of this waterbody and the greater range in water depths present. This was also the case when GNLP (2013) scoring species were considered in isolation, with 19 such species recorded in Drain 1 and 11 species in Drain 2. Both drains exceed the GNLP (2013) criteria for the identification of notable freshwater habitats based on their botanical interest.

Two species of algae were recorded. The presence of algae may be indicative of poor water quality, particularly nutrient enrichment, when they occur at high abundance. In this case, neither type of algae was any more than occasional in occurrence. Given the survey was undertaken in mid-summer, when algal levels tend to peak, the status of algae provide strong evidence that the water quality in both drains is relatively favourable for aquatic flora.

Table 4.5. Results of the Botanical Survey of Drains 1 and 2

Common name	Latin name	Drain 1	Drain 2
GNLP (2013) scoring freshwater flora		DAFOR	
Water-plantain	<i>Alisma plantago-aquatica</i>	R	-
Water-starwort species*	<i>Callitriche</i> agg.	LA	D
Broad-leaved water-starwort*	<i>Callitriche obtusangulus</i>	F	-
Greater pond-sedge	<i>Carex riparia</i>	O	-
Floating sweet-grass	<i>Glyceria fluitans</i>	A	A
Reed sweet-grass	<i>Glyceria maxima</i>	A	LA
Water-violet	<i>Hottonia palustris</i>	O	LF

Common name	Latin name	Drain 1	Drain 2
Yellow iris	<i>Iris pseudacorus</i>	O	O
Fat duckweed	<i>Lemna gibba</i>	LO	O
Common duckweed	<i>Lemna minor</i>	R	-
Ivy-leaved duckweed	<i>Lemna trisulca</i>	R	-
Purple loosestrife	<i>Lythrum salicaria</i>	O	-
Water mint	<i>Mentha aquatica</i>	R	-
Whorled water-milfoil	<i>Myriophyllum verticillatum</i>	O	-
Watercress species	<i>Nasturtium officinale</i> agg.	R	-
Reed canary-grass	<i>Phalaris arundinacea</i>	LA	A
Common reed	<i>Phragmites australis</i>	LA	LA
Curled pondweed	<i>Potamogeton crispus</i>	A	O
Broad-leaved pondweed	<i>Potamogeton natans</i>	-	O
Fennel pondweed	<i>Potamogeton pectinatus</i>	O	-
Water dock	<i>Rumex hydrolapathum</i>	-	R
Branched bur-reed	<i>Sparganium erectum</i>	O	R
Bulrush	<i>Typha latifolia</i>	LO	-
Other emergent and aquatic flora		DAFOR	
Creeping bent	<i>Agrostis stolonifera</i>	O	F
Wild angelica	<i>Angelica sylvestris</i>	-	R
Hedge bindweed	<i>Calystegia sepium</i>	LO	O
False fox-sedge	<i>Carex otrubae</i>	R	-
Nuttall's waterweed	<i>Elodea nuttallii</i>	O	O
Great willowherb	<i>Epilobium hirsutum</i>	R	R
Meadowsweet	<i>Filipendula ulmaria</i>	O	LF
Soft rush	<i>Juncus effusus</i>	LO	-
Hard rush	<i>Juncus inflexus</i>	LO	-
Blunt-flowered rush	<i>Juncus subnodulosus</i>	LF	-
Yellow loosestrife	<i>Lysimachia vulgaris</i>	R	-
Amphibious bistort	<i>Persicaria amphibia</i>	O	R
Celery-leaved buttercup	<i>Ranunculus sceleratus</i>	-	LO
Clustered dock	<i>Rumex conglomeratus</i>	O	O
Negative Indicators (Algae)		DAFOR	
Green filamentous algae		O	R
An algae	<i>Enteromorpha intestinalis</i>	R	-
Total - all species excluding algae		31	20
Total - scoring species only		19	11
Number of scoring species required to meet GNLP (2013) criteria for LWS quality based on botanical diversity alone		10	10

* water-starwort species are treated in aggregate for scoring purposes as there was nothing to suggest the presence of more than one species, despite the ability to make identifications to species level was limited by a lack of the necessary diagnostic fruit.

5. Nature Conservation Evaluation

This section provides an assessment of the botanical features present to determine their relative nature conservation value using the approach detailed in Section 2.5 of this report. There is no reasonable likelihood of the botanical features present being of international nature conservation importance, so this can be discounted. This is on the basis that the site does not support any:

- Known endemic plant species or races;
- Plant species of European Union concern as listed on Annexes II and IV of the Habitats Directive (Council Directive 92/43/EEC); or
- Habitats of European Union concern as listed on Annex I of the Habitats Directive.

5.1 Plant Species and Assemblages

The site supports a diverse assemblage of plant species that contribute to and define the nature conservation interest and relative nature conservation value of the habitats associated with the site. They are best assessed in this context and there is no need for a nature conservation evaluation of all of the plant species listed in Appendix A. Instead the remit of species-specific assessment can be limited to the nine relevant notable plant species listed in Table 4.1. The relevant plant species, their assessed geographic value, and the rationale for this are provided in below in Table 5.1.

Based on the assessment the site is assessed to support three plant species of regional nature conservation value, four of county value and two of district value. Taken together, this assessment implies that the site should be considered to support a regionally important assemblage of notable plant species based on their current nature conservation status, the large population sizes of many of the species concerned, and the extent and good condition of the habitats that support these species and which contributes to their favourable nature conservation status within the site. Therefore the site is of at least regional importance for its flora.

Due regard must be given whether the combined botanical interest of the site would indicate that the assigned value should be upgraded to national value. National guidance for the selection of biological SSSIs for vascular plants (JNCC, 2017b) provides criteria for the identification of sites of national value. This is not to imply that the site is of SSSI quality or that it should or should not be designated as such, this is the responsibility of Natural England alone. But reasonably, if criteria are met then the assessed geographic value should be upgraded based on this. However, in order to use the criteria they must be workable and currently they are difficult to apply in practice as they have not been updated for a number of years, are based on concepts of a 'good population' (which is not defined), and inference or calculation of site value requires use of out-of-date assessments of status that are not directly translatable to current classifications of the relative status of the species concerned.

Running through the criteria are themes of status, relative abundance and significance in the context of the relevant 'Area of Search' (AOS) i.e. status in the county (based on the original definition for AOS) or the relevant National Character Area (NCA) (based on the current definition for AOS in England).

In the case of bearded fescue a population in the 10,000s is highly likely to be considered 'good' for the purposes of SSSI selection criteria. This is a rare species in the county, and therefore in the NCA (Humberhead Levels). As acknowledged in Table 5.1, all records for the species are clustered around Scunthorpe and it is considered likely that the site supports a substantial proportion of the local/ NCA population of this Nationally Scarce species. Current data on wider status is inadequate to reach a robust conclusion on this and therefore any judgement made would be supposition only. A similar case might be made for wall bedstraw which has a site population in the 1,000s, but any conclusions again would be supposition. On this basis the site may be of national value for these species, but there is low confidence in this because of the limitations inherent in the currently available criteria for assessment.

For the purposes of this report, it is considered that regional value is sufficient to flag the botanical value of the site and is defensible based on available evidence.

Table 5.1. Nature Conservation Evaluation of Relevant Plant Species

Common name	Geographic scale of value	Reason for assigned value
Small cudweed	County	The OMH and acid grasslands associated with the site support a very large population (estimated in the 1,000s) of this declining plant species. However, it remains widespread both nationally and in the east Midlands (BSBI, 2017), and there are a concentration of records on the coversands of Lincolnshire between Lincoln and Scunthorpe. On this basis regional value seems unjustified, but regard must be given to the size of the population which is linked to an extensive area of suitable habitat in favourable condition for the species. On this basis county value is considered appropriate, and the site is of potential importance for the maintenance of the species in the county.
Common cudweed	District	Common cudweed has a wider ecological niche than small cudweed, so while considered Near Threatened its status is relatively more favourable and it is more widespread. The same rationale can be applied as per small cudweed, but it is considered that the geographic value is relatively lower.
Wall bedstraw	Regional	The OMH and acid grasslands associated with the site support a very large population (estimated in the 1,000s) of this Nationally Scarce plant species. The species is of scattered occurrence and was historically climate-limited and confined predominantly to East Anglia and South East England (Stewart <i>et al.</i> 1994). Current data indicates a range extension northwards and westwards (BSBI, 2017), but the species remains scarce and is considered threatened implying a loss of sites overall (RDL Vulnerable). Some records are likely to represent short-lived casual occurrences. There are a small cluster of records for the Scunthorpe area (BSBI, 2017), and the site population adds to this. These are among the most northerly records in the country. There are few other records for Lincolnshire and the East Midlands. While there is no data available to assist interpretation, it is considered likely that a population of this size and linked to such an extensive area of suitable habitat will represent a significant part of the regional population of this species.
Water-violet	County	Water-violet is of patchy distribution in Britain, with its distribution concentrated in areas where there are, or were historically, extensive networks of suitable shallow freshwater habitat. As such, it was formerly widespread in the drainage ditches of North Lincolnshire. The species has declined markedly as a result of eutrophication of freshwater habitats, and its distribution is now much reduced (BSBI, 2017). Given the unfavourable status of the species (RDL Vulnerable) it is likely to be considered a key part of the nature conservation interest of Keadby Boundary Drain LWS and county value is justified on that basis. The population in the connected unnamed drain is complementary to the designated population, and may be important for the maintenance of this population e.g. in supporting recovery following periodic dredging of the LWS or as a buffer against loss during periods of drought.
Smooth cat's-ear	Regional	The distribution of this species is strongly linked with the distribution of suitable sandy geologies, and as such its main strongholds include East Anglia and the Lincolnshire coversands between Lincoln and Scunthorpe (BSBI, 2017). The wide distribution in Lincolnshire needs to be balanced against the national status, as regional concentrations can be critical for maintaining national status. This species is of conservation concern and has been assessed as RDL Vulnerable. While relatively widespread in Lincolnshire, it is local in occurrence. Based on current data, the site population is likely to be an important in the context of the NCA. While there is no data available to assist interpretation, it is considered likely that a population of this size (estimated in the 1,000s) and linked to such an extensive area of suitable habitat in favourable condition for the species will represent a significant part of the regional population of this species.
Whorled water-milfoil	County	Whorled water-milfoil is a species of calcareous freshwaters with good water clarity. It has declined substantially nationally due to eutrophication of its habitats, and is now primarily concentrated in the drainage systems of North Lincolnshire and the fenland of south Lincolnshire and Cambridgeshire (BSBI, 2017). These strongholds are important for the maintenance of the species nationally. Given the unfavourable status of the species (RDL Vulnerable) it is likely to be considered a key part of the nature conservation interest of Keadby Boundary Drain LWS and county value is justified on that basis.
Lesser spearwort	District	Lesser spearwort is a widespread species and remains locally common throughout Britain. It has experienced a marked decline in England and has been assigned RDL Vulnerable status as a consequence. In this case, this relates to the speed of decline and is not also an indicator of rarity at this

Common name	Geographic scale of value	Reason for assigned value
		time. However, while the species is widespread in Lincolnshire it is very local in distribution, including in North Lincolnshire (BSBI, 2017). The population associated with the site is very small, and there is limited suitable wetland habitat to allow an expansion in population. It is considered of district value on the basis of current status balanced against the small population size within the site.
Wild pansy	County	Wild pansy is a formerly widespread species that has undergone a substantive decline, particularly due to the loss of populations associated with arable farmland as a consequence of agricultural intensification. It remains widely distributed but is very local in occurrence (BSBI, 2017) and is likely to be vulnerable to increasing population loss as a result of loss or unfavourable management of remaining habitats. It should also be noted that the status of the native population is clouded to a large degree by records of short-lived garden escapes and therefore its status may be less favourable than can be inferred from available data. The site supports a relatively small but viable population (<100 plants), and as this is an annual species the population may fluctuate and do better in some years compared with others. The habitat conditions on site are optimal for the species. In the absence of any data to the contrary, and given the apparently parlous state of the species in Lincolnshire (based on available data in BSBI, 2017), county value seems appropriate and suitably precautionary.
Bearded fescue	Regional	The OMH and acid grasslands associated with the site support a very large population (estimated in the 10,000s) of this Nationally Scarce plant species. This is a species largely restricted to East Anglia and South East England. There are a cluster of records for the Scunthorpe area (BSBI, 2017) suggesting a second centre of distribution linked to the sandy substrates of this area. These are among the most northerly records in the country. There are no other records for Lincolnshire. It is also notable in an East Midlands context, where at least some of the other records are likely to relate to short-lived casual occurrences. While there is no data available to assist interpretation, it is considered likely that a population of this size and linked to such an extensive area of suitable habitat will represent a significant part of the regional population of this species.

5.2 Habitats

The habitats assessed in this report are considered to have nature conservation values as follows:

- Acid grassland – national value
- OMH – national value
- Freshwater habitats (drains) – county value

The rationale in support of the above conclusions is provided below in Sections 5.2.1 to 5.2.3.

The other habitats present within the site will complement and support the functional integrity of the above habitats. In combination, all of the habitats present contribute to an extensive area of semi-natural habitat that is otherwise isolated in the wider landscape, and the size of this habitat parcel is likely to be notable in the context of the NCA. This does not in itself imply that the other habitats present are of comparable value, especially when assessed on their own merits, or that the value they contribute to the above notable habitats cannot be replicated or is automatically essential for the maintenance of the value of the notable habitats.

5.2.1 Acid Grassland

Based on the botanical surveys, there is no doubt that the mature acid grassland within the site represents a good example of the NERC Act Section 41 lowland acid grassland priority habitat (as defined in Maddock, 2011). It markedly exceeds criteria (GNLP, 2013) for the identification of acid grasslands of county value for nature conservation in Lincolnshire (see also Section 4.2.2). The acid grassland is notable for its diverse flora, the presence of a suite of notable plant species (including species of at least regional importance for nature conservation, see Section 5.1), and the unusual characteristics of the grassland that result from its development on artificial substrates in isolation from other acid grasslands in the wider landscape.

The acid grasslands associated with the site occur in a Natural Character Area (the Humberhead Levels NCA) which is dominated by intensively managed arable landscapes. Priority habitats (as defined in Maddock, 2011) make up less than 14% of the area of the NCA. Good examples of lowland dry acid grassland are rare, with an estimated area of 734 ha for this priority habitat and making up less than 1% of the NCA (Natural England, 2014). Given this, acid grassland is a rare habitat in the NCA.

The Multi-Agency Geographic Information for the Countryside (MAGIC) website shows the known extent of priority habitats in the region, including acid grassland. This indicates that most of the known resource associated with the Scunthorpe Coversands (outside the NCA), on old mineral workings and commons. Most of the sites supporting acid grassland tend to do so as part of a matrix of other habitats, rather than as extensive discrete areas of acid grassland, and often in association with later successional habitats. Keadby is distinctive in supporting an extensive area of acid grassland at early successional stages.

Appendix C provides a screenshot from MAGIC, allowing the site to be placed in context both in terms of geographic location and the relative size of the on-site habitat resource. The scale and the botanical quality of the acid grasslands associated with the site are notable in this context, and they have not been recorded or mapped as the priority habitat previously (in the Priority Habitat Inventory maintained by Natural England). The contribution of the site to the combined area of lowland dry acid grassland in the NCA represents at least 1.1% of the known resource (742 ha i.e. 734 ha recorded for the NCA plus a conservative estimate of 8 ha associated with the site (which excludes the early successional grassland of the former quarry). It is therefore also likely to contribute to the coherence of the habitat, and has a potential value for the long term maintenance and possible restoration of the acid grasslands in the NCA, and indeed the wider region.

On this basis of the above, the acid grassland associated with the site is assessed to be of at least regional value for nature conservation. This is without taking account of the other (non-acid) species-rich grassland types supporting notable plant species that contribute to the OMH resource within the site. This initial assessment merits further assessment to determine if it should be considered to be of national value for nature conservation. There are current criteria to allow this (Jefferson *et al.* 2014). The relevant criteria form part of national guidance for the selection of biological SSSIs for grassland and other habitats. This is not to imply that the site is of SSSI quality or that it should be designated as such, this is the responsibility of Natural England alone, but it provides a framework for the further interrogation of relative nature conservation value.

Acid grasslands can be considered of national value (based on Jefferson *et al.* 2014) if they are of a listed type (in this case U1 grasslands meet this requirement), are at least 0.5 ha in area (as is the case here), and (numbered for ease of reference):

1. They include the best examples within an AOS [in this case the Humberhead Levels NCA], especially if of 0.5 ha area or greater.
2. They are located in an AOS where:
 - there are few areas of the type and selection would contribute to representing the geographical range of the NVC type nationally, or
 - the geographical unit contains the only, or a high proportion of, locations for a particular sub-community or an unusual variant.
3. They provide additional ecological coherence and functionality by contributing to a network in the sense of Lawton *et al.* (2010). For example, sites may add to more dispersed habitat networks or be juxtaposed to land with high restoration potential enabling potential site expansion and linkages or increasing connectivity at the landscape scale. Each case should be considered on its merits.
4. Habitat diversity encompassing considerations based around:
 - The diversity of sub-types within a site: diversity of types is more highly valued than uniformity;
 - Plant species-richness: very species-rich sites are often of higher value but this should be used carefully as a measure of value, because it may include species indicative of

unfavourable site conditions and non-native species. This criterion can be judged using data in Rodwell (1992);

- Number and relative abundance of character or positive indicator plant species, including NVC preferential species (as per Rodwell, 1992).
5. Presence, number and abundance of species of local distinctiveness, restricted distribution or threatened at national, regional and local scales in the grassland type.

