LAND NORTH OF WILTHORPE ROAD, BARNSLEY, SOUTH YORKSHIRE

Proposed residential development

Ecology Report

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Dr. Madeline Holloway, 19 Farfield Road, Shipley, Bradford BD18 4QP
Phone/Fax 01274 598839 e-mail: holloway597@btinternet.com

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ECOLOGY REPORT

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1 INTRODUCTION

1.1 EINC was commissioned in March 2013 by Mr R. Steadman of Land Restoration Management Ltd. to undertake an ecological survey of the land north of Wilthorpe Road, Barnsley, South Yorkshire. The proposal is to release the land at this site for a residential housing development. The aims of the Ecology Report are to present:

- The findings of a desktop study, a Phase 1 Habitat Survey and a Potential Bat Roost Survey of Individual Trees.
- The criteria used to determine the nature conservation significance of the findings.
- A summary of the ecological impacts arising from the proposed residential housing development together with a range of recommended mitigation and compensation measures.

2 METHODOLOGY

2.1 Desktop study

2.1.1 The location and nature of any designated sites within a 2km radius of the land to the north of Wilthorpe Road was recorded. This included both statutory and non-statutory sites. Information on species protected by the Wildlife and Countryside Act 1981 (as amended) within the general vicinity was also collected. UK and Local Biodiversity Action Plans were additionally consulted for information on priority habitats and species within a national and local context respectively.

2.2 Phase 1 Habitat Survey

2.2.1 The purpose of undertaking a Phase 1 Habitat Survey was to provide information on the location, extent and distribution of the vegetation within, and adjacent to, the proposed extension area within the school site. Such information is essential to provide an objective basis for determining the nature conservation value of the site.

2.2.2 The Phase I Habitat Survey was undertaken using the standard methodology devised by English Nature (English Nature 1993) on 9th April 2013. The vegetation was mapped onto a large scale map using standard alphanumeric codes, which were used to produce coded habitat maps (Figure 2). Further information for the site was described in the form of target notes which provide supplementary information on species composition and structure, evidence of management, habitats too small to map and transitional or mosaic habitats.

2.2.3 Despite the sub-optimal time for gathering data (ideally such surveys should be undertaken in May – September for maximum identification of plants) the data collected on the composition of the vegetation was sufficient to categorise it according to broad Phase 1 Habitat categories. Notes were also

made on other species seen on site, including any tracks or signs of mammals, birds and invertebrates.

2.3 Potential Bat Roost Survey of Individual Trees

Legislation

2.3.1 All species of bats are protected under The Wildlife and Countryside Act 1981 and the Conservation (Natural Habitats, &c.) Regulations 1994. Under this legislation it is an offence for any person to intentionally kill, injure or take any wild bat; to intentionally disturb any wild bat while it is occupying a structure or place that it uses for shelter or protection; to intentionally damage, destroy or obstruct access to any place that a wild bat uses for shelter or protection; to be in possession or control of any live or dead wild bat, or any part of, or anything derived from a wild bat; or to sell, offer or expose for sale, or possess or transport for the purpose of sale, any live or dead wild bat, or any part of, or anything derived from a wild bat.

2.3.2 The Countryside and Rights of Way Act 2000 and the Conservation (Natural Habitats & c.) (Amendment) Regulations, 2009, updated the Wildlife and Countryside Act 1981 to also make it an offence to intentionally or recklessly damage, destroy or obstruct a place that bats use for shelter or protection.

Tree Survey

2.3.5 Cracks and crevices in trees can be used as places that bats use for shelter and current legislation therefore requires that any tree(s) within the footprint of the development should be assessed for their bat roost potential. Sustained summer dusk surveys at an individual tree/shrub to locate emerging bats are often a very time consuming and prohibitively expensive methodology to assess their value for roosting bats.

2.3.6 Instead all the mature trees along the boundary of the site and fringing the watercourse were searched for the presence of cavities suitable for bat roosts. Although the entrance to a suitable bat roost site can be as narrow as approximately 10 mm, the length and depth of the cavity must be relatively much larger if at least one bat is to roost within it. However, the depth of a cavity could usually only be estimated in this survey by the amount of visual rot around holes within the trunk and/or main branches. Thus the bat potential, rather than actual bat roost occupation, of the tree was estimated. The survey was limited to a visual assessment of each tree from ground level.

2.3.7 For the purposes of this report the bat roost potential of the trees were graded as follows:

- ‘high’ bat potential: potentially suitable cavities for bat roost occupation were recorded.
- ‘medium’ bat potential: suitable cavities for bat roost occupation may not appear to be present but evidence of die-back, and hence bat roost potential, was apparent in the inaccessible upper parts of the tree.
- ‘low’ bat potential: suitable cavities for bat roost occupation and evidence of die-back did not appear to be present but parts of the upper tree were inaccessible.

- 'nil' bat potential: no suitable cavities for bat roost occupation were recorded.

2.4 Great Crested Newts

2.4.1 A comprehensive survey for great crested newts *Triturus cristatus*, a protected species, was not undertaken as there were no areas of standing water within the proposed residential development that could be used for breeding purposes. It was considered impractical to undertake a specific survey of the use of terrestrial habitats by these newts as they are very difficult to conduct thoroughly. In addition, the extent of likely terrestrial habitat disturbance from the proposed residential development can be assessed from the Phase 1 Habitat Survey.

3 RESULTS

This section describes the current ecological conditions gathered from a desktop study and field surveys.