For the reasons given above in support of the initial assessment of regional value, the acid grassland associated with the site is of high nature conservation value and of likely importance in terms of the contribution it makes to the wider resource of the priority habitat in the Humberhead Levels NCA and wider North Lincolnshire. Therefore, there appears to be a strong case for the site being considered to meet criteria 1 to 3 and 5 above. Although the acid grassland of the site has established on an artificial substrate, it would otherwise appear to have strong affinity with the acid/ calcareous grassland and heath communities that have developed on the Scunthorpe Coversands. Acid grasslands of this type would not appear to be represented within the NCA, except at Keadby where the historic deposition of ash has provided suitable conditions for establishment. The site also appears notable because the acid grassland present is at a stable early successional stage, which is not well represented in the gallery of SSSIs on the Scunthorpe Coversands. Whilst comparable ash deposits were formerly common due to the predominance of coal-fired power stations, it is relatively uncommon to have situations where semi-nature habitats have been allowed to develop on these substrates through natural processes and without any proactive landscaping and planting. With the recovery of ash deposits from similar sites and the re-development of other brownfield sites, sites with comparable ash deposits are decreasing in extent, especially with coal-fired power stations being phased out. This reinforces the position that the site represents an unusual variant of acid grassland on nature conservation importance.

Consideration of Criterion 4 requires further interrogation of the botanical data collected for the acid grassland habitat. Table 5.2 below summarises the incidence of plant species that are considered typical (preferential) for U1 acid grassland (based on Rodwell, 1992), or otherwise a positive indicator of the quality of lowland acid grassland (based on JNCC, 2004). These species provide a proxy measure of both the species-richness and relative quality of the acid grassland. They also allow potential for cross-comparison (where feasible and relevant) with other areas of acid grassland. Table 5.2 demonstrates a high incidence of both preferential and positive indicator plant species in the acid grassland associated with the site (36% and 42% incidence respectively). These tallies are considered to demonstrate a strong case for criterion 4 being met. Particularly given that it is unrealistic to expect that all of the plant species listed in the reference publications would occur in all examples of acid grassland, even when these are considered species-rich or are designated as SSSIs. For example, many of the plant species considered preferential by Rodwell (1992) are of geographically restricted distribution and do not occur in the region (although in this case, where data allows, such species have been excluded from the analysis).

Given the above considerations, the acid grassland exhibits many characteristics that align with criteria developed for the recognition of lowland acid grassland habitats of national importance for nature conservation. On this basis, and pending any information from relevant stakeholders to the contrary, the site is considered to be of national nature conservation value for its acid grassland.

Table 5.2. Incidence of Flora Preferential for or Positive Indicators for Acid Grassland

Species	Preferential	Positive Indicator
Biting stonecrop	✓	✓
Cat's-ear	✓	-
<i>Cladonia portentosa</i>	✓	-
<i>Cladonia</i> species	-	✓
Cock's-foot	✓	-
Common centaury	✓	✓
Common mouse-ear	✓	-
Common mouse-ear-hawkweed	✓	✓
Common ragwort	✓	-
Common stork's-bill	✓	✓
Common vetch	✓	-
Common whitlow-grass	✓	-
Creeping bent	✓	-
Creeping cinquefoil	✓	-
Dandelions	✓	-
Dog lichen	✓	-
Dove's-foot crane's-bill	✓	-
Early forget-me-not	✓	-
Early hair-grass	✓	✓
Germander speedwell	✓	-
Ground-ivy	✓	-
Groundsel	✓	-
Juniper hair-cap	✓	-
Lesser trefoil	✓	-
Parsley-piert	✓	✓
Procumbent pearlwort	✓	-
Red fescue	✓	-
Ribwort plantain	✓	-
Rosebay willowherb	✓	-
Sheep's fescue	✓	-
Sheep's-sorrel	✓	✓
Silvery hair-grass	-	✓
Slender sandwort	✓	-
Small cudweed	✓	-
Soft brome	✓	-
Wall speedwell	✓	-
White clover	✓	-
Wild mignonette	✓	-
Yarrow	✓	-
Yorkshire-fog	✓	-
Total	38 (excluding trees and shrubs)	9

Species	Preferential	Positive Indicator
Proportion	36% (out of 108, excluding trees and shrubs, and geographically improbable species where possible)	42% (out of 19, hair-grass (<i>Aira</i>) species treated in aggregate to match source guidance)

5.2.2 Open Mosaic Habitat

Based on the botanical surveys, the OMH is considered a good example of the NERC Act Section 41 OMH habitat, and it markedly exceeds GNLP criteria for the identification of OMH of county value.

The OMH is of at least regional value for nature conservation based on the highest valued plant species present in the habitat, i.e. bearded fescue, wall bedstraw and smooth cat's-ear (see Section 5.1).

As with the acid grassland, consideration needs to be given to whether the OMH merits a higher nature conservation value. There are current criteria to allow this (JNCC, 2017c). The relevant criteria form part of national guidance for the selection of biological SSSIs for artificial and other habitats. Again, this is not to imply that the site is of SSSI quality or that it should be designated as such, this is the responsibility of Natural England alone, but it provides a framework for the further interrogation of relative nature conservation value.

The published guidance emphasises that wherever possible artificial habitats should be assessed according to guidance given under the most appropriate component semi-natural habitat. In this case, the most appropriate criteria would be those for lowland grasslands (Jefferson *et al.* 2014). This is reiterated elsewhere in the guidance where in acknowledging that artificial habitats created by industrial activity and with unusual mineral substrates (as is the case with the site) can be of considerable interest for successional development of vegetation, flora and fauna, but that most such habitats can be assessed under the lowland grassland criteria. Where this is not possible, or where other interest features need to be taken into account, then the identification of nationally important sites should follow the usual principle of representing the range of variation within each AOS (in this case the Humberhead Levels NCA). Large and diverse occurrences which can be encompassed by a single boundary merit specific consideration. In many cases, features will qualify for national value based on the interest of dependent flora, e.g. rare plants, and fauna, e.g. notable invertebrate assemblages.

Taking the above guidance into account, it is considered that the determination of any value of the site over and above regional value is best reached with regard to the acid grassland interest of the site. The OMH encompasses a large part of the total developing (early succession) acid grassland habitat resource within the site and the Humberhead Levels NCA. By extension, the remaining areas of OMH contribute to, and are functionally important for, the maintenance of the nature conservation interest and value of this acid grassland as they are intimately linked to it. They also contribute to the maintenance of the favourable nature conservation status of the identified notable plant species that are common to the acid grassland and OMH. However, an overview must be maintained of the wider extent and habitat variation inherent in the OMH present in association with the site, and its wider value for dependent flora and fauna. Therefore even without consideration of the acid grassland criteria, the site clearly aligns well with the specific guidance for OMH summarised above. The site supports a large and cohesive area of OMH (conservative estimate of 13 ha, including habitats moving towards acid grassland) that is considered notable in the context of the NCA, and that is in a stable state with no likelihood of loss through natural successional processes over the medium term.

Given the foregoing, and the nature conservation value attributed to the acid grassland in Section 5.2.1, the OMH is considered to contribute functionally and substantively to a combined grassland and OMH habitat matrix of national nature conservation value. OMH is also frequently notable for assemblages of terrestrial invertebrates, but the quality of Site for invertebrates is beyond the scope of this botanical report. See the separate standalone report for the results of the terrestrial invertebrate surveys undertaken at the site.

5.2.3 Freshwater Habitats – Boundary Drains

Both drains meet GNLP (2013) botanical criteria for the identification of freshwater habitats of county value for ecology and nature conservation. Indeed, Drain 1 is a designated LWS so the current data re-confirms a previous third-party assessment that the drain is of county value. Drain 2 is hydrologically linked to Drain 1 and therefore has a value in supporting the nature conservation interest of the LWS.

The drains are not considered to be of greater than county value at this time. The desk study undertaken for the PEA identified a large number of similarly designated drains and other watercourses in the local area (within a 2 km radius of the site boundary, including the access road), of which the section of drain associated with the site represents only a very small proportion. In addition, similar drains are widespread in the Humberhead Levels NCA. While the extent of the drain network is not automatically an indicator of comparable botanical value, it seems likely that other drains would be found that support a similar assemblage of plant species will occur more widely in the NCA beyond the boundaries of North Lincolnshire. Most of the plant species listed as grounds for LWS selection are common and widespread in freshwater habitats, and there is no specific requirement for rare or notable plant species to be present to merit selection as a LWS for freshwater habitats.

No plant species of particularly high nature conservation were recorded from the two drains, so there are no plant species present that would indicate a botanical value above the county level. The most notable plant species recorded from the drains were water-violet and whorled water-milfoil, with both assessed in Table 5.1 to be of county value only.

The drains complement but are not integral to the nature conservation value of the acid grassland and OMH associated with the site, so this is not a consideration in the valuation of the drain habitats in isolation (but see also Section 5.2.4).

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File Name: F:\ENVIRONMENT\Practice Areas\GIS\Projects\Keadby\Workspace\Keadby Ash Tip\Location of Acid Grassland.mxd



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

Legend

- Boundary of study site
- Establishing acid grassland (part of OMH)
- Mature acid grassland
- Other OMH habitat
- Transitional grassland (part of OMH)

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Purpose of Issue
FINAL

Report

Client

Project Title
KEADBY ASH TIP

Drawing Title
LOCATION OF GRASSLAND, OMH
& FRESHWATER HABITATS

Drawn DM	Checked SD	Approved SD	Date 12/09/2017
AECOM Internal Project No. 60534600		Scale @ A3 1:5,000	

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FIGURE 1

Rev

Appendix A Flora Recorded from the Site

Broad habitat type	Latin name	Acid Grassland habitats	OMH transitional towards acid grassland	OMH		Other habitats	
Within Site Location		Former settling lagoons	Quarry	Former rail sidings	Wider site: other OMH	Wider Site: rank grassland and scrub	Boundary drains
Common name	Latin name	DAFOR					
Yarrow	<i>Achillea millefolium</i>	R	R	LO		O	
Creeping bent	<i>Agrostis stolonifera</i>	R	R	LO		O	LF
Silvery hair-grass	<i>Aira caryophyllea</i>	F	F	LF			
Early hair-grass	<i>Aira praecox</i>	O	O	LO			
Hollyhock	<i>Alcea rosea</i>			LO			
Soft lady's-mantle	<i>Alchemilla mollis</i>			LO			
Water-plantain	<i>Alisma plantago-aquatica</i>				R		R
Scarlet pimpernel	<i>Anagallis arvensis subsp. arvensis</i>	R	O	O			
Wild angelica	<i>Angelica sylvestris</i>						R
Barren brome	<i>Anisantha sterilis</i>					R	
Parsley-piert	<i>Aphanes arvensis</i>	LO	LO	LO			
Columbine	<i>Aquilegia vulgaris</i>			R			

Broad habitat type	Latin name	Acid Grassland habitats	OMH transitional towards acid grassland	OMH	Other habitats
<i>Within Site Location</i>		<i>Former settling lagoons</i>	<i>Quarry</i>	<i>Former rail sidings</i>	<i>Wider site: other OMH</i> <i>Wider Site: rank grassland and scrub</i> <i>Boundary drains</i>
Greater burdock	<i>Arctium lappa</i>			R	R
Lesser Burdock	<i>Arctium minus</i>	R			
Hairy Burdock	<i>Arctium pubens</i>				LO
Slender sandwort	<i>Arenaria leptoclados</i>	F	O	O	
False oat-grass	<i>Arrhenatherum elatius</i>		LO	LO	LD
Mugwort	<i>Artemisia vulgaris</i>			R	LO
Asparagus	<i>Asparagus officinalis</i>				LO
Daisy	<i>Bellis perennis</i>	LO	O	O	O
Silver birch	<i>Betula pendula</i>				LD
Yellow-wort	<i>Blackstonia perfoliata</i>			F	R
Oil-seed rape	<i>Brassica napus subsp. oleifera</i>				R
Soft brome	<i>Bromus hordaceus subsp. hordaceus</i>	R	LO		
Wood small-reed	<i>Calamagrostis epigejos</i>	LA		LF	LA
Water-starwort species	Callitriche agg. (probably <i>obtusangulus</i>)				A

Broad habitat type	Latin name	Acid Grassland habitats	OMH transitional towards acid grassland	OMH		Other habitats	
Within Site Location		Former settling lagoons	Quarry	Former rail sidings	Wider site: other OMH	Wider Site: rank grassland and scrub	Boundary drains
Broad-leaved water-starwort	<i>Callitriche obtusangulus</i> (certain)						F
Hedge bindweed	<i>Calystegia sepium</i> subsp. <i>sepium</i>					LF	O
Wavy bittercress	<i>Cardamine flexuosa</i>					LO	
Musk thistle	<i>Carduus nutans</i>		R			R	
Glaucous sedge	<i>Carex flacca</i>		R				
Hairy sedge	<i>Carex hirta</i>	LO					
False fox-sedge	<i>Carex otrubae</i>		LO		R	LF	R
Greater pond-sedge	<i>Carex riparia</i>					LA	O
Spiked sedge	<i>Carex spicata</i>					R	
Fern-grass	<i>Catapodium rigidum</i> subsp. <i>rigidum</i>	O	O	O			
Common knapweed	<i>Centaurea nigra</i> agg.			LO		R	
Common centaury	<i>Centaurium erythraea</i>	F	F	F			
Common mouse-ear	<i>Cerastium fontanum</i> subsp. <i>vulgare</i>	O	O	O		O	
Little mouse-ear	<i>Cerastium semidecandrum</i>	F	F	F			

Broad habitat type	Latin name	Acid Grassland habitats	OMH transitional towards acid grassland	OMH	Other habitats
<i>Within Site Location</i>		<i>Former settling lagoons</i>	<i>Quarry</i>	<i>Former rail sidings</i>	<i>Wider site: other OMH</i> <i>Wider Site: rank grassland and scrub</i> <i>Boundary drains</i>
Rosebay willowherb	<i>Chamerion angustifolium</i>	O	O	O	O
Common stonewort	<i>Chara vulgaris</i>				LF
Creeping thistle	<i>Cirsium arvense</i>	O	O	O	O
Spear thistle	<i>Cirsium vulgare</i>	O	O	O	O
A cup lichen	<i>Cladonia</i> species (crustose)	R		R	
Reindeer lichen	<i>Cladonia portentosa</i>	A	A	LF	
Hemlock	<i>Conium maculatum</i>				LF
Canadian fleabane	<i>Conyza canadensis</i>	O	O	O	
Wall cotoneaster	<i>Cotoneaster horizontalis</i>			LO	
Hawthorn	<i>Crataegus monogyna</i>			LO	LA
Smooth hawk's-beard	<i>Crepis capillaris</i>	O	O	O	O
Broom	<i>Cytisus scoparius</i> subsp. <i>scoparius</i>				R
Cock's-foot	<i>Dactylis glomerata</i>	R	R	R	O
Northern x southern marsh-orchid	<i>Dactylorhiza x insignis</i>	O	O	O	O

Broad habitat type	Latin name	Acid Grassland habitats	OMH transitional towards acid grassland	OMH	Other habitats
<i>Within Site Location</i>		<i>Former settling lagoons</i>	<i>Quarry</i>	<i>Former rail sidings</i>	<i>Wider site: other OMH</i> <i>Wider Site: rank grassland and scrub</i> <i>Boundary drains</i>
Southern marsh-orchid	<i>Dactylorhiza praetermissa</i> subsp. <i>praetermissa</i>		R	R	O
Northern marsh-orchid	<i>Dactylorhiza purpurella</i>	R	R		R
Teasel	<i>Dipsacus fullonum</i>	LO	LO	O	F
Male-fern	<i>Dryopteris filix-mas</i>				LO
Viper's-bugloss	<i>Echium vulgare</i>	O	O	F	
Nuttall's waterweed	<i>Elodea nuttallii</i>				O
Common spike-rush	<i>Eleocharis palustris</i>				R
Great willowherb	<i>Epilobium hirsutum</i>				LF R
Hoary willowherb	<i>Epilobium parviflorum</i>		R	O	O
Square-stalked willowherb	<i>Epilobium tetragonum</i> subsp. <i>tetragonum</i>	O	O	O	O
Field horsetail	<i>Equisetum arvense</i>				LA
Blue fleabane	<i>Erigeron acris</i>	R	R	LO	R
Common stork's-bill	<i>Erodium cicutarium</i> subsp. <i>cuticularium</i>	O	O	O	
Common whitlow-grass	<i>Erophila verna</i>	LO	LO	LO	

Broad habitat type	Latin name	Acid Grassland habitats	OMH transitional towards acid grassland	OMH		Other habitats	
Within Site Location		Former settling lagoons	Quarry	Former rail sidings	Wider site: other OMH	Wider Site: rank grassland and scrub	Boundary drains
Hemp agrimony	<i>Eupatorium cannabinum</i>	R					
Caper spurge	<i>Euphorbia lathyris</i>					R	
Sheep's fescue	<i>Festuca ovina</i>	F	F	O			
Red fescue	<i>Festuca rubra subsp. rubra</i>	F	O	O		F	
Lesser celandine	<i>Ficaria verna</i>					LO	
Small cudweed	<i>Filago minima</i>	O	O	O			
Common cudweed	<i>Filago vulgaris</i>	F	O	F			
Meadowsweet	<i>Filipendula ulmaria</i>					LF	LF
Wild strawberry	<i>Fragaria vesca</i>			R			
Blanketflower	<i>Gaillardia x grandiflora</i>			LA			
Cleavers	<i>Galium aparine</i>					R	
Marsh bedstraw	<i>Galium palustre subsp. palustre</i>					R	
Wall bedstraw	<i>Galium parisiense</i>	O		A			
Cut-leaved crane's-bill	<i>Geranium dissectum</i>	O	O	O		O	