3.1 Consultation

3.1.1 There are no statutory sites of national nature conservation importance within a 2km radius of the Land North of Wilthorpe Road. Nevertheless, two non-statutory sites have been designated by Barnsley Metropolitan Borough Council as Local Wildlife Sites (LWS) in accordance with national policy and in consultation with Natural England and ecologists. These sites, namely Barnsley Canal at Wilthorpe (LWS No. 25) and Old Mill Lane (LWS No. 54) are considered to be of regional nature conservation importance.

3.1.2 Barnsley Canal at Wilthorpe (LWS No. 25) is located to the north of the active railway line that borders the proposed site for development and, in one place, is only 25m north-east of the site as illustrated in Figure 2. The site has a broad diversity of species-rich habitats including neutral and acidic grassland, wetland/swamp, scrub and broadleaved woodland communities.

3.1.3 Records received from Sheffield City Council (which include records for Barnsley Metropolitan Borough Council) list several species within LWS No. 25 that are identified as nationally important in UK Biodiversity Action Plans (UKBAPs). These include a total of thirteen bird species which are also listed as high priority, Red List, Birds of Conservation Concern (Eaton *et. al.* 2009). These are the skylark *Alauda arvensis,* linnet *Carduelis cannabina*, cuckoo *Cuculus canorus*, yellowhammer *Emberiza citronella*, yellow wagtail *Motacilla flava*, tree sparrow *Passer montanus*, grey partridge *Perdix perdix,* lapwing *Vanellus vanellus,* reed bunting *Emberiza schoeniclus,* grasshopper warbler *Locustella naevia,* willow tit *Poecile montanus,* bullfinch *Pyrrhula pyrrhula* and song thrush *Turdus philomelos.* In addition, the dunnock *Prunella modularis* has also been recorded at this site and is identified as nationally important in UK Biodiversity Action Plans (UKBAPs).

4.3.1 Other notable species recorded within LWS No. 25 include the common toad *Bufo bufo* and great crested newt *Triturus cristatus*, both of which are also identified as nationally important in UKBAPs. In addition, the great crested

newt is a European Protected Species which is protected by Schedule 5 of the Wildlife & Countryside Act 1981 (as amended) and the Conservation of Habitats and Species Regulations 2010. The locations of the two records closest records of great crested newts *Triturus cristatus* to the proposed residential development are illustrated in Figure 2. One female great crested newt was recorded on 27/4/10 in a pond formed within a shallow hollow adjacent to the southern edge of Barnsley Canal at Grid Reference SE 32960 08432 (EINC 2010). This pond is located approximately 250m north of the proposed residential development. The second record was recorded on 16/5/12 at the west part of the Barnsley Canal at Wilthorpe at Grid Reference SE 33727 08366 (Sheffield City Council 2013 – Appendix 1). This part of the canal is located approximately 350m north-east of the site.

3.1.4 Old Mill Lane (LWS No. 54) is located on the River Dearne, where it flows in a south-easterly direction just to the north-east of Barnsley. This site is located approximately 1.3 km east of the proposed site for development and is important for a maternity colony of Daubenton's bat *Myotis daubentonii* in the culvert near the bridge of the A61. Common Pipistrelle *Pipistrellus pipistrellus* have also been recorded foraging upstream and downstream of the culvert. These species are both European Protected species which are protected by Schedule 5 of the Wildlife & Countryside Act 1981 (as amended) and the Conservation of Habitats and Species Regulations 2010. The corridor also supports breeding kingfisher *Alcedo atthis,* a Schedule 1 species (Wildlife & Countryside Act 19821 – as amended), UKBAP breeding willow tit *Poecile montanus*, bullfinch *Pyrrhula pyrrhula* and song thrush *Turdus philomelos*.

3.1.5 For further details of the above sites refer records received from Sheffield City Council (Appendix 1).

3.1.6 Finally, the Land North of Wilthorpe Road is within the natural range of species of bats listed in Table 1.

Table 1 Bat species within 100km of the site

Species	**National status**
Common pipistrelle *Pipistrellus pipistrellus*	Widespread and common
Soprano pipistrelle *Pipistrellus pygmaeus*	Widespread and common
Noctule *Nyctalus noctula*	Widespread but uncommon
Leisler's bat *Nyctalus leisleri*	Widespread but rare
Brown long-eared bats *Plecotus auritus*	Widespread and common
Natterer's bat *Myotis nattereri*	Widespread but frequent
Daubenton's bats *Myotis daubentonii*	Widespread and common
Whiskered bats *Myotis mystacinus*	Widespread but scarce
Brandt's bats *Myotis brandtii*	Widespread but scarce

3.2 Phase 1 Habitat Survey

3.2.1 This section is concerned with individual target notes, which offer greater detail for specific areas. The locations of all the different habitats within the proposed development area north of Wilthorpe Road are illustrated in Figure 2.

Target Note 1 Small stream bisecting the site

3.2.2 A small stream flows in a northerly direction across the site effectively bisecting the proposed development into two unequal parts as illustrated in Figure 2. Moving from north to south across the site the stream is described in five separate sub-target notes 1a – 1f as follows:

1a (small, inundation, pond)

3.2.3 A small inundation pond had developed immediately north of the site (north of the railway embankment) beside the stream as it emerged from the culvert at this location. The small, shallow, pond had developed in the hollow ground beside the left bank (looking downstream). At this point both banks of the stream were very small (<0.3m high and <0.5m wide) and it was likely that the pond had developed as a result of overspill into an adjacent depression within the field. Water depth within the standing water was <10cm and hydrophilic species recorded included floating sweet-grass *Glyceria fluitans*.