Broad habitat type	Latin name	Acid Grassland habitats	OMH transitional towards acid grassland	OMH	Other habitats
<i>Within Site Location</i>		<i>Former settling lagoons</i>	<i>Quarry</i>	<i>Former rail sidings</i>	<i>Wider site: other OMH</i> <i>Wider Site: rank grassland and scrub</i> <i>Boundary drains</i>
Dove's-foot crane's-bill	<i>Geranium molle</i>	O	O	O	
Small-flowered crane's-bill	<i>Geranium pusillum</i>	O	O	O	
Wood avens	<i>Geum urbanum</i>				LO
Ground-ivy	<i>Glechoma hederacea</i>	R	LF	A	O
Floating sweet-grass	<i>Glyceria fluitans</i>				R A
Reed sweet-grass	<i>Glyceria maxima</i>				LA
Bristly oxtongue	<i>Helminthotheca echinoides</i>				LO
Hogweed	<i>Heracleum sphondylium</i> subsp. <i>sphondylium</i>				LO
A hawkweed	<i>Hieracium salticola</i>				R
Umbellate hawkweed	<i>Hieracium umbellatum</i> subsp. <i>umbellatum</i>				LO
Glabrous-headed hawkweed	<i>Hieracium vagum</i>				R
Yorkshire-fog	<i>Holcus lanatus</i>	R		R	F
Water-violet	<i>Hottonia palustris</i>				LF
Hybrid bluebell	<i>Hyacinthoides x massartiana</i>			R	

Broad habitat type	Latin name	Acid Grassland habitats	OMH transitional towards acid grassland	OMH	Other habitats
<i>Within Site Location</i>		<i>Former settling lagoons</i>	<i>Quarry</i>	<i>Former rail sidings</i>	<i>Wider site: other OMH</i> <i>Wider Site: rank grassland and scrub</i> <i>Boundary drains</i>
Tutsan	<i>Hypericum androsaemum</i>			R	
Desetang's St Hohn's-wort	<i>Hypericum x desetangsii</i>			R	O
Perforate St John's-wort	<i>Hypericum perforatum</i>	LF	F	F	LO
Cat's-ear	<i>Hypochaeria radicata subsp. radicata</i>	O		O	R
Smooth cat's-ear	<i>Hypochaeris glabra</i>	F	F	F	
Ploughman's spikenard	<i>Inula conyzae</i>			R	
Yellow iris	<i>Iris pseudacorus</i>				R O
Jointed rush	<i>Juncus articulatus</i>				LF LF
Toad rush	<i>Juncus bufonius</i>				LO
Soft rush	<i>Juncus effusus</i>				LO
Hard rush	<i>Juncus inflexus</i>				LF LO LO
Blunt-flowered rush	<i>Juncus subnodulosus</i>				LF
Great lettuce	<i>Lactuca virosa</i>			R	R
White dead-nettle	<i>Lamium album</i>			R	R

Broad habitat type	Latin name	Acid Grassland habitats	OMH transitional towards acid grassland	OMH	Other habitats
<i>Within Site Location</i>		<i>Former settling lagoons</i>	<i>Quarry</i>	<i>Former rail sidings</i>	<i>Wider site: other OMH</i> <i>Wider Site: rank grassland and scrub</i> <i>Boundary drains</i>
Meadow vetchling	<i>Lathyrus pratensis</i>			R	R
Fat duckweed	<i>Lemna gibba</i>				LO
Common duckweed	<i>Lemna minor</i>				R
Ivy-leaved duckweed	<i>Lemna trisulca</i>				R
Oxeye daisy	<i>Leucanthemum vulgare subsp. vulgare</i>		R		LO
Garden privet	<i>Ligustrum ovalifolium</i>		R		
Toadflax	<i>Linaria vulgaris</i>			O	LO
Perennial rye-grass	<i>Lolium perenne</i>				LO
Common bird's-foot-trefoil	<i>Lotus corniculatus</i>			R	R
Fodder bird's-foot-trefoil	<i>Lotus corniculatus var. sativus</i>		R		
Greater bird's-foot-trefoil	<i>Lotus pedunculatus</i>				R
Heath wood-rush	<i>Luzula multiflora subsp. multiflora</i>	R		R	
Yellow loosestrife	<i>Lysimachia vulgaris</i>				R
Purple loosestrife	<i>Lythrum salicaria</i>				R O

Broad habitat type	Latin name	Acid Grassland habitats	OMH transitional towards acid grassland	OMH	Other habitats
<i>Within Site Location</i>		<i>Former settling lagoons</i>	<i>Quarry</i>	<i>Former rail sidings</i>	<i>Wider site: other OMH</i> <i>Wider Site: rank grassland and scrub</i> <i>Boundary drains</i>
Orchard apple	<i>Malus pumila</i>				R
Black medick	<i>Medicago lupulina</i>	O	O	O	
Water mint	<i>Mentha aquatica</i>				R
Corn mint	<i>Mentha arvensis</i>				R
Field forget-me-not	<i>Myosotis arvensis</i>	F	F	F	
Early forget-me-not	<i>Myosotis ramosissima</i> subsp. <i>ramosissima</i>	F	F	F	
Whorled water-milfoil	<i>Myriophyllum verticillatum</i>				LO
a hybrid daffodil cultivar	<i>Narcissus x boutigyanus</i>				R
Spanish daffodil cultivar	<i>Narcissus hispanicus</i>				R
a hybrid daffodil cultivar	<i>Narcissus x incomparabilis</i>			R	R
Wild daffodil cultivar	<i>Narcissus pseudonarcissus</i>				R
Watercress species	<i>Nasturtium officinale</i> agg.				R
Twayblade	<i>Neottia ovata</i>		LO	R	
Red bartsia	<i>Odontites vernus</i> subsp. <i>serotinus</i>				LO

Broad habitat type	Latin name	Acid Grassland habitats	OMH transitional towards acid grassland	OMH	Other habitats
<i>Within Site Location</i>		<i>Former settling lagoons</i>	<i>Quarry</i>	<i>Former rail sidings</i>	<i>Wider site: other OMH</i> <i>Wider Site: rank grassland and scrub</i> <i>Boundary drains</i>
Bee orchid	<i>Ophrys apifera</i>	R		R	
Garden peony	<i>Paeonia officinalis</i>			R	
Opium poppy	<i>Papaver somniferum</i> subsp. <i>somniferum</i>			R	LO
Dog lichen	<i>Peltigera canina</i>	A	F	O	
Green alkanet	<i>Pentaglottis sempervirens</i>				LF
Amphibious bistort	<i>Persicaria amphibia</i>			LO	R LO
Reed canary-grass	<i>Phalaris arundinacea</i>				LO A
Smaller cat's-tail	<i>Phleum bertolonii</i>	R			
Common reed	<i>Phragmites australis</i>	LO			LF LA
Common mouse-ear-hawkweed	<i>Pilosella officinalis</i> subsp. <i>officinalis</i>	LF	LF	LF	
Ribwort plantain	<i>Plantago lanceolata</i>			LO	LO
Greater plantain	<i>Plantago major</i> subsp. <i>major</i>	R	R	R	
Annual meadow-grass	<i>Poa annua</i>			LO	
Smooth meadow-grass	<i>Poa pratensis</i>	O	O	LO	O

Broad habitat type	Latin name	Acid Grassland habitats	OMH transitional towards acid grassland	OMH	Other habitats
<i>Within Site Location</i>		<i>Former settling lagoons</i>	<i>Quarry</i>	<i>Former rail sidings</i>	<i>Wider site: other OMH</i> <i>Wider Site: rank grassland and scrub</i> <i>Boundary drains</i>
Rough meadow-grass	<i>Poa trivialis</i>		LO	LO	F
Juniper haircap	<i>Polytrichum juniperinum</i>	LO			
Grey poplar	<i>Populus x canescens</i>				LA
Curled pondweed	<i>Potamogeton crispus</i>				F
Broad-leaved pondweed	<i>Potamogeton natans</i>				O
Fennel pondweed	<i>Potamogeton pectinatus</i>				LO
Silverweed	<i>Potentilla anserina</i>		LO	LF	LF
Creeping cinquefoil	<i>Potentilla reptans</i>	A	LA	A	F
Cowslip	<i>Primula veris</i>	R		R	R
Selfheal	<i>Prunella vulgaris</i>	F	F	F	F
Wild cherry	<i>Prunus avium</i>				R
Lungwort	<i>Pulmonaria officinalis</i>			R	
Water-crowfoot species (terrestrial form)	<i>Ranunculus aquatilis</i> agg.				R
Bulbous buttercup	<i>Ranunculus bulbosus</i>				R

Broad habitat type	Latin name	Acid Grassland habitats	OMH transitional towards acid grassland	OMH	Other habitats
<i>Within Site Location</i>		<i>Former settling lagoons</i>	<i>Quarry</i>	<i>Former rail sidings</i>	<i>Wider site: other OMH</i> <i>Wider Site: rank grassland and scrub</i> <i>Boundary drains</i>
Lesser spearwort	<i>Ranunculus flammula subsp. flammula</i>		R		
Creeping buttercup	<i>Ranunculus repens</i>	R	LO	LO	O
Celery-leaved buttercup	<i>Ranunculus sceleratus</i>		R		R
Wild mignonette	<i>Reseda lutea</i>	R		R	R
Weld	<i>Reseda luteola</i>			R	R
Gooseberry	<i>Ribes uva-crispa</i>			R	
Dog-rose species	<i>Rosa canina</i> agg. (undetermined forms)			O	O
Dog-rose form	<i>Rosa canina</i> group <i>Lutetiana</i>				O
Dog-rose form	<i>Rosa canina</i> group <i>Transitoriae</i>			LO	LF
Red-leaved rose	<i>Rosa glauca</i>			R	LO
Glandular dog-rose	<i>Rosa squarrosa</i>			R	
Japanese rose	<i>Rosa rugosa</i>			R	
Hybrid dog-rose	<i>Rosa x dumalis</i>			LO	LF
Himalayan giant bramble	<i>Rubus armeniacus</i>				R

Broad habitat type	Latin name	Acid Grassland habitats	OMH transitional towards acid grassland	OMH	Other habitats
<i>Within Site Location</i>		<i>Former settling lagoons</i>	<i>Quarry</i>	<i>Former rail sidings</i>	<i>Wider site: other OMH</i> <i>Wider Site: rank grassland and scrub</i> <i>Boundary drains</i>
Dewberry	<i>Rubus caesius</i>		R		R
Bramble species	<i>Rubus fruticosus</i> agg.	R	LO	LO	LA
Sheep's-sorrel	<i>Rumex acetosella</i>	R		R	
Clustered dock	<i>Rumex conglomeratus</i>				O
Water dock	<i>Rumex hydrolapathum</i>				R
Broad-leaved dock	<i>Rumex obtusifolius</i>				LO
Wood dock	<i>Rumex sanguinea</i>				R
Procumbent pearlwort	<i>Sagina procumbens</i>	R			
Goat willow	<i>Salix caprea</i> subsp. <i>caprea</i>				R
Grey willow	<i>Salix cinerea</i> subsp. <i>oleifera</i>			R	LF
Osier	<i>Salix viminalis</i>				R
Sharp-stipuled willow	<i>Salix x mollissima</i> nothovar. <i>undulata</i>			LO	
Elder	<i>Sambucus nigra</i>				LF
Brookweed	<i>Samolus valerandii</i>		LO		LO

Broad habitat type	Latin name	Acid Grassland habitats	OMH transitional towards acid grassland	OMH	Other habitats
<i>Within Site Location</i>		<i>Former settling lagoons</i>	<i>Quarry</i>	<i>Former rail sidings</i>	<i>Wider site: other OMH</i> <i>Wider Site: rank grassland and scrub</i> <i>Boundary drains</i>
Tall fescue	<i>Schedonorus arundinaceus</i>			R	LD
Water figwort	<i>Scrophularia auriculata</i>			LF	
Common figwort	<i>Scrophularia nodosa</i>			R	
Biting stonewort	<i>Sedum acre</i>	F	F	F	
Common ragwort	<i>Senecio jacobaea</i>	O	O	O	O
Groundsel	<i>Senecio vulgaris subsp. vulgaris</i>		LO	LO	
Field madder	<i>Sherardia arvensis</i>		R	LO	
Red campion	<i>Silene dioica</i>				R
White campion	<i>Silene latifolia</i>	R	R	R	R
Hybrid campion	<i>Silene x hampeana</i>	R			
Tall rocket	<i>Sisymbrium altissimum</i>		LO		
Green nightshade	<i>Solanum nitidibaccatum</i>		LO		
Rowan	<i>Sorbus aucuparia</i>				R
Branched bur-reed	<i>Sparganium erectum</i>				O

Broad habitat type	Latin name	Acid Grassland habitats	OMH transitional towards acid grassland	OMH	Other habitats
<i>Within Site Location</i>		<i>Former settling lagoons</i>	<i>Quarry</i>	<i>Former rail sidings</i>	<i>Wider site: other OMH</i> <i>Wider Site: rank grassland and scrub</i> <i>Boundary drains</i>
Common chickweed	<i>Stellaria media</i>				R
Lesser chickweed	<i>Stellaria pallida</i>	LO		LO	
Snowberry	<i>Symphoricarpos albus</i>			R	
Dandelion species	<i>Taraxacum agg.</i>		R	R	O
Dandelion species segregate	<i>Taraxacum Section Erythrosperma</i>	O	O	O	
Upright hedge-parsley	<i>Torilis japonica</i>			R	R
Goat's-beard	<i>Tragopogon pratensis subsp. minor</i>				R
Hare's-foot clover	<i>Trifolium arvense</i>			R	R
Hop trefoil	<i>Trifolium campestre</i>				R
Lesser trefoil	<i>Trifolium dubium</i>	F	F	F	O
White clover	<i>Trifolium repens</i>	R	LO	LO	O
Scentless mayweed	<i>Tripleurospermum inodorum</i>				R
Colt's-foot	<i>Tussilago farfara</i>		LO	LO	LO
Bulrush	<i>Typha latifolia</i>				LF LO

Broad habitat type	Latin name	Acid Grassland habitats	OMH transitional towards acid grassland	OMH	Other habitats
<i>Within Site Location</i>		<i>Former settling lagoons</i>	<i>Quarry</i>	<i>Former rail sidings</i>	<i>Wider site: other OMH</i> <i>Wider Site: rank grassland and scrub</i> <i>Boundary drains</i>
Common nettle	<i>Urtica dioica</i> subsp. <i>dioica</i>				LF
Common cornsalad	<i>Valerianella locusta</i>	LO			
Orange mullein	<i>Verbascum phlomoides</i>				R
Great mullein	<i>Verbascum thapsus</i>	LO		LO	LO
Wall speedwell	<i>Veronica arvensis</i>	F	F	F	
Pink-flowered speedwell	<i>Veronica catenata</i>		R		LF
Germander speedwell	<i>Veronica chamaedrys</i>	R		R	O
Common field-speedwell	<i>Veronica persica</i>		R		
Thyme-leaved speedwell	<i>Veronica serpyllifolia</i> subsp. <i>serpyllifolia</i>	O	O	O	
Tufted vetch	<i>Vicia cracca</i>				R
Common vetch subspecies	<i>Vicia sativa</i> subsp. <i>nigra</i>	LO	LO	LO	
Common vetch subspecies	<i>Vicia sativa</i> subsp. <i>segetalis</i>				R
Smooth tare	<i>Vicia tetrasperma</i>		LO	R	
Field pansy	<i>Viola arvensis</i>		LO	LO	

Broad habitat type	Latin name	Acid Grassland habitats	OMH transitional towards acid grassland	OMH		Other habitats	
Within Site Location		Former settling lagoons	Quarry	Former rail sidings	Wider site: other OMH	Wider Site: rank grassland and scrub	Boundary drains
Sweet violet	<i>Viola odorata</i>					LO	
Common dog-violet	<i>Viola riviniana</i> subsp. <i>minor</i>		R	LO			
Wild pansy	<i>Viola tricolor</i> subsp. <i>tricolor</i>	LO					
Squirrel-tail fescue	<i>Vulpia bromoides</i>	A	A	A			
Bearded fescue	<i>Vulpia ciliata</i> subsp. <i>ambigua</i>	A	A	LA			

Appendix B NVC Survey Data

Project Name	Keadby	Date	09/06/17	Recorders	DB & CW	Land parcel	Acid grassland – settling lagoons	Photo ref.		Sheet no.	1 of 2		
Broad vegetation type	Swamp Mire Heath Maritime	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Grassland Tall-herb fen Open habitat	Y <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Substrate	Acid Calcareous Neutral Not known	Y <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Condition	Improved Semi-improved Unimproved Not relevant	<input type="checkbox"/> <input type="checkbox"/> Y <input type="checkbox"/>			
Hydrology	Wet Dry	<input type="checkbox"/> Y	Transitional	<input type="checkbox"/>	Age/ origin	Sown/recent origin Semi-natural	<input type="checkbox"/> Y	Aspect	All	Slope	Flat	Water Depth	N/A
Layers Mean Height		m	0.2	m	5	cm	10	mm	Habitat Area		m x		m
Layers Cover		%	10	%	40	%	50	%	Quadrat/sample size	2	m x	2	m

Quadrat	1		2		3		4		5		Frequency (I-V)
Quadrat Grid Reference	SE82051165		SE82001173		SE81711179		SE81481174		SE81221168		
Species List	%	Domin	%	Domin	%	Domin	%	Domin	%	Domin	
Hypericum perforatum	8								3		II
Potentilla reptans	20		5		2						III
Dipsacus fullonum	1										I
Cirsium vulgare	2		3				3				III
Silene latifolia	1										I
Myosotis arvensis	3		2								II
Taraxacum agg.	1		1		2				1		IV
Festuca rubra	32		2		2		25				IV
Trifolium repens	1										I
Rubus fruticosus agg.	2										I
Prunella vulgaris	3		5		2		3				IV
Poa pratensis	5		2		2		3				IV
Glechoma hederacea	2										I
Epilobium tetragonum	2		2						3		III
Shrub seedlings	2				2						II
Geranium dissectum	2										I
Galium parisiense	2										I
Chamerion angustifolium	2				3		1		4		IV
Catapodium rigidum	1		2								II
Crepis capillaris	2		2		2		3				IV
Ranunculus repens	2										I
Medicago lupulina	3		3								II
Cirsium arvense	1		2		3				3		IV
Vulpia ciliata ambigua			3		2						II
Bellis perennis			2								I
Cerastium fontanum			2		2		2		1		IV
Festuca ovina			10		3		10		3		IV
Achillea millefolium			2								I
Erodium cicutarium			2						1		II
Arenaria serpyllifolia			2		3		2		2		IV
Senecio jacobaea			2		2		2		2		IV
Plantago major			1				1				II
Peltigera canina			2				3				II
Cerastium semidecandrum			2		2		2		2		IV
Centaureum erythraea			2		2		2		2		IV
Veronica arvensis			2		1		1		2		IV
Trifolium dubium			3								I
Pilosella officinarum			3								I
Sedum acre			3		2		2		2		IV
Aira caryophyllea			2		2		2				III