1b (stream vegetation at the north end of the site)

3.2.4 The banks of the stream as it flowed towards the railway embankment at the northern end of the proposed development site were asymmetric with the right bank (looking downstream) much larger (c.3.5m high) than the left bank (c. 1.5m high). Coppiced hazel *Corylus avellana* and hawthorn *Crataegus monogyna* were scattered along each bank and were intermittently dense in places and only one mature sessile oak *Quercus petraea* oak (T26) was recorded. Wild garlic *Alium ursinum* frequently fringed the channel although much of banks were covered by exposed earth as illustrated in (Plate 14). Other, occasional herbs included bluebell *Hyacinthoides non-scripta* and ivy *Hedera helix***.** The channel here was 1.5m wide but, as before, very shallow and substrates similar to that described above.

1c (stream vegetation and inflowing ditch)

3.2.5 Running water emerged from a small field drain in the adjacent horse-grazed pasture at this location and flowed into the stream that bisected the site (Plate 15). The very small ditch here was <0.3m wide with banks <0.3m high and water depth <5cm. Where it joined the main stream the banks were asymmetric with the right bank (looking downstream) much larger (c.3.5 - 5m high x c. 4 - 7m wide) than the left bank (c. 1 - 1.5m high x 1 – 2m wide). A fence ran along the top of the right bank which had an angle of slope of 40^0 whilst the left bank here was often almost vertical 90^0. Dense elder *Sambucus nigra* scrub and multi-stemmed semi-mature sycamore *Acer pseudoplatanus* co-dominated the much larger right bank. Additional woody vegetation included occasional hazel *Corylus avellana* and a mature pedunculate oak *Quercus robur* (T27) and alder *Alnus glutinosa* (T28).

3.2.6 In contrast bare earth was often exposed on the smaller, more vertical, left bank (looking downstream) and occasional scattered elder *Sambucus nigra* were recorded on the banks. A mature alder *Alnus glutinosa* (T28) with high bat roost potential occurred on the left bank as illustrated in Plates 16 and 17. A 3m wide buffer strip of rough grassland separated the left bank from the adjacent arable field.

3.2.7 Occasional other plants recorded on both banks were bramble *Rubus fruticosus,* dog's mercury *Mercurialis perennis* and bluebell *Hyacinthoides non-scripta*.

3.2.8 Two rabbit burrows were also recorded in the large right bank (looking downstream).

1d (stream vegetation in the vicinity of Wilthorpe Farm)

3.2.9 To the north of Wilthorpe Farm the small left bank (looking downstream i.e. south to north) was only 0.5m high, and also very steep with angle of slope $>80^0$. Generally, the left bank was smaller than the right bank and varied between 0.7 – 1.5m height (occasionally reaching 2m height) and 1.5 – 2m width. Also, a buffer strip of rough grass and tall ruderals between 2 – 5m wide fringed this bank, between the stream and adjacent arable land. Tall ruderals recorded included raspberry *Rubus idaeus*, bramble *Rubus fruticosus*, broad-leaved dock *Rumex obtusifolius*, creeping thistle *Cirsium arvense*, cleavers *Galium aparine* and bracken *Pteridium aquilinum* (Plate 2). Other occasional plants included dog's mercury *Mercurialis perennis* and male fern *Dryopteris felix-mas.* Scattered trees and shrubs included coppiced lime *Tilia europaea,* coppiced hazel *Corylus avellana*, sycamore *Acer pseudoplatanus*, elder *Sambucus nigra* and sapling ash *Fraxinus excelsior*. Additional woody vegetation included occasional hawthorn *Crataegus monogyna* and rose *Rosa spp..*

3.2.10 Immediately west of Wilthorpe Farm the right bank (looking downstream) had a height of 2 - 2.5m, a width of 1 – 2m wide and a steep 45 -70^0 slope (Plate 1). Further south the right bank increased to a height of c.3m. The banks here were covered in ivy *Hedera helix,* bare earth and leaf litter with occasional nettle *Urtica dioica*, lords-and-ladies *Arum maculatum*, lesser celandine *Ranunculus ficaria*, cow parsley *Anthriscus sylvestris,* garlic mustard *Alliaria petiolata* and daffodil *Narcissus pseudonarcissus ssp.* The latter became more prevalent near the adjacent gardens. Similar to the left bank scattered trees and shrubs recorded were lime *Tilia europaea* (only one recorded), sycamore *Acer pseudoplatanus*, coppiced sycamore *Acer pseudoplatanus*, sapling/semi-mature ash *Fraxinuns excelsior,* cherry *Prunus spp.* and elder *Sambucus nigra*.

3.2.11 The channel here was between 0.5 – 1m wide and was generally very shallow <5cm deep. The channel bed was mostly composed of a mixture of rubble, boulders and pebbles with occasional patches of silt. One dead trunk was also recorded at this location (Plate 2). Slightly further upstream a small section of the stream had been completely overlain by boulders/rubble and rubbish and, where it re-emerged a small 'pool' had developed although the water depth here was still very shallow (<10cm depth) as illustrated in Plate 3.

1e (canalised section of the stream)

3.2.12 Where the stream bordered the houses between Bevcar and Wilthorpe Road short sections of the channel had been 'canalised' and both banks reduced to c.1m height and 0.5m width. In some of these sections the bank habitats (scrub, trees and tall ruderal vegetation) had been replaced with large concrete slabs and the channel was reduced to a width of c. 0.3m (Plate 4). In other sections, however, the banks were covered with dense thickets of sapling aspen *Populus tremula.*

3.2.13 In addition, woodland indicator species recorded on the left bank (and also occasionally on the right bank) included frequent dog's mercury *Mercurialis perennis*. Remnant populations of bluebell *Hyacinthoides non-scripta* and daffodil *Narcissus pseudonarcissus ssp* were also recorded at the top of the right bank.