Further information required, see back of sheet

Domin scale	1: few individuals, 2: several individuals, 3: many individuals, 4: 10-10%, 5: 11-25%, 6: 26-33%, 7: 34-50%, 8: 51-75%, 9: 76-90%, 10: 91-100%
-------------	--

Species List	1		2		3		4		5		Frequency (I-V)
	%	Domin	%	Domin	%	Domin	%	Domin	%	Domin	
Vulpia bromoides			2								I
Myosotis ramosissima			1				1		1		III
Aphanes arvensis			1		2		2		1		IV
Geranium pusillum			1		1		1				III
Filago vulgaris			1								I
Geranium molle			2								I
Veronica serpyllifolia			1				2				II
Dactylis glomerata			2						3		II
Conyza Canadensis			1		2		2		1		IV
Agrostis stolonifera			3								I
Holcus lanatus			2								I
Cladonia portentosa					43		15		60		III
Dactylorhiza purpurella					2						I
Filago minima					1		1				II
Aira praecox					2		2		2		III
Hypochaeris glabra					2		2		2		III
Carex hirta							5				I
Sagina procumbens							1				I
Vicia sativa nigra									2		I
Rumex acetosella									1		1
Bryophytes			4		2						II
Bare rock											
Bare soil			2		2		2				III
Leaf litter/ thatch											
Permanent open water											

Descriptive notes: negative indicators species (weeds), shrub/tree cover, management regime, other impacts, limitations

Other flora in wider habitat area- accurate typing of vegetation may require information on other flora present but missed by the quadrats

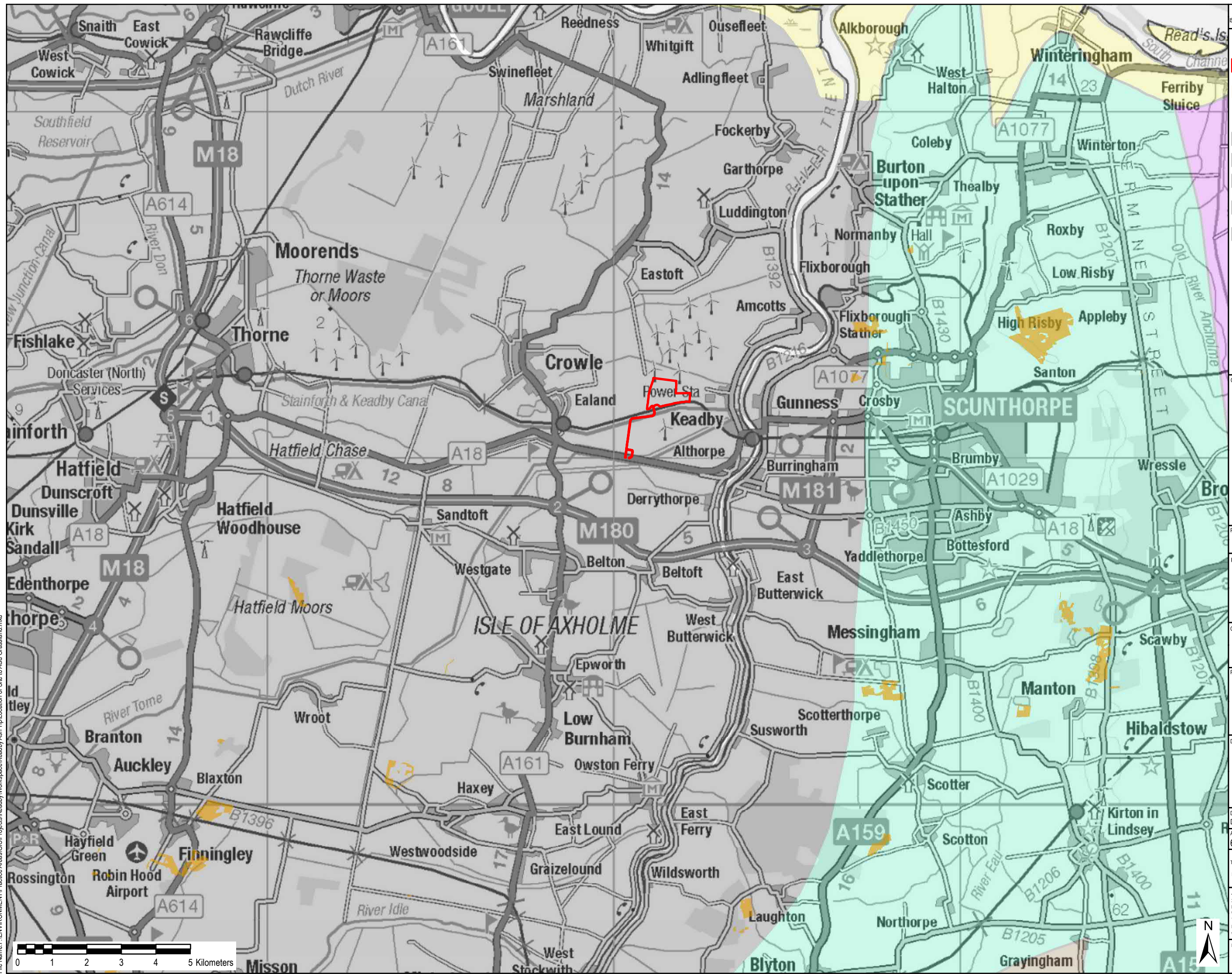
Luzula multiflora multiflora, Polytrichum juniperum, Veronica chamaedrys. See wider species list for acid grassland also.

Domin scale 1: few individuals, 2: several individuals, 3: many individuals, 4: 4-10%, 5: 11-25%, 6: 26-33%, 7: 34-50%, 8: 51-75%, 9: 76-90%, 10: 91-100%

Frequency Number of quadrats which the species occurs in, use Roman numerals I to V.

Appendix C Distribution of Acid Grassland Priority Habitats in the Wider Landscape around the Site

File Name: F:\ENVIRONMENT\Practice Areas\GIS\Projects\Keadby\Workspace\Keadby Ash Tip\Location of Site to Acid Grassland.mxd



THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

Legend

- Boundary of study site
- Priority Habitat Inventory: Lowland Dry Acid Grassland
- National Character Areas:
 - Central Lincolnshire Vale
 - Humber Estuary
 - Humberhead Levels
 - Northern Lincolnshire Edge with Coversands
 - Trent and Belvoir Vales

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Purpose of Issue
FINAL

Report

Client


Project Title
KEADBY ASH TIP

Drawing Title
LOCATION OF SITE RELATIVE TO OTHER ACID GRASSLANDS

Drawn DM	Checked SD	Approved SD	Date 12/09/2017
AECOM Internal Project No. 60534600		Scale @ A3 1:100,000	

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ANNEX 11F – REPTILE SURVEY REPORT

Keadby Ash Tip

Reptile Survey Report

Keadby Generation Ltd

Project Number: 60538500

12 June 2017

Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
0	September 2017	First issue			

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Summary

This report provides the results of the reptile survey undertaken in 2017 at Keadby Ash Tip (the site), as part of a wider suite of surveys commissioned to determine the baseline ecological value of the site. The purpose of the reptile surveys and this report is to:

- provide data on the presence/ absence of reptiles, and where present characterise the level of reptile activity present in association with the site; and
- provide the above data in a manner that allows the results to be used to support an assessment of relative nature conservation value of the site for reptiles, including review against relevant criteria (see Section 2.5 of this report).

Only a single juvenile grass snake was recorded over the course of the survey. Based on available evidence the site is subject to a low level of transitory use by grass snake, but the site does not support an established site-faithful population. This is consistent with the findings of a previous survey by AECOM in 2010 (see Desk Study).

Based on the level of reptile activity recorded, the site supports a grass snake population of no more than local nature conservation value.

1. Introduction

1.1 Background and Purpose

This report provides the results of the reptile surveys undertaken in 2017 at Keadby Ash Tip (the site), North Lincolnshire (centred on central grid reference SE 814 118). The reptile survey was one of a series of surveys commissioned to determine the baseline ecological value of the site following an initial Phase 1 Habitat survey and scoping of the ecological constraints and opportunities associated with the site by AECOM in March 2017. The findings of the habitat and scoping survey were compiled as a Preliminary Ecological Appraisal (PEA) report and included recommendations for further survey.

The boundary of the site is shown on Figure 1. It should be noted that the site coincides with two discrete areas of land and that the ecological risks associated with these are not comparable, namely:

- an existing access route via a surfaced road off the A18 road which requires no refurbishment or alteration. The road passes between fields of intensively managed arable farmland; and
- the ash tip to the north of the Stainforth and Keadby Canal. The ash tip is approximately 67 ha in area.

It is the ash tip where there is greatest potential for ecological constraints to be encountered, and therefore this land was the primary focus for the ecological surveys. The reptile surveys were restricted to the ash tip.

The methods employed when undertaking the reptile survey are detailed in this report, along with the results of these surveys. A nature conservation assessment is provided to allow the reptile interest of the site to be valued and placed in its appropriate geographic context.

1.2 Summary Habitat Conditions

The preceding PEA provides details of the habitats present in association with the site, including a supporting Phase 1 habitat map (included as Appendix A to this report), photographs and target notes.

The following habitats are extensive within the ash tip were considered to have potential to support populations of reptiles:

- Semi-improved neutral and acid grassland;
- Scattered scrub, juxtaposed with the above grasslands; and
- Ephemeral/ short perennial vegetation.

2. Methods

2.1 Survey Objectives

The purpose of the surveys completed and the associated assessment made in this report is to:

- collect data on the presence/ absence of reptiles within the site, and where present characterise the level of reptile activity present; and
- collect the above data in a manner that allows the results to be used to support an assessment of relative nature conservation value, including review against relevant criteria (see Section 2.5 of this report).

2.2 Study Area

The reptile survey encompassed the ash tip but was targeted towards optimal 'hotspots' of habitat as explained in Section 2.4, and as shown on Figure 1.

2.3 Desk Study

A desk study was undertaken as part of the PEA that was completed in advance of the reptile survey and informed the scoping of requirements for further survey.

Desk study results of relevance to the assessment have been carried forward into this report, and where appropriate this data is presented in more detail or re-interrogated for the needs of the current assessment.

2.4 Field Survey Approach

A presence/ absence survey for reptiles was undertaken following best practice as detailed in Froglife (1999) with reference to Gent & Gibson (1998) and English Nature (2004), comprising a combination of Artificial Refuge Survey (ARS) and Visual Encounter Surveys (VES).

Given the large size and the extensive suitable habitats present, it was appropriate to employ an ARS approach that applied appropriate survey effort but that also maximised the potential to detect reptiles, where present. As such, artificial refuges were deployed based on identification of likely 'hotspots' for reptile activity, rather than randomly across the site. Hotspots were selected based on identification of optimal micro-habitat conditions (sunny banks and other optimal conditions for basking, transitions in vegetation structure, avoidance of areas with dense vegetation), and consideration of juxtapositions between potential hibernation/ refuge habitat and optimal foraging habitat. Areas that were disturbed or that only supported very early successional habitats were avoided as these were considered not to provide sufficient cover for reptiles. Areas with very rank grassland were also avoided on the basis that it would be difficult to re-find refuges once deployed and to observe reptiles as the growing season progressed; and also because the dense vegetation and associated thatch did not represent optimal habitat structure for reptiles.

A total of 238 artificial reptile refuges (pre-cut roofing felt tiles approximately 0.5 m²) were placed in suitable reptile habitat based on the above principles. The number of refuges required was calculated based on general guidance of 5 to 10 refuges per hectare of suitable habitat (Froglife, 1999). The number of refuges deployed was towards the upper end of this threshold and was sufficient to target areas of optimal habitat structure (avoiding bare ground and other early successional areas with limited cover for reptiles). The refuges (as located on Figure 1) were placed on the 13th April 2017, and were left to bed in for over two weeks before the survey commenced.

In accordance with standard methods, the reptile surveys were carried out during the mornings when air temperatures were between 9 and 18°C, to coincide with times of day and conditions when reptiles are most likely to be active and detectable. Surveys stopped, even if started during suitable conditions, if temperatures rose above 18°C. Surveys were scheduled for dates when suitable weather conditions were expected (e.g. unrestricted visibility, winds of Beaufort 5 or less, and avoiding heavy or continuous rain).

The survey details and associated environmental conditions over the course of the eight surveys are detailed in Table 2.1. Eight survey visits were made to the site to undertake ARS and VES, ensuring that all refuges were surveyed a minimum of seven times under appropriate weather conditions (this was achieved despite certain survey visits being halted early due to hot weather, as detailed in Table 4.1). Incidental opportunities to record

reptiles were also provided when the reptile refuges were removed from site on 31st August 2017, and when undertaking the botanical and ornithological surveys on the site.

The ARS involved the survey checking each of the refuges installed on site for the presence of reptiles. The VES involved surveyors slowly walking transects routes (defined by the configuration of refuges and routes between these) and scanning vegetation for reptiles.

Table 2.1: Reptile Survey Dates and Weather Conditions

Visit number	Date	Time	Air Temperature (°C)	Cloud cover %	Wind speed (Beaufort)	Ground conditions
1	03/05/17	09:45-11:45	13-17	5-100	4-5	Dry
2	22/05/17	09:00-11:45	12-13	90-100	3	Damp
3	26/05/17	08:00-09:30*	16-19	0	3	Damp
4	09/06/17	07:30-10:30	14-17	40-30	2-3	Wet
5	15/06/17	07:30-09:15*	17-18	40-60	2-2	Dry
6	20/06/17	07:30-09:30	16-16	100	2-2	Dry
7	23/06/17	07:30-11:00*	14-17	100	3	Damp
8	03/07/17	08:00-10:30	15-18	100-90	2-3	Damp

* Survey stopped before all refuges could be checked due to high temperatures. The Beaufort scale of wind speed is: 0 No wind, 1 Light air *smoke drifts*, 2 Light Breeze *leaves rustle*, 3 Gentle Breeze *small twigs move*, 4 Mod Breeze *small branches move*, 5 Fresh Breeze *small trees sway*, 6 Strong breeze *large branches move*, 7 Mod Gale *whole trees in motion*. Ground conditions are categorised based on: Dry, Damp (no standing water) or Wet (standing water present)

2.5 Nature Conservation Evaluation Approach

The method of evaluation that has been utilised has been developed with reference to the Chartered Institute of Ecology and Environmental (CIEEM) *Guidelines for Ecological Impact Assessment in the UK and Ireland – Terrestrial, Freshwater and Coastal – Second Edition* (CIEEM, 2016). These give advice on scoping and carrying out environmental assessments and place appraisal in the context of relevant policies. Data received through consultation, desk-based studies and field-based surveys are used to allow ecological features of nature conservation value or potential value to be identified, and the main factors contributing to their value described and related to available guidance. These data can also be used to identify other relevant values e.g. socio-economic or ecosystem services values, but this is beyond the remit of this report and requires the involvement of other relevant specialists.

The relative value assigned to reptile populations should always be determined on a case by case basis to demonstrate a robust assessment process. The value of a faunal species may relate, for example, to its geographic location (species may be rare and more valued towards the edge of their geographic range), the extent to which the species is threatened throughout its range, or to its rate of decline. The value of the reptile population associated with the site, where present, has been defined with reference to the geographical level at which it is considered to matter (Table 2.2). Relevant published national and local guidance and criteria can be used, where available, to inform the assessment of nature conservation value and to assist consistency in evaluation. Guidance and criteria of potential relevance to the reptiles are summarised in Table 2.2. The identified guidance and criteria are not definitive and other criteria have been applied as relevant and appropriate to reach a decision on relative nature conservation value.

Table 2.2. Geographic Scale Used to Qualify Relative Nature Conservation Value of Features

Geographic scale of value	Definition	Example supporting guidance and assessment criteria
International	Europe	Guidelines for the selection of Special Areas of Conservation (SACs) (McLeod <i>et al.</i> 2005)
National	Great Britain/ England	Guidelines for the selection of biological Sites of Special Scientific Interest (SSSIs) (Bainbridge <i>et al.</i> 2013; JNCC, 2017)
Regional	East Midlands	No specific guidance available, professional judgement is to

Geographic scale of value	Definition	Example supporting guidance and assessment criteria
		be used. It will encompass features clearly of greater than county value but not of sufficient merit to demonstrate national value.
County	Lincolnshire	No specific guidance available, professional judgement is to be used.
District	North Lincolnshire	No specific guidance available, professional judgement is to be used.
Local	Below district value	No specific guidance available, professional judgement is to be used.

2.6 Limitations

There are no limitations to the survey work undertaken. The survey followed appropriate methods and was undertaken in appropriate favourable weather conditions, and in the appropriate survey season. The survey was targeted towards optimal 'hotspots' of habitat where reptiles were most likely to be detected if present. A large number of refuges was deployed such that it would be reasonable to expect that reptiles would have been detected if a site faithful population was present.

3. Legislation, Planning Policy and Related Guidance

The following wildlife legislation, planning policy and guidance is potentially relevant to the identification and assessment of potential constraints posed by the presence of reptiles (Table 3.1). At this stage of assessment, this legislation, policy and guidance is primarily listed to demonstrate that an appropriate level of survey and assessment has been undertaken to meet likely data requirements for future decision-making with regard to these material considerations.

Table 3.1: Summary of Relevant Legislation, Policy and Guidance

Document	Requirements/ Purpose
Wildlife and Countryside Act 1981 (as amended) (WCA)	Part 1 of the Act affords specific protection to fauna, including reptiles, listed on Schedule 5. In certain circumstances, licences can be granted to permit some actions prohibited under the Act.
Natural Environment and Rural Communities (NERC) Act 2006	Section 41 (s41) includes a list of habitats and species of principal importance for nature conservation in England which is to be used by decision-makers to guide the implementation of their duties under section 40 of the Act. All native species of reptile are included on s41. Decision-makers are required to have regard to the conservation of biodiversity in England when carrying out their normal functions.
National Planning Policy Framework (NPPF)	<p>Section 11 relates specifically to “Conserving and Enhancing the Natural Environment”. Paragraph 109 states that “<i>The planning system should contribute and enhance the natural and local environment by:</i></p> <ul style="list-style-type: none"> • <i>Protecting and enhancing valued landscapes, geological conservation interests and soils;</i> • <i>Recognising the wider benefits of ecosystem services; and</i> • <i>Minimising impacts on biodiversity and providing net gains in biodiversity where possible, ... including by establishing coherent ecological networks that are more resilient to current and future pressures; ...</i>” <p>Paragraph 113 adds to this and states: “<i>When determining planning applications, local planning authorities should aim to conserve and enhance biodiversity by applying the following principles:</i></p> <ul style="list-style-type: none"> • <i>if significant harm resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused; ...</i> • <i>planning permission should be refused for development resulting in the loss or deterioration of irreplaceable habitats, including ancient woodland and the loss of aged or veteran trees found outside ancient woodland, unless the need for, and benefits of, the development in that location clearly outweigh the loss; ...</i>”
Core Strategy	<p>Policy CS17 promotes effective stewardship of biodiversity resources by protecting national and international nature conservation designations, paying due regard to the presence of European and nationally protected species, protecting and maintaining features of biodiversity and geological interest, maintaining wildlife networks and green corridors, and ensuring ecological enhancement through good design.</p> <p>Policy CS21 states planning applications for mineral extraction should, where appropriate, contribute to the attainment of local biodiversity targets. [e.g. as detailed in the LBAP and NCA profile]</p>
Local Plan	Policy LC5 prohibits development that would have an adverse impact on protected species, except where appropriate mitigation can be delivered.
Standing Advice	The purpose of standing advice is to guide decision-makers on the determination of proposals with potential to affect protected species. The guidance sets out responsibilities and minimum requirements for survey and mitigation, including requirements for reptiles.
NCA Profile 39	NCA profiles are guidance documents intended to help local decision-making. The information they contain supports the planning of conservation initiatives at a landscape scale, informs the delivery of Nature Improvement Areas and encourages broader partnership working through Local Nature Partnerships. Each profile includes a description of the relevant natural (habitat and species) features.

4. Results

4.1 Desk Study Results

The site lies well outside the known range of the sand lizard (*Lacerta agilis*) and smooth snake (*Coronella austriaca*). These European protected species of reptile are therefore given no further consideration in this report.

Lincolnshire Environmental Records Centre returned recent (post-2010) records for grass snake (*Natrix natrix*) in proximity to the site. This included records from Keadby Wind Farm, immediately north of the site. There are no records of any other reptile species in proximity to the site.

AECOM previously undertook a limited reptile survey at the site in June and July 2010. Survey effort was focussed in the extreme southwest corner of the site to coincide with the working area required for construction requirements of Pilfrey Bridge. Seventy-four artificial reptile refuges were deployed and a seven visit presence/absence survey was completed (as per the methods given in Section 2.4 of this report). No reptiles were found during the survey.

4.2 Field Survey Results

Only a single juvenile grass snake was recorded over the course of the eight survey visits. It was recorded on the 15th June (Visit 5) under a mat adjacent near the western boundary of the site (SE 81068 11783).

No other reptile species were recorded.

5. Nature Conservation Evaluation

Only a single juvenile grass snake was recorded over the course of the survey. Based on available evidence the site is subject to a low level of transitory use by grass snake, but the site does not support an established site-faithful population. The desk study identifies that grass snakes occur in the vicinity of watercourses in the wider landscape, and they are likely to use the drains located on the site boundary also. On this basis they can be expected to make some use of habitats within the site, particularly on the site boundaries, but the main body of the site does not appear to support a regularly occurring or notable reptile population. This is consistent with the findings of a previous survey by AECOM in 2010 (see Desk Study).

Based on the level of reptile activity recorded, the site supports a grass snake population of no more than local nature conservation value.

6. References

Bainbridge, I., Brown, A., Burnett, N., Corbett, P., Cork, C., Ferris, R., Howe, M., Maddock, A., Mountford, E. & Pritchard, S. (2013) *Guidelines for the Selection of Biological SSSIs. Part 1: Rationale, Operational Approach and Criteria for Site Selection*. JNCC, Peterborough

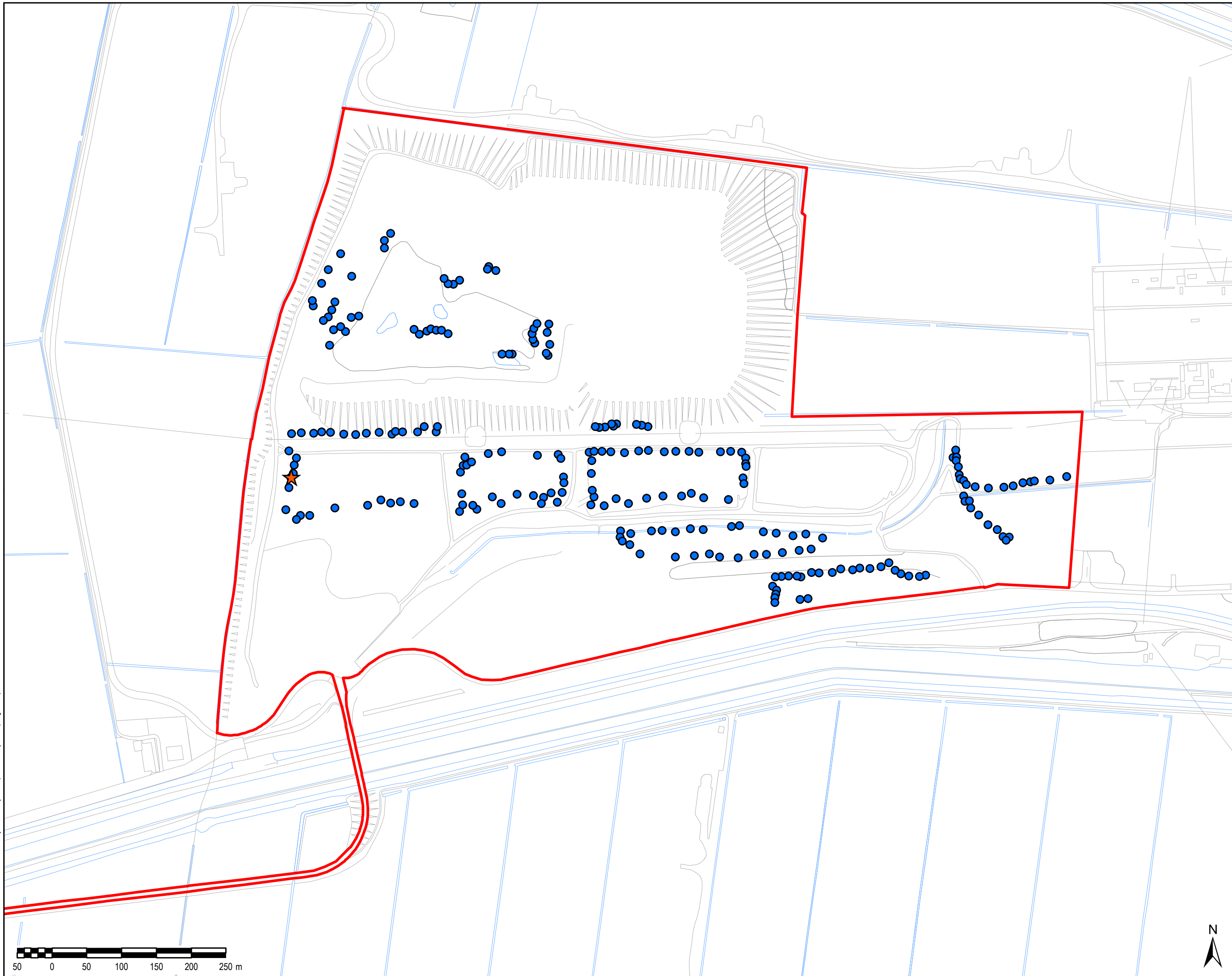
English Nature (2004) *Reptiles: guidelines for developers*. English Nature (now Natural England), Peterborough

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JNCC (2017) *Guidelines for the Selection of Biological SSSIs. Part 2: Detailed Guidelines for Habitats and Species Groups. Chapter 15 Reptiles and Amphibians*. JNCC, Peterborough

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Legend

- Boundary of study site
- Refuge location
- ★ Grass Snake

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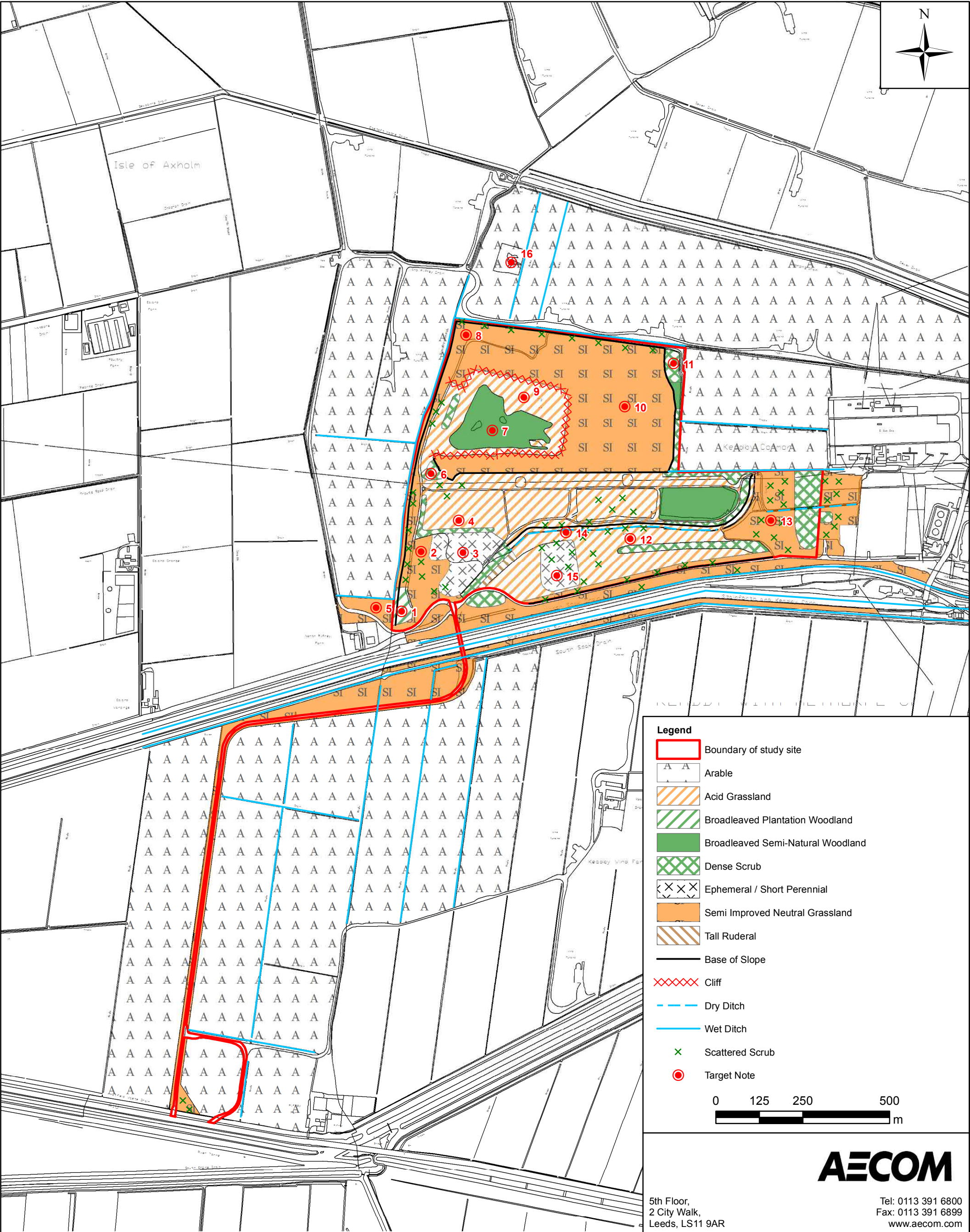
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FIGURE 1	

Appendix A Phase 1 Habitat Map

The following map is an extract from the Preliminary Ecological Appraisal Report



Client:	
Project:	KEADBY ASH TIP

Title:	PHASE 1 HABITAT SURVEY
--------	------------------------

Drawn:	DM	Checked:	DM
Verified:	DB	Approved:	DB
Date:	06/04/2017	Scale at A3:	1:10,000
Drawing Number:	FIGURE 1		A3

ANNEX 11G – TERRESTRIAL INVERTEBRATE SURVEY REPORT

ANNEX 11H – BREEDING BIRD SURVEY REPORT

Keadby Ash Tip

Breeding Bird Survey Report

Keadby Generation Ltd

Project Number: 60538500

28 July 2017

Quality information

Prepared by

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
0	September 2017	First issue			

Distribution List

# Hard Copies	PDF Required	Association / Company Name

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Summary

This report provides the results of the breeding bird surveys undertaken in 2017 at Keadby Ash Tip (the site), as part of a wider suite of surveys commissioned to determine the baseline ecological value of the site. The purpose of the breeding bird surveys and this report is to:

- provide data on the bird species present in association with the site during the breeding season, along with clarification (where feasible) of whether or not they use the site for breeding; and
- provide the above data in a manner that allows the results to be used to support an assessment of relative nature conservation value of the site for birds, including review against relevant criteria (see Section 2.5 of this report).

A moderately diverse bird assemblage of 50 species was recorded from the site, of which 39 were considered to be breeding. Most of the species present were as would be expected for a lowland site with scrub and grassland habitats. The distribution of most bird species strongly correlated with the distribution of woodland and scrub habitats within the site.

Eleven bird species of high conservation concern ('Red list') were considered to breed in association with the site, and all are present in relatively small numbers. With the exception of one bird species, the individual populations of all are assessed as being of local nature conservation value.

The exception is willow tit. One pair was recorded from the site. The site is considered to be of county importance for this species because willow tit is scarce and declining, one pair represents more than 1% of the county population, and because the site contains habitats suitable to maintain the species over the longer term.

A further six species of moderate conservation concern ('Amber list') were also recorded. All are present in relatively small numbers, and the individual populations of each are assessed as being of local nature conservation value.

One additional bird species was recorded that requires specific consideration. This is little ringed plover, a bird species subject to specific legal protection during the breeding season as a result of its listing on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended). While this species is not considered threatened, it is a scarce breeding species and it has specialist habitat requirements. The site supports more than 1% of the county population, and contains habitats suitable to maintain the species over the longer term. On this basis the site is considered to be of county importance for little ringed plover.

Notwithstanding the assessment summarised above, the nature conservation value of the combined assemblage of birds present was also assessed. The site is considered to be of district value for its assemblage of breeding birds, but encompassing populations of willow tit and little ringed plover of county value on their individual merits.

1. Introduction

1.1 Background and Purpose

This report provides the results of the breeding bird survey undertaken in 2017 at Keadby Ash Tip (the site), North Lincolnshire (centred on central grid reference SE 814 118). The breeding bird survey was one of a series of surveys commissioned to determine the baseline ecological value of the site following an initial Phase 1 Habitat survey and scoping of the ecological constraints and opportunities associated with the site by AECOM in March 2017. The findings of the habitat and scoping survey were compiled as a Preliminary Ecological Appraisal (PEA) report and included recommendations for further survey.

The boundary of the site is shown on Figure 1. It should be noted that the site coincides with two discrete areas of land and that the ecological risks associated with these are not comparable, namely:

- an existing access route via a surfaced road off the A18 road which requires no refurbishment or alteration. The road passes between fields of intensively managed arable farmland; and
- the ash tip to the north of the Stainforth and Keadby Canal. The ash tip is approximately 67 ha in area.

It is the ash tip where there is greatest potential for ecological constraints to be encountered, and therefore this land was the primary focus for the ecological surveys. The breeding bird survey were restricted to the ash tip.

The methods employed when undertaking the breeding bird survey are detailed in this report, along with the results of these surveys. A nature conservation assessment is provided to allow the breeding bird interest of the site to be valued and placed in its appropriate geographic context.

2. Methods

2.1 Survey Objectives

The purpose of the surveys completed and the associated assessment made in this report is to:

- collect data on the bird species present in association with the site during the breeding season, along with clarification (where feasible) of whether or not they use the site for breeding; and
- collect the above data in a manner that allows the results to be used to support an assessment of relative nature conservation value of the site for birds, including review against relevant criteria (see Section 2.5 of this report).

2.2 Study Area

The study area for the breeding bird survey was the ash tip as shown on Figure 1, and habitats up to 100 m out from this where visible from within the site. No access was possible to third party land beyond the site boundary. Such access was not necessary given the excellent views across adjacent land that could be achieved from view points within the site.

2.3 Desk Study

A desk study was undertaken as part of the Preliminary Ecological Appraisal that was completed in advance of the bird surveys and that scoped the need for these surveys. Lincolnshire Environmental Records Centre were contacted and provided data in March 2017.

Desk study results of relevance to the assessment of birds have been carried forward into this report, and where appropriate this data is presented in more detail or re-interrogated for the needs of the current assessment.

2.4 Field Survey and Analytical Approach

The bird survey approach was based on Common Birds Census (CBC) methods as described in Marchant (1983) and Gilbert *et al.* (1998). A scaled down CBC approach was employed, with five visits made to the site as detailed in Table 2.1. This was considered an appropriate level of survey effort to characterise the bird interest associated with the site during the breeding season.

During each survey all of the birds observed were recorded, along with details of their behaviour. Contacts with birds (by song, call or sighting) were marked on a suitably-scaled survey map using British Trust for Ornithology (BTO) two-letter species codes, and using standard notations for behaviour (see Appendix A).