1f (the stream immediately north of Wilthorpe Road)

3.2.14 The banks of the small section of stream immediately north of Wilthorpe Road were covered in hawthorn *Crataegus monogyna* and coppiced hazel *Corylus avellana*, as shown in Plate 6 (looking downstream). The left bank was only 1m high, and coppiced hazel *Corylus avellana* sat at the top of the 'bank' mound, with moss-covered exposed tree roots below. Dense patches of bramble *Rubus fruticosus* were recorded within the wide buffer strip (up to 9m wide) that occurred between the stream and adjacent arable field.

3.2.15 The right bank at this location was c. 2m high and was partly covered by a privet *Ligustrum spp.* hedge which was situated at the top of the 'bank' mound.

3.2.16 Once again the banks near the large culvert at Wilthorpe Road were partially concreted (Plate 7), although the adjacent ground to the left bank still contained dog's mercury *Mercurialis perennis* and lords-and-ladies *Arum maculatum*. The deepest pool of the whole stream occurred at this location but water depth was still <20cm.

Target Note 2 Horse-grazed pasture

3.2.17 The horse-grazed pasture was dominated by grasses such as rye-grass *Lolium perenne*, with tussocks of cock's-foot *Dactylis gomerata*. Sward height at the time of survey (9/4/13) was generally less than 6cm. Occasional herbs recorded amidst the pasture included creeping buttercup *Ranunculus repens* , ribwort plantain *Plantago lanceolata*, yarrow *Achillea millefolium*, dandelion *Taraxacum agg.*, clover *Trifolium spp.* and chickweed *Stellaria media.* Exposed patches of bare earth were also scattered within the pasture.

3.2.18 A small patch of heavily-poached wet ground occurred at the very eastern edge of the horse-grazed pasture. Creeping buttercup *Ranunculus repens* was abundant amidst the exposed wet mud here.

Target Note 3 Arable land

3.2.19 Arable land occurs to the west of the stream where the stubble of an old barley *Hordeum spp.* crop was recorded together with grasses such as rye-grass *Lolium perenne*, Yorkshire fog *Holcus lanatus* and cock's-foot *Dactylis*

gomerata. Sparsely recorded herbs here included dandelion *Taraxacum agg.* and dock *Rumex spp.*

Target Note 4 Rough grassland/tall ruderal buffer strip

3.2.20 Rough grass, tall ruderals and occasional moss-covered boulders co-dominated a small strip of land (c. 2.5m wide) between the wall fringing Wilthorpe Road and the arable field further north. Frequent herbs recorded were great willowherb *Epilobium hirsutum,* nettle *Urtica dioica*, cleavers *Galium aparine* and cow parsley *Anthriscus sylvestris*. Occasional small mammal (e.g. field vole *Microtus agrestis*) entrances leading into runways between the grassy tussocks were also recorded (refer to TN 10 and Plate 12).

3.2.21 A small strip of this vegetation was recorded within the site adjacent to the small watercourse, the residential and business development to the west and the railway embankment to the north (TN 10), as illustrated in Figure 2.

Target Note 5 Scrub

3.2.22 Overgrown, coppiced hazel *Corylus avellana* was recorded along the top of a small embankment between the Wilco building to the east of the proposed development boundary and the arable crop within the study area. The embankment was c. 2.5m high and was mostly covered in hawthorn *Crataegus monogyna* scrub. Other shrubs recorded were elder *Sambucus nigra*, dogwood, a semi-mature cherry *Prunus spp.* (T14), and privet *Ligustrum spp.* Beneath the woody vegetation the ground flora was mostly a mixture of bare earth, leaf and twig litter, moss-covered boulders and piles of fly-tipping. Occasional tall herbs and umbellifers recorded were bramble *Rubus fruticosus*, nettle *Urtica dioica* and cow parsley *Anthriscus sylvestris*.

Target Note 6 Young broadleaved plantation

3.2.23 Semi-mature, multi-stemmed, willow *Salix spp.* co-dominated the canopy of this young plantation together with grey alder *Alnus incana*, sessile oak *Quercus petraea* and larch *Larix decidua*. Occasional shrubs here included hawthorn *Crataegus monogyna,* elder *Sambucus nigra* and flowering current *Ribes sanguineum*. The ground flora beneath the canopy was occupied by a mosaic of bare earth, leaf/twig litter, rubble and tall ruderals. The latter included bramble *Rubus fruticosus*, cleavers *Galium aparine* and hogweed *Heracleum sphondylium*. Other occasional herbs recorded were cow parsley *Anthriscus sylvestris* and garlic mustard *Alliaria petiiolata*.

Target Note 7 Semi-mature broadleaved plantation

3.2.24 The canopy of this semi-mature plantation was co-dominated by tall, semi-mature grey alder *Alnus incana* and silver birch *Betula pendula*. The trees had been planted in straight lines and were even-aged as illustrated in Plate 9. Frequent clumps of mature pine *Pinus spp.* and holm oak *Quercus ilex* were also recorded together with occasional, semi-mature ash *Fraxinus excelsior.* The understorey/field layer beneath the canopy was co-dominated by frequent pedunculate oak *Quercus robur* and very occasional sycamore *Acer pseudoplatanus*. Self-seeded, young, hawthorn *Crataegus monogyna*, elder

Sambucus nigra and rose *Rosa spp.* were also recorded here together with sparse holly *Ilex aquifolium* and flowering current *Ribes sanguineum*.