Surveys were carried out during the mornings when birds are more active and can be detected in song more frequently. Surveys were also timed for suitable weather conditions (unrestricted visibility, winds less than Beaufort 5, and avoiding heavy or continuous rain). The survey details are provided in Table 2.1.

Table 2.1. Breeding Bird Survey Dates and Weather Conditions

Visit	Dates	Time	Weather
Visit 1	12 th April 2017	07:50-11:00	Dry, F4 W wind, 100% cloud, 10-12°C, >5km visibility
Visit 2	27 th April 2017	07:25-11:10	Period of light rain in middle part of survey, F2 W wind, 80-100% cloud, 8-10°C, >5km visibility
Visit 3	11 th May 2017	07:30-11:00	Dry, sunny, F1-2 E wind, 50% cloud, 14-16°C, >5km visibility
Visit 4	30 th May 2017	07:30-11:00	Dry apart from heavy shower at 09:30, F0-F1 W wind, 100% cloud, 14-15°C, >5km visibility
Visit 5	9 th June 2017	07:32-11:00	Dry, F3-4 SW wind, 40-50% cloud cover, 14°C, >5km visibility

Once all surveys were completed, the survey maps were analysed to determine breeding activity for species of conservation concern and/ or protected species based on the following categories:

- Possible breeding (Po) – species present during the survey period in suitable nesting habitat, but with no evidence to confirm breeding. Presumed passage migrants are not included.
- Probable breeding (Pr) – as determined through observation of one or more of the following activities during the survey period:
 - singing male heard, or breeding calls heard
 - pair observed in suitable nesting habitat during the survey period
 - display or courtship behaviour
 - birds visiting a probable nest site
 - birds seen to be carrying nesting material
- Confirmed breeding (Co) – as determined through observation of one or more of the following activities during the survey period:
 - agitated behaviour or anxiety calls from adults suggesting a nest or young close by
 - distraction display or injury feigning from adults
 - a nest has obviously been used or egg shells found
 - adults seen carrying food for young
 - adults seen carrying faecal sac away from nest site
 - nest with eggs
 - nest with young, or other observations of downy young in the case of waders, game bird species etc
 - recently fledged young
 - soliciting calls from young birds
- Non-breeding (Nb) – species present during the survey period however the habitat type within the survey area is unsuitable for the particular species.

Best copy maps (Figures 1 to 3 of this report) were generated to show the distribution of all notable bird species. These maps encompass all bird species listed on the Red or Amber lists of conservation concern given in Eaton *et al.* (2015), and all bird species listed on s41 of the NERC Act. Certain additional bird species that are notable for other reasons are also mapped, even where not Red or Amber listed e.g. uncommon bird species subject to specific legal protection.

Eaton *et al.* (2015) identifies birds of conservation concern based on a three tier system as follows:

- Red list. This covers those bird species of high conservation concern. Qualification for the Red list is based on:

- Global conservation status, covering bird species that are Globally Threatened (Critically Endangered, Endangered and Vulnerable, but not Near Threatened) under International Union for Conservation of Nature (IUCN) guidelines;
 - Historical decline in breeding populations, covering bird species judged to have declined severely between 1800 and 1995 and which have not recovered subsequently;
 - Breeding population decline, covering bird species that have experienced severe decline in the UK breeding population size (>50%) over 25 years or the longer term;
 - Non-breeding population decline, covering bird species that have experienced severe decline in the UK non-breeding population size (>50%) over 25 years or the longer term;
 - Breeding range decline, covering bird species that have experienced severe decline in their UK range (>50%) based on comparison of national bird atlas datasets; and/ or
 - Non-breeding range decline, covering bird species that have experienced severe decline in their UK range (>50%) based on comparison of national bird atlas datasets.
- Amber list. This covers those bird species of moderate conservation concern. Qualification for the Amber list is based on:
 - European Red Data List status, covering bird species considered Critically Endangered, Endangered or Vulnerable within Europe [but not globally];
 - Historical decline with evidence of recovery, covering bird species that were previously Red-listed for historical decline, followed by an increase of at least 100% over 25 years or the longer term;
 - Breeding population decline, covering bird species that have experienced moderate decline (>25% but <50%) over 25 years or the longer term;
 - Non-breeding population decline, covering bird species that have experienced moderate decline in the UK non-breeding population size (>25% but <50%) over 25 years or the longer term;
 - Breeding range decline, covering bird species that have experienced moderate decline in their UK range (>25% but <50%) based on comparison of national bird atlas datasets;
 - Non-breeding range decline, covering bird species that have experienced moderate decline in their UK range (>25% but <50%) based on comparison of national bird atlas datasets;
 - Breeding and non-breeding rarity. Bird species qualified as rare breeders (BR) if the UK breeding population was <300 pairs, and as rare non-breeders if the UK population was <900 individuals; and/ or
 - Breeding and non-breeding international importance. Species were considered of international importance if the UK holds at least 20% of the European population in either the breeding or non-breeding seasons.
 - Green list. This covers bird species of low conservation concern. Their conservation status is relatively favourable and none of the above criteria are met.

2.5 Nature Conservation Evaluation Approach

The method of evaluation that has been utilised has been developed with reference to the Chartered Institute of Ecology and Environmental (CIEEM) *Guidelines for Ecological Impact Assessment in the UK and Ireland – Terrestrial, Freshwater and Coastal – Second Edition* (CIEEM, 2016). These give advice on scoping and carrying out environmental assessments and place appraisal in the context of relevant policies. Data received through consultation, desk-based studies and field-based surveys are used to allow ecological features of nature conservation value or potential value to be identified, and the main factors contributing to their value described and related to available guidance. These data can also be used to identify other relevant values e.g. socio-economic or ecosystem services values, but this is beyond the remit of this report and requires the involvement of other relevant specialists.

Ornithological assemblages and individual bird species ('ornithological features') can be of nature conservation value for a variety of reasons, and their relative value should always be determined on a

case by case basis to demonstrate a robust assessment process. Value may relate, for example, to the uniqueness of the assemblage, or to the extent to which the species are threatened throughout their range, or to their rate of decline. The value of ornithological features has been defined with reference to the geographical level at which the feature being assessed is considered to matter (Table 2.2). Relevant published national and local guidance and criteria can be used, where available, to inform the assessment of nature conservation value and to assist consistency in evaluation. Guidance and criteria of potential relevance to the ornithological features being assessed is summarised in Table 2.2. The identified guidance and criteria is not definitive and other criteria have been applied as relevant and appropriate to reach a decision on relative nature conservation value.

Table 2.1. Geographic Scale Used to Qualify Relative Nature Conservation Value of Features

Geographic scale of value	Definition	Example supporting guidance and assessment criteria
International	Europe	Guidelines for the selection of Special Protection Areas (SPAs) and Ramsar sites (JNCC 1999, Ramsar 2012, Bainbridge <i>et al.</i> 2013)
National	Great Britain/ England	Guidelines for the selection of biological Sites of Special Scientific Interest (SSSIs) (Drewitt <i>et al.</i> 2015), other guidance in Fuller (1980)
Regional	East Midlands	Fuller (1980) method for assessing the ornithological value of sites
County	Lincolnshire	Fuller (1980) method for assessing the ornithological value of sites
District	North Lincolnshire	Fuller (1980) method for assessing the ornithological value of sites
Local	Below district value	Fuller (1980) method for assessing the ornithological value of sites

2.6 Limitations

There are no limitations to the ornithological survey work undertaken. All surveys were undertaken in appropriate conditions, the site was fully accessible, and adjacent land was clearly visible from view points within the site (which lies higher than the surrounding land, affording good views over adjacent farmland).

3. Legislation, Planning Policy and Related Guidance

The following wildlife legislation, planning policy and guidance is potentially relevant to the ornithological features covered in this report (Table 3.1). At this stage of assessment, this legislation, policy and guidance is primarily listed to demonstrate that an appropriate level of survey and assessment has been undertaken to meet likely data requirements for future decision-making with regard to these material considerations. However, relevant Standing Advice has informed survey approaches, while the relevant National Character Area (NCA) profile may have a bearing on the assessment of the nature conservation value of relevant ornithological features.

Table 3.1. Summary of Relevant Legislation, Policy and Guidance

Document	Requirements/ Purpose
The Conservation of Habitats and Species Regulations 2010 (as amended) (the Habitats Regulations)	Regulation 9A of the Conservation of Habitats and Species (Amendment) 2012 Regulations requires that competent authorities must take such steps in the exercise of their functions as they consider appropriate to secure the preservation, maintenance and re-establishment of a sufficient diversity and area of habitat for wild birds ... as appropriate, and having regard to the requirements of Article 2 of the new Wild Birds Directive. This includes the use of planning and development control measures.
Wildlife and Countryside Act 1981 (as amended)	Part 1 of the Act affords general protection to all species of wild bird, and additional specific protections to bird species listed on Schedule 1. In certain circumstances, licences can be granted to permit some actions prohibited under the Act.
Natural Environment and Rural Communities (NERC) Act 2006	Section 41 (s41) includes a list of habitats and species of principal importance for nature conservation in England which is to be used by decision-makers to guide the implementation of their duties under section 40 of the Act. Decision-makers are required to have regard to the conservation of biodiversity in England when carrying out their normal functions.
National Planning Policy Framework (NPPF)	<p>Section 11 relates specifically to "Conserving and Enhancing the Natural Environment". Paragraph 109 states that "<i>The planning system should contribute and enhance the natural and local environment by:</i></p> <ul style="list-style-type: none"> • <i>Protecting and enhancing valued landscapes, geological conservation interests and soils;</i> • <i>Recognising the wider benefits of ecosystem services; and</i> • <i>Minimising impacts on biodiversity and providing net gains in biodiversity where possible, ... including by establishing coherent ecological networks that are more resilient to current and future pressures; ..."</i> <p>Paragraph 113 adds to this and states: "<i>When determining planning applications, local planning authorities should aim to conserve and enhance biodiversity by applying the following principles:</i></p> <ul style="list-style-type: none"> • <i>if significant harm resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused; ...</i> • <i>planning permission should be refused for development resulting in the loss or deterioration of irreplaceable habitats, including ancient woodland and the loss of aged or veteran trees found outside ancient woodland, unless the need for, and benefits of, the development in that location clearly outweigh the loss; ..."</i>
Core Strategy	<p>Policy CS17 promotes effective stewardship of biodiversity resources by protecting national and international nature conservation designations, paying due regard to the presence of European and nationally protected species, protecting and maintaining features of biodiversity and geological interest, maintaining wildlife networks and green corridors, and ensuring ecological enhancement through good design.</p> <p>Policy CS21 states planning applications for mineral extraction should, where appropriate, contribute to the attainment of local biodiversity targets. [e.g. as detailed in the LBAP and NCA profile]</p>
Local Plan	<p>Policy LC4 affords protection for sites of local nature conservation importance.</p> <p>Policy LC5 prohibits development that would have an adverse impact on protected species, except where appropriate mitigation can be delivered.</p>
Standing Advice	The purpose of standing advice is to guide decision-makers on the determination of proposals with potential to affect protected species. This includes guidance on providing and protecting wild bird habitats to address legal requirements set out in the Habitats Regulations.
NCA Profile 39	NCA profiles are guidance documents intended to help local decision-making. The information they contain supports the planning of conservation initiatives at a landscape scale, informs the delivery of Nature Improvement Areas and encourages broader partnership working through Local Nature Partnerships. Each profile includes a description of the relevant natural (habitat and species) features.

4. Results

4.1 Desk Study Results

4.1.1 Designations

The site is located 1.3 km from the Humber Estuary SSSI, which is the only statutory designation in proximity to the site (as detailed in the standalone PEA report) with breeding birds identified as a reason for designation.

The breeding bird interest of the SSSI relates to its nationally important assemblage of breeding birds of lowland open waters and their margins. This breeding assemblage is very unlikely to make any substantive use of the site as supporting habitat, so the site will not be of functional importance for the maintenance of the SSSI breeding bird assemblage. The site does not support open water and wetland habitat, with the exception of the relatively limited extent and small scale of the boundary drains, and therefore is unlikely to be specifically attractive to bird species associated with open water and wetland habitats.

4.1.2 Species

Lincolnshire Ecological Records Centre provided records for a total of 27 bird species subject to specific legal protections, or otherwise considered to be of conservation concern based on Eaton *et al.* 2015 and Lincolnshire Biodiversity Partnership (2011). These records are summarised in Table 4.1. It should be noted that the presence of desk study records does not automatically indicate that these bird species will be present in association with the site.

Monitoring surveys for Keadby Wind Farm (Jacobs, 2016) included land parcels to the west and southeast of the site. These surveys recorded a number of bird species consistent with the LERC data, and indeed the breeding bird survey of the site as reported in Section 4.2. As such, it is considered that there is no need to summarise this data in detail. Marsh harrier was a species specifically considered during monitoring surveys in 2012 and 2015. This species was observed in vicinity of the site, but no breeding sites were detected. There is currently no evidence that this species breeds in proximity to the site.

Table 4.1. Summary of Desk Study Records for Bird Species Protected by Law or Otherwise Considered of Conservation Concern (based on a 2km search radius from the site)

Common name	Latin name	Date of most recent record	No. of Records	Legal and Conservation Status
Barn owl	<i>Tyto alba</i>	2012	1	WCA, S41, LBAP
Bullfinch	<i>Pyrrhula pyrrhula</i>	2014	1	Amber, S41, LBAP
Cetti's warbler	<i>Cettia cetti</i>	2009	1	WCA
Corn bunting	<i>Emberiza calandra</i>	2010	20	Red, S41, LBAP
Curlew	<i>Numenius arquata</i>	2010	1	Red, S41, LBAP
Fieldfare	<i>Turdus pilaris</i>	2007	2	Red (WCA not applicable, as does not breed in England)
Gadwall	<i>Anas strepera</i>	2010	1	Amber
Grasshopper warbler	<i>Locustella naevia</i>	2009	2	Red, S41
Grey partridge	<i>Perdix perdix</i>	2010	12	Red, S41, LBAP
Hen harrier	<i>Circus cyaneus</i>	2006	1	WCA, S41
Hobby	<i>Falco subbuteo</i>	2011	5	WCA
House sparrow	<i>Passer domesticus</i>	2015	14	Red, S41, LBAP
Kingfisher	<i>Alcedo atthis</i>	2010	3	WCA, Amber
Lapwing	<i>Vanellus vanellus</i>	2010	258	Red, S41, LBAP
Lesser redpoll	<i>Acanthis cabaret</i>	2014	1	Red, S41

Common name	Latin name	Date of most recent record	No. of Records	Legal and Conservation Status
Linnet	<i>Linaria cannabina</i>	2013	213	Red, S41, LBAP
Marsh harrier	<i>Circus aeruginosus</i>	2014		WCA, Amber
Mute swan	<i>Cygnus olor</i>	2010	7	Amber
Reed bunting	<i>Emberiza schoeniclus</i>	2015	56	Amber, S41, LBAP
Skylark	<i>Alauda arvensis</i>	2015	15	Red, S41, LBAP
Song thrush	<i>Turdus philomelos</i>	2009	2	Red, S41
Starling	<i>Sturnus vulgaris</i>	2010	563	Red, S41, LBAP
Swift	<i>Apus apus</i>	2010	46	Amber
Tree sparrow	<i>Passer montanus</i>	2010	101	Red, S41, LBAP
Turtle dove	<i>Streptopelia turtur</i>	2010	8	Red, S41, LBAP
Yellow wagtail	<i>Motacilla flava</i>	2010	19	Red, S41, LBAP
Yellowhammer	<i>Emberiza citrinella</i>	2015	9	Red, S41, LBAP

Abbreviations as follows: WCA = Schedule 1 species, S41 = NERC Act Section 41 bird species of principal importance for nature conservation in England, LBAP = Lincolnshire Biodiversity Action Plan Species (Lincolnshire Biodiversity Partnership, 2011), Red = Red Listed birds of Conservation Concern (after Eaton *et al.* 2015), Amber = Amber Listed birds of Conservation Concern (after Eaton *et al.* 2015)

4.2 Field Survey Results

4.2.1 Overview

All of the bird species recorded during the survey are summarised in Table 5.1, which also provides the latin names of the birds recorded. All observations of Red and Amber birds of conservation concern are shown on Figures 1 and 2 respectively. Figure 3 shows the distribution of Green list species that are not of conservation concern but that are covered by relevant legislation (WCA Schedule 1 species). The other Green list species encountered are not mapped, but they are listed in Table 5.1.

A total of 50 bird species were recorded during the breeding bird survey, of which 39 are likely (possible, probable and confirmed records) to have bred in 2017. The remaining 11 species recorded are either passage species on route to breeding sites elsewhere, or bird species using the site as general habitat but for which the survey area is currently unsuitable for breeding. A large degree of consistency was recorded between the five survey visits in terms of the bird species recorded and their numbers and locations.

The distribution of bird contacts within the site is closely correlated with areas of woody vegetation, with concentrations of bird activity in the areas of secondary woodland and in areas with dense or scattered scrub (as shown on the Phase 1 Habitat map provided with the standalone Preliminary Ecological Appraisal (PEA) Report). More limited bird activity was recorded in areas of open grassland and open mosaic habitats.

Woodland and scrub habitats support a wide range of small passerine bird species. These include both resident species such as blackbird, song thrush, dunno, robin, wren, and various tits, buntings and finches; and, migrant warblers such as blackcap, willow warbler, whitethroat and chiffchaff.

The extensive semi-improved neutral grassland habitat in the northern part of the site supports a number of pairs of breeding skylark, and smaller numbers of meadow pipit. There was a general absence of breeding activity within the acid grassland and open mosaic habitat in the southern and central parts of the site, as these provided insufficient cover for most bird species. But this habitat did support a single territory of little ringed plover, a species that is not currently considered threatened but that is listed on Schedule 1 of the WCA. These open habitats were otherwise used as foraging habitat by a wide range of bird species that breed in the adjacent wooded and rough grassland habitats.

Cliff faces within the central quarry provided suitable conditions for cavity nesting species, specifically sand martin (13 pairs) and stock dove.

Song birds which favour wetland and wetland edge habitats for breeding were recorded primarily outside the site boundary in association with the North Soak Drain. This included reed warbler, sedge warbler and reed bunting. These species are also likely to use wetland vegetation in the northern and western drains, but these habitats were difficult to observe given the over-deepening of these drains and the rank bank top vegetation. In addition, as noted in the standalone PEA report, these drains had been cleared in a previous year and current vegetation structure may also not have been optimal for these bird species as emergent tall reed vegetation was in the process of re-establishing and was not mature. Monitoring surveys for Keadby Wind Farm (Jacobs, 2016) indicate that reed bunting was widespread in the boundary drains in the year before the most recent dredging event.

Overflying and feeding bird species that were not part of the breeding assemblage of the site included gulls, corvids, grey heron, mallard and swift.

4.2.1 Species Accounts for Red, Amber and Other Notable Bird Species

Eleven Red list and S41 bird species were recorded. These are summarised below and are mapped on Figure 1:

- Cuckoo - 1-2 breeding pairs (probable breeding). Two calling males and a female bird were recorded in the scrub habitat during Visit 4. Incidental observations were also made during the course of other protected species surveys undertaken at the site, indicating a regular presence.
- Grasshopper warbler – 1 pair (probable breeding). A single male was recorded singing to the south of the site at North Soak Drain. This location is close to but outside the site.
- Grey partridge – 1 pair (possible breeding). A single pair was recorded in the north-western part of the site during Visit 4.
- Linnet – a minimum of 5 pairs (probable breeding). Scrub habitat in the southern and western part of the site provides suitable breeding habitat for this species. The open mosaic habitat in the central part of the site provides favourable foraging habitat for linnet.
- Mistle thrush – 2 pairs (confirmed breeding). A family party was recorded in the south-western part of the site during Visit 3. An adult carrying food was recorded over-flying the site during Visit 3, indicating breeding adjacent to the south-eastern boundary.
- Skylark – 8-11 breeding pairs (probable breeding). The majority of the territories are located in the semi-improved neutral grassland in the northern part of the site.
- Song thrush – a minimum of 5 pairs (probable breeding). Territories are concentrated in the scrub habitat in the south-eastern part of the site.
- Starling – small groups (peak count 7) of starling (including juvenile birds) were recorded foraging within the site during Visit 4. These observations relate to birds which have nested outside the site boundary.
- Willow tit – 1 pair (confirmed breeding). A willow tit was recorded carrying food within the scrub habitat area located in the south-eastern part of the site (Visit 2).
- Yellow wagtail – a single non-breeding bird was recorded foraging in the southern part of the site during Visit 3.
- Yellowhammer – approximately 10 pairs (probable breeding). The scrub habitat in the southern part of the site, and along the western boundary, supports the majority of the breeding population.

Six Amber list bird species were recorded and are mapped on Figure 2, three of which are also S41 species (see Table 4.1):

- Bullfinch - 1 pair (possible breeding).
- Dunnock – approximately 15 pairs (probable breeding), widespread in areas with dense vegetation.

- Meadow pipit – approximately 4 pairs in grassland in the north of the site (probable breeding).
- Reed bunting – approximately 5 pairs (including 2 edge territories) (probable breeding).
- Stock dove – 2 pairs (probable breeding). Using cavities in the quarry cliff.
- Willow warbler – 9 to 10 pairs (probable breeding). Using woodland and scrub habitats.

In addition to the above, a single pair of kestrel (Amber list) was frequently recorded hunting within the site. This species may breed in the site, but it is considered more likely that the nest site is on adjacent land. Mallard and swift (both Amber list) were only recorded overflying the site and there was no evidence of breeding.

Table 4.1. Summary of the Bird Species Recorded during the Survey and their Status

Common Species	Latin Name	Breeding Status	Legal and Conservation and Status
Blackbird	<i>Turdus merula</i>	Probable	Green
Blackcap	<i>Sylvia atricapilla</i>	Probable	Green
Black-headed gull	<i>Larus ridibundus</i>	Not breeding	Amber
Blue tit	<i>Parus caeruleus</i>	Possible	Green
Bullfinch	<i>Pyrrhula pyrrhula</i>	Possible	Amber, S41, LBAP
Buzzard	<i>Buteo buteo</i>	Not breeding	Green
Carrion crow	<i>Corvus corone</i>	Confirmed	Green
Chaffinch	<i>Fringilla coelebs</i>	Probable	Green
Chiffchaff	<i>Phylloscopus collybita</i>	Probable	Green
Cuckoo	<i>Cuculus canorus</i>	Probable	Red, S41
Dunnock	<i>Prunella modularis</i>	Probable	Amber, S41
Feral pigeon	<i>Columba livia</i>	Possible	Green
Goldfinch	<i>Carduelis carduelis</i>	Probable	Green
Grasshopper warbler	<i>Locustella naevia</i>	Probable	Red, S41
Great tit	<i>Parus major</i>	Possible	Green
Grey heron	<i>Ardea cinerea</i>	Not breeding	Green
Grey partridge	<i>Perdix perdix</i>	Possible	Red, S41, LBAP
Jackdaw	<i>Corvus monedula</i>	Not breeding	Green
Kestrel	<i>Falco tinnunculus</i>	Possible	Amber
Lesser whitethroat	<i>Sylvia curruca</i>	Probable	Green
Linnet	<i>Carduelis cannabina</i>	Probable	Red, S41, LBAP
Little ringed plover	<i>Charadrius dubius</i>	Probable	WCA, Green
Long-tailed tit	<i>Aegithalos caudatus</i>	Possible	Green
Magpie	<i>Pica pica</i>	Possible	Green
Mallard	<i>Anas platyrhynchos</i>	Not breeding	Amber
Meadow pipit	<i>Anthus pratensis</i>	Probable	Amber
Mistle thrush	<i>Turdus viscivorus</i>	Confirmed	Red, S41
Pheasant	<i>Phasianus colchicus</i>	Possible	Green
Pied wagtail	<i>Motacilla alba</i>	Probable	Green
Red-legged partridge	<i>Alectoris rufa</i>	Possible	Green
Reed bunting	<i>Emberiza schoeniclus</i>	Probable	Amber, S41, LBAP
Reed warbler	<i>Acrocephalus scirpaceus</i>	Probable	Green
Robin	<i>Erithacus rubecula</i>	Probable	Green
Rook	<i>Corvus frugilegus</i>	Not breeding	Green
Sand martin	<i>Riparia riparia</i>	Confirmed	Green

Common Species	Latin Name	Breeding Status	Legal and Conservation and Status
Sedge warbler	<i>Acrocephalus schoenobaenus</i>	Probable	Green
Skylark	<i>Alauda arvensis</i>	Probable	Red, S41, LBAP
Song thrush	<i>Turdus philomelos</i>	Probable	Red, S41
Starling	<i>Sternus vulgaris</i>	Not breeding	Red, S41, LBAP
Stock dove	<i>Columba oenas</i>	Probable	Amber
Swallow	<i>Hirundo rusticola</i>	Not breeding	Green
Swift	<i>Apus apus</i>	Not breeding	Amber
Wheatear	<i>Oenanthe oenanthe</i>	Not breeding	Green
Whitethroat	<i>Sylvia communis</i>	Probable	Green
Willow tit	<i>Parus montanus</i>	Confirmed	Red, S41
Willow warbler	<i>Phylloscopus trochilus</i>	Probable	Amber
Woodpigeon	<i>Columba palumbus</i>	Probable	Green
Wren	<i>Troglodytes troglodytes</i>	Probable	Green
Yellow wagtail	<i>Motacilla flava</i>	Not breeding	Red, S41, LBAP
Yellowhammer	<i>Emberiza cistinella</i>	Probable	Red, S41, LBAP

Abbreviations as follows: WCA = Schedule 1 species, S41 = NERC Act Section 41 bird species of principal importance for nature conservation in England, LBAP = Lincolnshire Biodiversity Action Plan Species (Lincolnshire Biodiversity Partnership, 2011), Red = Red Listed birds of Conservation Concern (after Eaton *et al.* 2015), Amber = Amber Listed birds of Conservation Concern (after Eaton *et al.* 2015)

5. Nature Conservation Evaluation

This section provides an assessment of the ornithological features present to determine their relative nature conservation value using the approach detailed in Section 2.5 of this report. There is no reasonable likelihood of the ornithological features present being of international nature conservation importance, so this can be discounted without further assessment. The numbers and species of birds present are not notable in international terms. The site is not part of a designated SPA, and therefore the breeding birds recorded are not part of the breeding population of any international designations

5.1 Bird Species

The remit of the species-specific assessment is restricted to those breeding bird species considered to be of nature conservation concern (after Eaton *et al.* 2015) or otherwise notable in a geographic context. Therefore no specific assessment of Green list bird species is made, with the exception of little ringed plover as a rare breeding species. All other Green list species are currently of favourable nature conservation status and none use the site in exceptional numbers. Therefore all populations of Green list bird species are considered to be of local value only, in the context of the site and immediately surrounding land.

It should be noted that the inclusion of individual bird species on lists of conservation concern does not automatically imply that a specific population is of high nature conservation value or critical for the maintenance of the conservation status of the species concerned. Species are considered of conservation concern based on a range of criteria (see Section 2.4), including rate of decline. A species can be undergoing a rate of decline sufficient to merit listing, but can still be a widespread and commonly encountered species. Decline and population size are not always one and the same. An example would be skylark which is Red list based on rate of decline, but which has a national breeding population estimated at 1.4 million pairs (Musgrove *et al.* 2013, BTO, 2017).

The relevant bird species, their assessed geographic value, and the rationale for this are provided below in Table 5.1. The assessment has been made with reference to the relative population sizes associated with the site, and county and national estimates of wider population size. National population estimates are published by Musgrove *et al.* (2013) and BTO (2017), while county population sizes need to be inferred from other sources where available.

None of the breeding populations of the species recorded approach the 1% of the national breeding population, which is the commonly used threshold for identifying bird populations of national value. Therefore, none of the individual breeding bird species using the site occur at population levels that would be considered to be of national nature conservation importance.

Table 5.1. Nature Conservation Evaluation of Relevant Breeding Bird Species

Common name	Geographic scale of value	Reason for assigned value
Little ringed plover	County	This species has a national (Great Britain) breeding population in the order of 1,200 pairs. Rare Breeding Bird Panel (2010) data indicates that there are at least 31 pairs in Lincolnshire in 2010 (the most recent data), while acknowledging that not all sites are monitored so this may be an under-estimate. The 1 pair using the site represents approximately 3% of the county population (even if the county population is under-estimated it is unlikely to be to the extent that the site population would represent less than 1% of the county breeding population). The site can be considered to contain abundant suitable habitat for this species, such that this species would be expected to occur annually or with regularity. The habitat conditions are also likely to remain stable over the longer term due to the nature of the substrates and vegetation present. This species has specialist habitat needs and suitable habitat is relatively scarce in the wider landscape. Applying the 1% rule used for national assessments, and with consideration of the optimal habitat conditions, the site is considered to be of county value for this species as it supports more than 1% of the Lincolnshire breeding population.
Willow tit	County	This species has a national (Great Britain) breeding population in the order of 3,400 pairs. Rare Breeding Bird Panel (2010) data indicates that there are at least 41 pairs in Lincolnshire in 2010 (the most recent data), while acknowledging that not all sites are monitored so this may be an under-estimate. The 1 pair using the site represents approximately 2.4% of the

Common name	Geographic scale of value	Reason for assigned value
		county population (even if the county population is under-estimated it is unlikely to be to the extent that the site population would represent less than 1% of the county breeding population). The site can be considered to contain reliable habitat for this species, such that this species would be expected to occur annually or with regularity. This species has specialist habitat needs and suitable habitat is relatively scarce in the wider landscape. Applying the 1% rule used for national assessments, and with consideration of the likely ongoing suitability of the site for this species, the site is considered to be of county value for this species as it supports more than 1% of the Lincolnshire breeding population.
Cuckoo	Local	This species has a national (Great Britain) breeding population in the order of 15,000 pairs. The national population size is beyond the threshold that would trigger monitoring by the Great Britain Rare Breeding Bird Panel. Fairly common but declining. Considered fairly common in Lincolnshire (Lincolnshire Bird Club, 2014).
Skylark	Local	This species has a national (Great Britain) breeding population in the order of 1.4 million pairs. The national population size is well beyond the threshold that would trigger monitoring by the Great Britain Rare Breeding Bird Panel. Very common resident in Lincolnshire (Lincolnshire Bird Club, 2014).
Song thrush	Local	This species has a national (Great Britain) breeding population in the order of 1.1 million pairs. The national population size is well beyond the threshold that would trigger monitoring by the Great Britain Rare Breeding Bird Panel. Common resident in Lincolnshire (Lincolnshire Bird Club, 2014).
Mistle thrush	Local	This species has a national (Great Britain) breeding population in the order of 160,000 pairs. The national population size is well beyond the threshold that would trigger monitoring by the Great Britain Rare Breeding Bird Panel. Common resident in Lincolnshire (Lincolnshire Bird Club, 2014).
Linnet	Local	This species has a national (Great Britain) breeding population in the order of 410,000 pairs. The national population size is well beyond the threshold that would trigger monitoring by the Great Britain Rare Breeding Bird Panel. Common resident in Lincolnshire (Lincolnshire Bird Club, 2014).
Yellowhammer	Local	This species has a national (Great Britain) breeding population in the order of 700,000 pairs. The national population size is well beyond the threshold that would trigger monitoring by the Great Britain Rare Breeding Bird Panel. Common resident in Lincolnshire (Lincolnshire Bird Club, 2014).
Dunnock	Local	This species has a national (Great Britain) breeding population in the order of 2.3 million pairs. The national population size is well beyond the threshold that would trigger monitoring by the Great Britain Rare Breeding Bird Panel. Very common resident in Lincolnshire (Lincolnshire Bird Club, 2014).
Bullfinch	Local	This species has a national (Great Britain) breeding population in the order of 190,000 pairs. The national population size is well beyond the threshold that would trigger monitoring by the Great Britain Rare Breeding Bird Panel. Common resident in Lincolnshire (Lincolnshire Bird Club, 2014).
Reed bunting	Local	This species has a national (Great Britain) breeding population in the order of 230,000 pairs. The national population size is well beyond the threshold that would trigger monitoring by the Great Britain Rare Breeding Bird Panel. Common resident in Lincolnshire (Lincolnshire Bird Club, 2014).
Grasshopper warbler	Local	This species has a national (Great Britain) breeding population in the order of 13,000 pairs. The national population size is beyond the threshold that would trigger monitoring by the Great Britain Rare Breeding Bird Panel. Scarce summer visitor in Lincolnshire (Lincolnshire Bird Club, 2014) but not considered rare.
Grey partridge	Local	This species has a national (Great Britain) breeding population in the order of 43,000 pairs. The national population size is well beyond the threshold that would trigger monitoring by the Great Britain Rare Breeding Bird Panel. Common resident in Lincolnshire (Lincolnshire Bird Club, 2014).
Meadow pipit	Local	This species has a national (Great Britain) breeding population in the order of 1.9 million pairs. The national population size is well beyond the threshold that would trigger monitoring by the Great Britain Rare Breeding Bird Panel. Common resident in Lincolnshire (Lincolnshire Bird Club, 2014).
Stock dove	Local	This species has a national (Great Britain) breeding population in the order of 260,000 pairs. The national population size is well beyond the threshold that would trigger monitoring by the Great Britain Rare Breeding Bird Panel. Common resident in Lincolnshire (Lincolnshire Bird Club, 2014).

Common name	Geographic scale of value	Reason for assigned value
Willow warbler	Local	This species has a national (Great Britain) breeding population in the order of 2.2 million pairs. The national population size is well beyond the threshold that would trigger monitoring by the Great Britain Rare Breeding Bird Panel. Very common in Lincolnshire (Lincolnshire Bird Club, 2014).
Kestrel	Local	This species has a national (Great Britain) breeding population in the order of 45,000 pairs. The national population size is well beyond the threshold that would trigger monitoring by the Great Britain Rare Breeding Bird Panel. Common resident in Lincolnshire (Lincolnshire Bird Club, 2014).

5.2 Breeding Bird Assemblage

As well as being of importance for individual bird species, sites may also be considered important for the assemblages of breeding birds that they support. The site contains a breeding bird assemblage that is considered relatively typical for the habitats present and therefore is not particularly unusual or unique. However, the presence of willow tit and little ringed plover is considered notable given the relative rarity of these species.

GNLP (2013) provides no relevant bird-specific criteria to inform evaluation of the importance of the site for breeding birds. Criteria have previously been published by Fuller (1980) which, while rather dated, are still widely used and do set out a rationale for site assessment that allows consistent comparison of the relative value of different sites. Fuller (1980) established a series of threshold values (Table 5.2) against which the relative scale of geographic importance of a site for breeding birds can be judged. In applying these criteria due consideration should also be given to whether the recorded bird species are likely to show high fidelity to a specific site, and whether the habitat conditions present are likely to remain consistent and stable over time. In other words, whether the value derived using the Fuller thresholds is likely to be representative of the typical situation at this location, and can reasonably be expected to be maintained over the longer term.

Table 5.2. Fuller (1980) Threshold Score Used to Apply a Geographic Scale of Value to Breeding Bird Assemblages Based on the Number of Bird Species Recorded Breeding at a Site

Geographic scale of value	Number of breeding species	Supporting comment
National	85 or more bird species	-
Regional	70-84 bird species	-
County	50-69 bird species	-
District	25-49 bird species	Fuller (1980) applied this threshold for purposes of identifying sites of 'local value', and did not distinguish a threshold for district value. However, it is considered that this threshold is better applied at the district level and that this is in keeping with the purpose of the original method and what Fuller intended when he used the term 'local'. This modification is widely applied when using the Fuller approach.
Local	24 or less bird species	In making the above modification to define a district threshold, a logical extension is to apply a score of 24 or less for the purposes of defining local value

Based on application of the Fuller (1980) approach, the site is considered to be of district nature conservation value for its breeding bird assemblage. This judgement does not conflict with or detract from the nature conservation values applied to each component bird species in isolation, and the attribution of county value to the site for its breeding little ringed plover and willow tit remains valid.