3.2.25 The ground flora was a mosaic of bare ground, bramble *Rubus fruticosus* and cow parsley *Anthriscus sylvestris*. Other occasional herbs recorded were bluebell *Hyacinthoides non-scripta*, ivy *Hedera helix,* hogweed *Heracleum sphondylium*, garlic mustard *Alliaria petiiolata* and dandelion *Taraxacum agg.*.

Target Note 8 Strip of ash woodland fringing Greenfoot Lane and adjacent horse-grazed pasture/scattered scrub

3.2.26 A linear length of mature ash *Fraxinus excelsior* woodland and hawthorn *Crataegus monogyna* scrub was sandwiched between Greenfoot Lane and the north-western border of the site. Other occasional woody vegetation was hazel *Corylus avellana* and rose *Rosa spp.* Within the ground flora were woodland indicator species such as bluebell *Hyacinthoides non-scripta* and dog's mercury *Mercurialis perennis*. Other herbs and tall ruderals recorded were ivy *Hedera helix*, cow parsley *Anthriscus sylvestris* and bramble *Rubus fruticosus*. A large but shallow and heavily shaded 'puddle' with water depth <5cm was also recorded within the woodland and hydrophilic species here included great willowherb *Epilobium hirsutum*.

3.2.27 Horse-grazed pasture similar to that described in Target Note 2 occurred to the east of Greenfoot Lane, just east of the proposed development site. The ground here, however, was more heavily poached and clumps of hawthorn *Crataegus monogyna* were scattered throughout.

Target Note 9 Railway embankment (semi-mature broadleaved woodland)

3.2.28 The railway embankment between the footbridge and small underpass at this location was dominated by semi-mature sessile oak *Quercus petraea* with silver birch *Betula pendula* scattered throughout. Frequent hawthorn *Crataegus monogyna*, hazel *Corylus avellana* and elder *Sambucus nigra* were recorded in the understorey/field layer. Tall grasses and ruderals co-dominated the ground flora and plants here included false oat-grass *Arrhenatherum elatius*, bramble *Rubus fruticosus*, cleavers *Galium aparine* and rosebay willowherb *Chamerion angustifolium*.

Target Note 10 Railway embankment (rough grassland and scattered scrub)

3.2.29 The railway embankment at this location was occupied by rough grassland, tall ruderals and scattered scrub (Plate 13). Species recorded were hawthorn *Crataegus monogyna*, elder *Sambucus nigra*, pedunculate oak *Quercus robur* (sapling), bramble *Rubus fruticosus*, rosebay willowherb *Chamerion angustifolium* and false oat-grass *Arrhenatherum elatius*.

Target Note 11 Wooded railway cutting and rough grassland buffer strip

3.2.30 The railway cutting adjacent to the northern boundary of the site at this location was generally covered by semi-mature (and occasional mature) sessile *Quercus petraea* and pedunculate oak *Quercus robur*. A small buffer strip of rough grassland dominated by false oat-grass *Arrhenatherum elatius* separated the wooded railway cutting from the adjacent arable field as illustrated in Plate 11. Within the large amounts of standing dead material

here several entrances to small mammal tunnels were recorded as illustrated in Plate 12.

Target Note 12 Pond, swamp and adjacent broadleaved woodland

3.2.31 A large sluice pond was located approximately 100m west of the north-west corner of the proposed development (Plate 10). Water depth was over 65cm and the open water was a green, colloidal, colour and full of suspended solids. The standing water was frequently interspersed by swamp vegetation dominated by clumps of common reedmace *Typha latifolia*. Other wetland plants recorded adjacent to the pond edge were soft rush *Juncus effusus* and greater tussock sedge *Carex paniculata*. Mature willow *Salix spp.* was frequent in the surrounding woodland which was otherwise similar to the plantation described in Target Note 7. Additional species recorded in the ground flora, however, were male fern *Dryopteris felix-mas*, lords-and-ladies *Arum maculatum*, tufted hair-grass *Deschampsia cespitosa,* hard shield fern *Polystichum aculeatum* and sapling ash *Fraxinus excelsior.*

Hedges

3.2.32 Several hedges fringed the study area and these are described below:

H1

3.2.33 A short length of gappy, hawthorn *Crataegus monogyna*, hedge (1.5m tall) occurred beside a fence at the top of the stream bank (right bank, looking downstream) where it bordered Wilthorpe Farm. Occasional other species recorded were elder *Sambucus nigra* and leylandii *x Cupressocyparis leylandii*.

H2

3.2.34 A short length of hawthorn *Crataegus monogyna* hedge (2m tall) occurred beside a fence along the boundary of the proposed development. This was separated from the adjacent arable field by a 2 – 3m wide buffer of rough grassland and tall ruderal vegetation. Plants recorded here were cock's-foot *Dactylis gomerata*, nettle *Urtica dioica*, bramble *Rubus fruticosus*, spear thistle *Cirsium vulgare*, raspberry *Rubus idaeus*, and occasional daffodil *Narcissus pseudonarcissus ssp* and snowdrop *Galanthus nivalis*.

H3 (Plate 8)

3.2.35 A leylandii *x Cupressocyparis leylandii* hedge (3 – 4m tall) fringed the tennis courts adjacent to the south-west border of the site. This was separated from the adjacent arable field by a 2 – 4m wide buffer of tall ruderal vegetation dominated by bramble *Rubus fruticosus*. A short length of this hedge had been cut to 2m height where it bordered one of the houses further west.

H4

3.2.36 Parallel to H3 described above, and within the site borders, was a length of overgrown hazel *Corylus avellana* coppice (up to 8m tall) amidst which were two sessile oak *Quercus petraea* (T15 and T16) and occasional hawthorn *Crataegus monogyna* and elder *Sambucus nigra*. At this point the buffer strip

between the woody vegetation and adjacent arable field widened to approximately 6-7m and woodland plants such as bluebell *Hyacinthoides non-scripta* were recorded amidst the leaf litter and tall ruderal vegetation. A short length of this hedge had been recently 'layed' where it bordered one of the houses further west.