The survey identifies that the site supports 39 breeding bird species, and therefore falls comfortably within the threshold used to define district value. This is considered an appropriate conclusion given the stability of the habitats present on site, meaning that the bird species recorded are likely to show a

high degree of fidelity to the site over time. The relatively small numbers of each contributing bird species recorded does not suggest that the site supports breeding birds at levels that would be considered exceptional or noteworthy, further supporting the judgement that district value is the most appropriate geographic scale of value.

The Fuller (1980) method is not the only established approach for the identification of sites of national value for assemblages of breeding birds. Drewitt *et al.* (2015) provides alternate criteria and these are used for the purposes of identifying sites of SSSI quality for birds. While the above assessment has concluded that the site is not of national value for its breeding bird assemblage, it is considered appropriate to sense check this conclusion against the Drewitt criteria to provide further assurance that the site is not of national importance for its breeding birds.

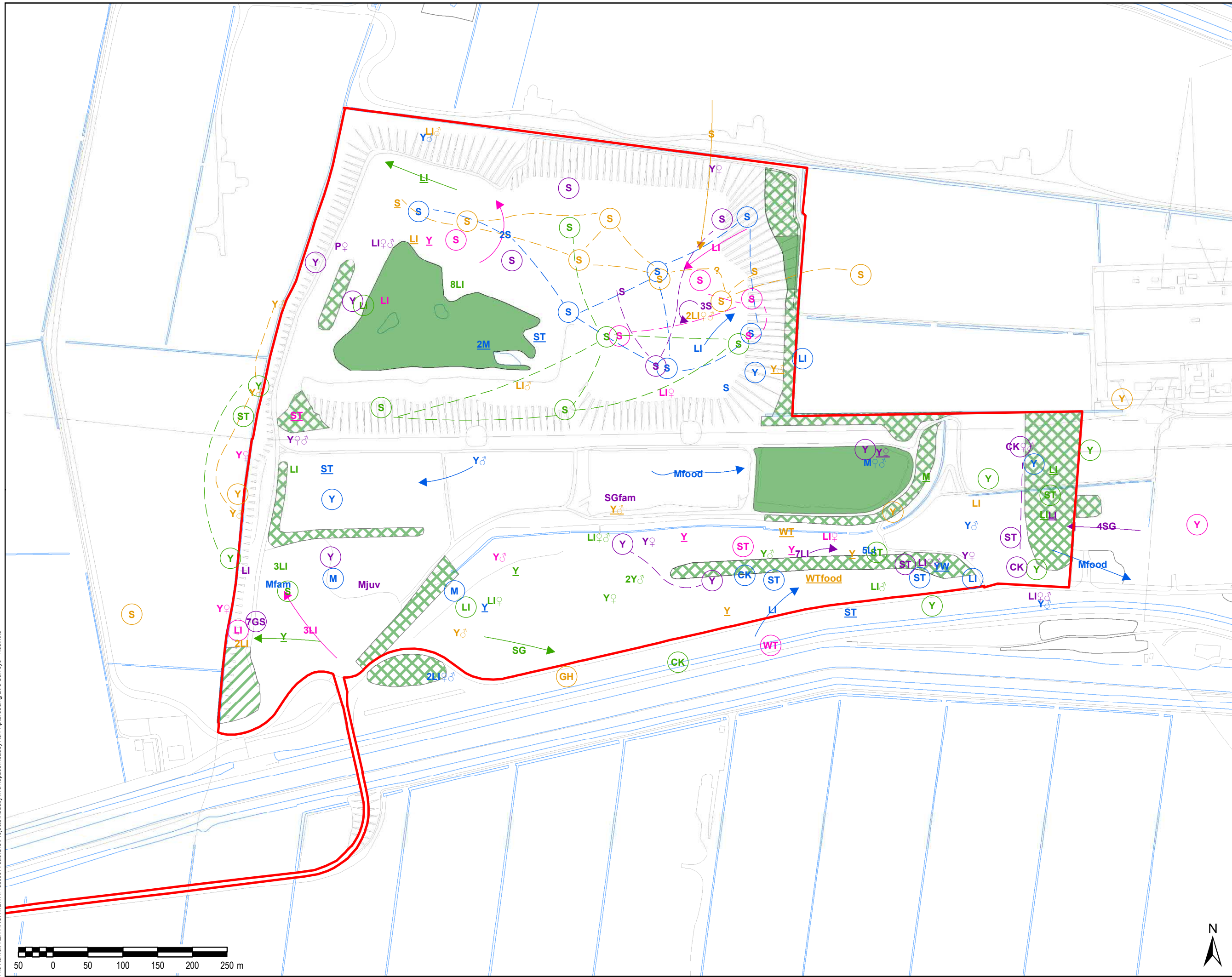
Drewitt *et al.* (2015) is a scoring system based on typical bird species associated with different habitat types. It is a threshold based system, and any assemblage meeting or exceeding the relevant threshold value set is considered to be of national importance. Where more than one major habitat type occurs, the individual scores can be combined to allow assessment in aggregate, and double-counting is allowed where birds use more than one of the habitat types being considered. As identified in the results, the breeding bird interest of the site is predominantly associated with its scrub habitats and therefore the threshold value set for lowland scrub is most relevant to assessment of the site. There is also extensive grassland habitat present on site, so it is considered appropriate to assess the site against the threshold established for lowland farmland also (as the most suitable habitat option for the purposes of assessment). Based on this approach a combined threshold score of 36 would be required to merit a conclusion of national value. The site scores 21 only (10.5 out of 14 for scrub plus 10.5 out of 22 for lowland farmland¹). On this basis, the site is not of national value for its breeding bird assemblage, and the results are consistent with the conclusion reached above using the Fuller (1980) approach i.e. that the site is of district value for its breeding bird assemblage.

¹ Based on the presence of cuckoo, willow tit, linnet, bullfinch, yellowhammer and lesser whitethroat in association with scrub on site, and grey partridge, kestrel, stock dove, reed bunting, yellowhammer and (assuming future potential for breeding) yellow wagtail in habitats broadly comparable to lowland farmland.

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File Name: F:\ENVIRONMENT\Practice Areas\GIS\Projects\Keadby\Workspace\Keadby Ash Tip\Breeding Bird Surveys - Red.mxd



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Legend

- Boundary of study site
- Broadleaved Plantation Woodland
- Broadleaved Semi-Natural Woodland
- Dense Scrub

Visit 1 - 12/04/2017
Visit 2 - 27/04/2017
Visit 3 - 11/05/2017
Visit 4 - 30/05/2017
Visit 5 - 09/06/2017

BoCC Red List

- CK - Cuckoo
- GH - Grasshopper Warbler
- LI - Linnet
- M - Mistle Thrush
- P - Grey Partridge
- S - Skylark
- SG - Starling
- ST - Song Thrush
- WT - Willow Tit
- YW - Yellow Wagtail
- Y - Yellowhammer

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Purpose of Issue
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Report



Project Title

KEADBY ASH TIP

Drawing Title

FIGURE 1
RED LIST
BREEDING BIRDS

Drawn GB	Checked sb	Approved SB	Date 12/09/2017
AECOM Internal Project No. 60534600		Scale @ A3 1:5,000	

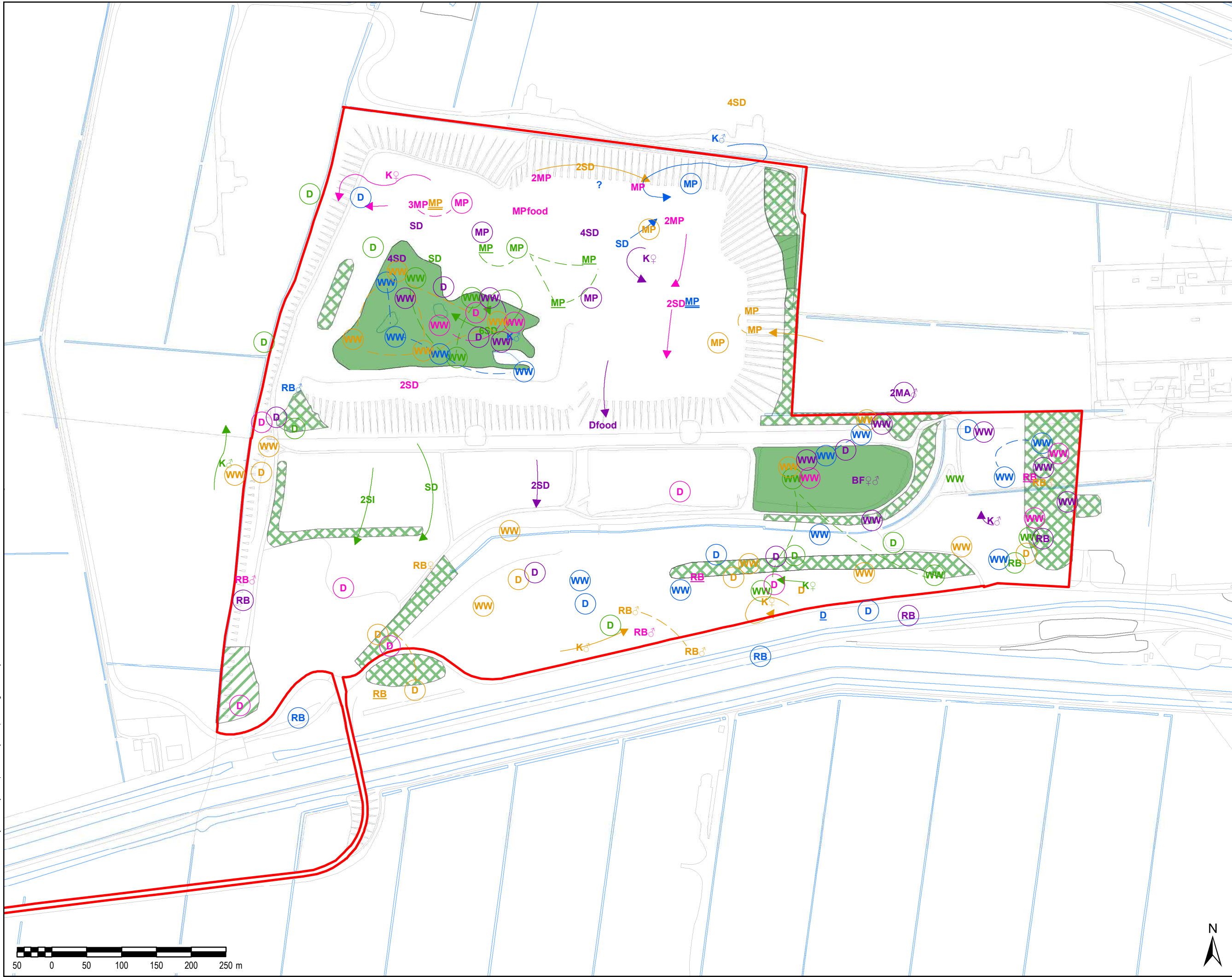
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Legend

- Boundary of study site
- Broadleaved Plantation Woodland
- Broadleaved Semi-Natural Woodland
- Dense Scrub

Visit 1 - 12/04/2017
Visit 2 - 27/04/2017
Visit 3 - 11/05/2017
Visit 4 - 30/05/2017
Visit 5 - 09/06/2017

BoCC Amber List

BF - Bullfinch
K - Kestrel
D - Dunnock
MP - Meadow Pipit
RB - Reed Bunting
SD - Stock Dove
SI - Swift
WW - Willow Warbler

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Client
SSE

Project Title
KEADBY ASH TIP

Drawing Title
FIGURE 2 AMBER LIST
BREEDING BIRDS

Drawn GB	Checked sb	Approved SB	Date 12/09/2017
AECOM Internal Project No. 60534600		Scale @ A3 1:5,000	

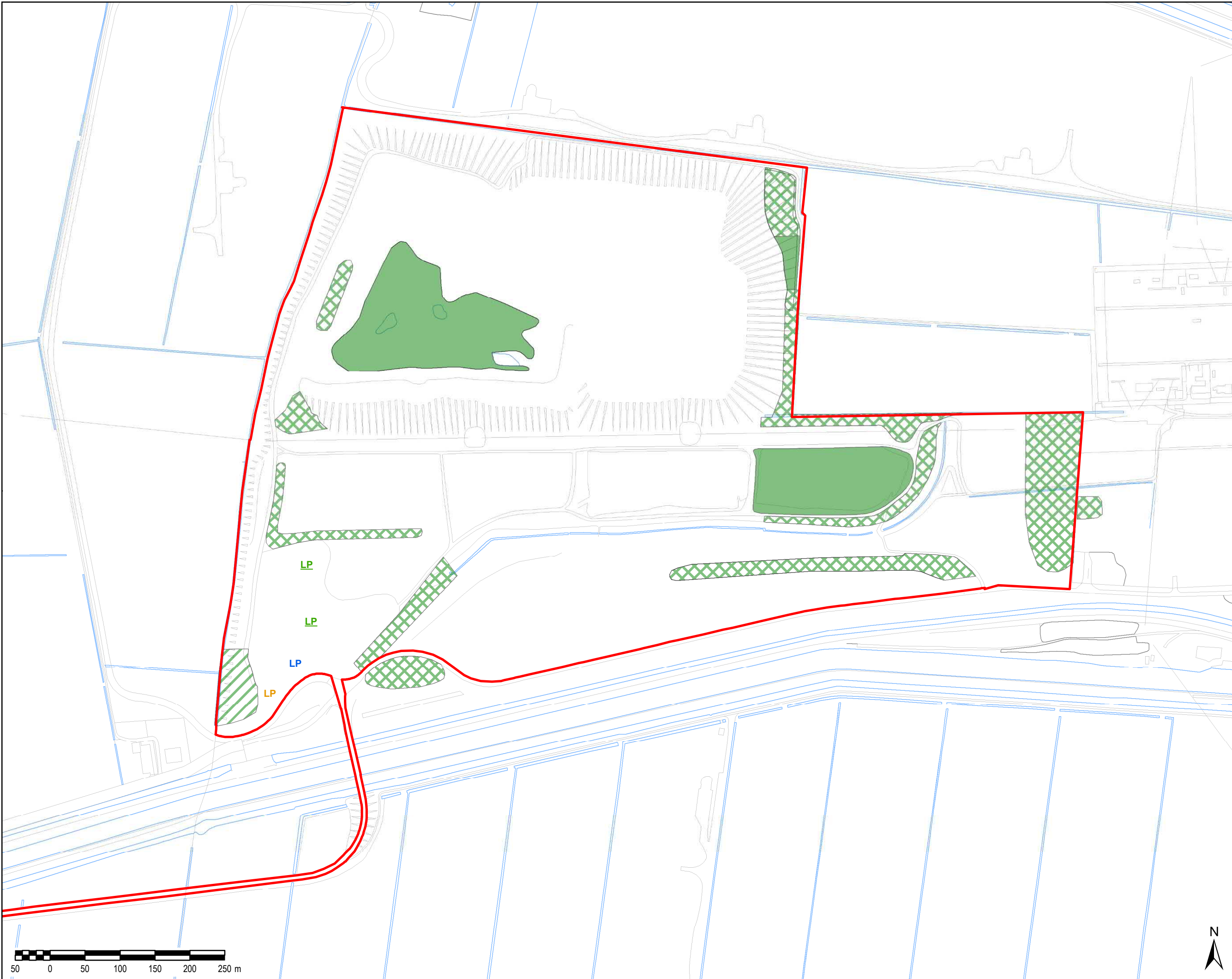
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Legend

- Boundary of study site
- Broadleaved Plantation Woodland
- Broadleaved Semi-Natural Woodland
- Dense Scrub

Visit 1 - 12/04/2017
Visit 2 - 27/04/2017
Visit 3 - 11/05/2017
Visit 4 - 30/05/2017
Visit 5 - 09/06/2017

WCA 1981 Schedule 1
LP - Little Ringed Plover

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Purpose of Issue
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Report

Client
SSE

Project Title
KEADBY ASH TIP

Drawing Title
FIGURE 3
OTHER NOTABLE
BREEDING BIRD RECORDS

Drawn GB	Checked sb	Approved SB	Date 12/09/2017
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Appendix A BTO Common Bird Surveys Standard Notation

CH, CH♂, CH♀
3 CH juv, CH♂ 1♀

Chaffinch sight records, with age, sex or number of birds if appropriate. CH ♀ indicates one pair; 2CH ♂ means two pairs together.

R fam

Juvenile Robins with parents(s) in attendance.

R

A calling Robin

R

A Robin repeatedly giving alarm calls or other vocalisations (not song) thought to have strong territorial significance.

Ⓡ

A Robin in song.

⚡RR⚡

An aggressive encounter between two Robins.

* R

An occupied nest of Robins: do not mark unoccupied nests, which are of no territorial significance by themselves.

☐ BT

Blue Tits nesting in a specially provided site (e.g. nest-box)

* PW on

Pied Wagtail nest with an adult sitting.

PW mat

Pied Wagtail carrying nest material.

PW food

Pied Wagtail carrying food.

Movements of birds can be indicated using the following conventions:

→ GR →

A calling Greenfinch flying over (seen only in flight).

Ⓢ →

A singing Dunnock perched then flying away (not seen to land).

→ B♂

A male Blackbird flying in and landing (first seen in flight)

$$WR \longrightarrow WR$$

Diagram showing two 'WR' nodes connected by a horizontal line.

$$\begin{array}{ccc} * & & * \\ | & \text{---} & | \\ \text{Li} & & \text{Li} \end{array}$$

SD — ? — SD

WR WR mat

$$C^* \qquad C^*$$

Where adjacent nests are marked without a line, it will often be assumed that they were first and second broods, or a replacement nest following an earlier failure.