H5

3.2.37 A hawthorn dominated *Crataegus monogyna* hedge (2m tall x 2m width) bordered the south-eastern border of the site. Other occasional woody species within the hedge were rose *Rosa spp.*, elder *Sambucus nigra* and hazel *Corylus avellana*. Three mature trees, one sycamore *Acer pseudoplatanus* (T22) and two pedunculate oaks *Quercus robur* (T23 andT24) were also recorded within the hedge. Occasional gaps occurred within the hedge and herbs recorded within the ground flora included frequent bluebell *Hyacinthoides non-scripta* and occasional foxglove *Digitalis purpurea*, cleavers *Galium aparine*, ivy *Hedera helix*, nettle *Urtica dioica* and bramble *Rubus fruticosus*.

H6

3.2.38 A fence and an overgrown hawthorn *Crataegus monogyna* hedge (c. 5m tall) bordered the base of the wooded slopes here and formed the western boundary of the site. The base of the hedge was fringed with rubbish which had presumably fallen down from the top of the slopes where it had been fly-tipped. A buffer strip of rough grassland (3.5m wide) occurred between the hedge and adjacent arable field.

3.3 Bat Roost Potential Survey in Trees

2.5.16 Thirty three individual trees and shrubs were examined for their bat roosts, and individual descriptions of their bat roost potentials are given in Appendix 2. A summary of the bat roost potential of each tree/shrub is given in Table 2.

3.3.1 Four mature trees beside the stream that bisected the proposed residential development were recorded with a high bat roost potential. These trees were an ash *Fraxinus excelsior* (T11), an alder *Alnus glutinosa* (T28, Plates 16 and 17), a sessile oak *Quercus petraea* (T8) and a pedunculate oak *Quercus robur* (T31, Plates 18 and 19). The locations of each tree are illustrated in Figure 3. A further seven trees, again located beside the stream, were identified with a medium bat roost potential. These were an ash *Fraxinus excelsior* (T30), two sycamore *Acer pseudoplatanus* (T1 and T2), a sessile oak *Quercus petraea* (T26), an oak hybrid *Quercus x rosacea* (32), a lime *Tilia europaea* (T5) and an over-mature hawthorn *Crataegus monogyna* (T13, Plate 5).

Table 2 Bat roost potential of trees/shrubs within the proposed development site

Tree species	High bat roost potential	Medium bat roost potential	Low bat roost potential	Nil bat roost potential	Total no. of trees
Cherry spp. *Prunus spp.*				1 (T14)	1
Hawthorn *Crataegus monogyna*		1 (T13)			1
Ash *Fraxinus excelsior*	1 (T11)	1 (T30)	2 (T3, T33)	3 (T7, T12, T25)	7
Sycamore *Acer pseudoplatanus*		2 (T1, T2)	3 (T4, T10, T22)	1 (T6)	6
Alder *Alnus glutinsa*	1 (T28)				1
Grey alder *Alnus incana*			4 (T18 – T21)		4
Sessile oak *Quercus petraea*	1 (T8)	1 (T26)	2 (T15, T16)	1 (T29)	5
Pedunculate oak *Quercus robur*	1 (T31)		3 (T23, T24, T27)		4
Oak hybrid *Quercus x rosacea*		1 (T32)			1
Wych elm *Ulmus glabra*			1 (T9)		1
Silver birch *Betula pendula*			1 (17)		1
Lime *Tilia europaea*		1 (T5)			1
Total	**4**	**7**	**16**	**6**	**33**

3.4 Fauna

Birds

3.4.1 A total of eleven bird species were recorded in the study area during the Phase 1 Habitat Survey. These were blackbird, blue tit, goldfinch, great tit, greenfinch, grey partridge (two pairs), house sparrow, long-tailed tit, magpie, mallard (near large adjacent pond) and robin. In addition, a sparrowhawk flew over the site.

Mammals

3.4.2 Rabbit burrows were recorded in the stream bank and several small mammal (e.g. field vole *Microtus agrestis*) entrances leading into runways between the grassy tussocks were recorded in the rough grassland around the edge of the site.

4 NATURE CONSERVATION VALUE

4.1 Criteria for evaluation

4.1.1 In order to determine the significance of any development on the proposed land for development upon ecological interests, it is necessary to determine the value and sensitivity of each area to be affected. It has become standard practice for bodies designating sites of nature conservation interest to evaluate sites according to criteria identified in the Nature Conservation Review (Ratcliffe, 1977) and in Guidelines for the selection of biological SSSIs (NCC 1989). Briefly these criteria are:

- size (extent);
- diversity;
- rarity;
- fragility;
- typicalness;
- recorded history;
- position within an ecological/geographical unit;
- potential value;
- intrinsic value.

4.1.2 These criteria have been used to help assess the International and/or National, Regional, High Local (County), Moderate Local (District), Low Local (Parish) or Negligible overall value of the fauna and flora within a site. Examples of the levels of ecological value that have been assigned to the fauna and/or flora of specific areas are summarised in Table 3. The examples follow government guidance on the nature conservation aspects of planning 'Planning Policy Statement 9: Biodiversity and Geological Conservation' (DCLG 2006). A supporting document 'Planning for Biodiversity and Geological Conservation - A Guide to Good Practice' was published by the Office of the Deputy Prime Minister in the same year (ODPM 2006).

4.1.3 In February 2006 Defra published the first national guidelines for non-statutory nature conservation site systems under the generic term "Local Sites". These may be of Regional, High Local (County), Moderate Local (District) and in some cases even Low Local (Parish) overall value for the fauna and/or flora within a site. The relatively new guidelines reiterate most of the selection criteria identified in the Nature Conservation Review (Ratcliffe, 1977). In addition, however, "intrinsic appeal" is further interpreted as values for appreciation of nature and learning. Also important is that the Defra guidelines require that all sites (rather than representative samples of the best examples) which meet the selection criteria are designated as non-statutory "Local Sites". In Yorkshire the Defra guidelines are being adopted with the generic term "Local Sites" subdivided into Local Wildlife Sites and Local Geological Sites, as set out in the national guidelines (WYJS 2011; BMBC 2011).

4.1.3 PPS 9 acknowledges that, in addition to both statutory and non-statutory designated sites of national and regional importance, networks of undesignated natural habitats can also provide a valuable resource. For example PPS 9 states that such areas "…. can link sites of biodiversity

importance and provide routes or stepping stones for the migration, dispersal and genetic exchange of species in the wider environment" (PPS 9 paragraph 12). Guidance is also given for the re-use of previously developed land which has significant biodiversity or geological interest of recognised local importance. In such cases the recommendation is that "…local planning authorities, together with developers, should aim to retain this interest or incorporate it into any development of the site" (PPS 9 paragraph 13). Also of relevance is the recognition that development proposals "… provide many opportunities for building-in beneficial biodiversity or geological features as part of good design" (PPS 9 paragraph 14).

4.1.4 In summary it is not uncommon for otherwise unpromising (and undesignated) sites to support species highlighted as being of conservation interest or concern in one of a number of published lists. In such cases, it becomes necessary to consider the value of the site on the basis of its more noteworthy species. Thus, an overall site assessment involves variable weighting of the criteria used for the selection of statutory sites of international or national value as well as non statutory "Local Sites" of local value. Some areas may be important for a combination of attributes, whilst others are rated highly for only a single important feature.

4.1.5 Detailed advice on the various categories of ecological value that can be assigned to a site are described by Regini & Tofts (2000). These, together with their relationship to non statutory "Local Sites", are illustrated in Table 3. In particular, the selection criteria for "Local Wildlife Sites" in Yorkshire have been revised to bring them into line with the Defra (2006) national guidance (WYJS 2011 and BMBC 2011).

Table 3: Ecological value of habitats (modified from Regini and Tofts - 2000)

Level of Value	Examples
International	Internationally designated or proposed sites, or otherwise meeting criteria for international designation. Sites supporting populations of internationally important species.
National	Nationally designated sites such as SSSIs, or non-designated sites meeting SSSI designation. Those containing viable areas of any key habitat identified in the UK Biodiversity Action Plan. Sites supporting viable breeding populations of Red Data Book species (excluding scarce species), or supplying critical elements of their habitat requirements.
Regional	Sites containing viable areas of threatened habitats listed in a Regional Biodiversity Action Plan (or some Natural Areas), comfortably exceeding the Defra 2006 guidelines for non-statutory nature conservation sites but not meeting SSSIs selection criteria. The sites may include those that support viable breeding populations of Nationally Scarce species or those included in the Regional Biodiversity Action Plan (or some Natural Areas) on account of their rarity, or supplying critical elements of their habitat requirements. Such sites would undoubtedly all qualify as "Local Wildlife Sites" (Defra 2006) but may otherwise be known as Sites of Scientific Importance, Sites of Biological Importance, Sites of Importance for Nature Conservation, Sites of Ecological or Geological Importance etc.
High Local (County)	Sites meeting the criteria for a county or metropolitan area designation. Such sites are very likely to qualify as "Local Wildlife Sites" under the Defra guidelines (Defra 2006) but may otherwise be known as Sites of Scientific Importance, Sites of Biological Importance, Sites of Importance for Nature Conservation, Sites of Ecological or Geological Importance etc. They may also include sites that include amenity and educational criteria in urban areas, ancient semi-natural woodland areas and designated Local Nature Reserves. Other sites included may contain viable areas of any key habitat type identified in the County Biodiversity Action Plan (or some Natural Areas). Sites supporting viable breeding populations of species known to be county/metropolitan rarities, or supplying critical elements of their habitat requirements (e.g. featuring in a county 'red data book' or included in the county/metropolitan Biodiversity Action Plan or some Natural Areas), or supplying critical elements of their habitat requirements.
Moderate Local (District)	Undesignated sites, or features considered appreciably to enrich the habitat resource within the context of the Borough or District, or included in the Borough or district Biodiversity Action Plan or some Natural Areas. Amenity and educational functions will be recognised in urban areas. Sites supporting viable breeding populations of species listed as rare in the District or Borough Biodiversity Action Plan or some Natural Areas, or supplying critical elements of their habitat requirements. These sites would only be included as "Local Wildlife Sites", however, if they passed the criteria recommended by the Defra guidelines (Defra 2006)
Low Local (Parish)	Undesignated sites, or features considered appreciably to enrich the habitat resource within the context of the Parish or neighbourhood (e.g. a species-rich hedgerow). These sites may or may not, however, qualify as "Local Wildlife Sites" under the Defra guidelines (Defra 2006)
Negligible	Low grade and widespread habitats.

4.1.6 Further government guidance on the protection of water resources requires flood risk assessments to take into account all types of flooding, including surface water flooding (DCLG 2006 – revised 2010 and DCLG 2009). This is a particularly pertinent issue to the proposed residential development within the Land to the North of Wilthorpe Road, where excess surface water run-off could, potentially, cause regular flooding downstream of the site. Planning Policy Statement 25: Development and Flood Risk (paragraph 5) makes it clear that any off-site impacts should not increase flood risk (DCLG 2006 – revised 2010).

4.1.7 Planning Policy Statement 25 also advises that "Planning applications for development proposals of 1 hectare or greater in Flood Zone 1 and all proposals for new development located in Flood Zones 2 and 3 should be accompanied by a Flood Risk Assessment (DCLG 2006 – amended 2010, paragraph E9, pp32). Note that Flood Zone 1 = Low Probability, Flood Zone 2 = Medium Probability, Flood Zone 3 = High Probability. Advice is also given on how Regional Planning Bodies (RPBs) and Local Planning Authorities (LPAs) should consult the Environment Agency on flood risk issues when preparing their Regional Spatial Strategies (RSSs).

4.1.8 Finally, paragraphs 22-23 of PPS25 make it clear that it is the responsibility of the developer to consider the flood risk issues at a site. A wide range of good Surface Water Flood Risk Assessment case studies are described in the Practice Guide (DCLG 2009). These give details of all the different ways in which the planning system has been used to encourage the use of Sustainable Drainage Systems (SUDS) and the development of surface water plans. The PPS25 Practice Guide notes that "SUDS can achieve multiple objectives; they remove pollutants from urban run-off at source, control surface water run-off from developments, ensure that new developments do not increase flood risk downstream, and combine water management with green space which can increase amenity, recreation and biodiversity value" (DCLG 2009, paragraph 5.13 pp110).

4.1.9 The evaluation of fauna and flora within the Land to the North of Wilthorpe Road that would be impacted by the proposed residential development is based on survey work described in this report. Information gained from the desk-based study is referred to wherever appropriate in each evaluation.

4.2 Habitats

4.2.1 As described in the following paragraphs (4.2.2 – 4.2.6) none of the individual habitats within the study area meet the specific ecological criteria required to qualify as "Local Wildlife Sites" (BMBC 2011).

Arable

4.2.1 The arable land within the study site is of low botanical value

Species-poor, horse-grazed pasture and rough grassland

4.2.2 All the species-poor horse-grazed pasture within the Land North of Wilthorpe Road is ubiquitous throughout the British lowlands and is of relatively low botanical value. Similarly, the narrow strip of species-poor rough grassland recorded along the boundaries of the site, and also beside the small stream, is

also virtually ubiquitous throughout the lowlands of Britain and of relatively low botanical value.

Broadleaved plantations, scattered scrub, hedges and tall ruderal communities

4.2.3 The broadleaved plantations, scattered scrub, species-poor hedges and tall ruderal habitats immediately adjacent to (and sometimes within), the study area are virtually ubiquitous throughout the lowlands of Britain and are each of relatively low ecological value. Thus, none of these habitats have been included within the boundaries of the adjacent Barnsley Canal at Wilthorpe LWS No. 633 (illustrated in Figure 2).

4.2.4 Nevertheless, these habitats often occurred as linked mosaics. For example, a hedgerow (H6) ran alongside the broadleaved plantation and sluice pond adjacent to the west of the site (TN 7 and TN 12) which was itself bordered by a strip of tall ruderal vegetation. These were effectively linked to the Barnsley Canal at Wilthorpe Local Wildlife Site (LWS No. 633) further east by the scattered scrub, broadleaved woodland and tall ruderal vegetation of the railway embankment along the northern boundary of the site. Together these habitats provide important shelter, foraging and/or breeding for a range of wildlife including many terrestrial invertebrates, small mammals and birds. Thus, their collective value can be considered of some (low local) conservation value.

Small Watercourse (small beck flowing south to north and bisecting the site)

4.2.5 As noted in paragraphs 3.2.12 and 3.2.16 occasional sections of the small stream adjacent to the existing houses at the southern end of the site had been straightened and re-inforced with concrete. This had resulted in a major reduction in the diversity and nature of both its in-channel habitats and those on the beckside. In addition, water depth within the channel was almost uniformly shallow throughout, and there was very little diversity in terms of flow (i.e. riffles, ponds and slacks).

4.2.6 Nevertheless, the banks exhibited a reasonable structural diversity that included, for example, dead wood, scattered and dense scrub, several mature trees and the remnants of a woodland ground flora. These included bluebell *Hyacinthoides non-scripta,* dog's mercury *Mercurialis perennis,* and wild garlic *Allium ursinum.* Together these habitats form a linear wildlife corridor across the site that provides important shelter, foraging and/or breeding for a range of wildlife including many terrestrial invertebrates, amphibians, small mammals and birds. Thus, their collective value can also be considered of some (low local) conservation value.

4.3 Fauna

Mammals

4.3.2 Four mature trees beside the watercourse that bisected the proposed residential development were recorded with a high bat roost potential. These trees were an ash *Fraxinus excelsior* (T12), an alder *Alnus glutinosa* (T28), a sessile oak *Quercus petraea* (T8) and a pedunculate oak *Quercus robur* (T31). The locations of each tree are illustrated in Figure 3.

4.3.3 In addition, all the trees and shrubs within the site are host to numerous insects and so provide an important food source for bats (a protected species). Also, the watercourse (despite its partially canalised bank and poor channel features), is likely to have some populations of freshwater invertebrates, providing yet another source of food for bats within the site.

Birds

4.3.4 A total of 12 bird species were recorded during the Phase 1 Habitat Survey and although none are rare, one (the grey partridge *Perdix perdix*), nevertheless qualifies as a Red List bird of high nature conservation priority. This is because the UK population of grey partridge has declined by over 50% over the entire period used for assessments since 1969 (Eaton *et. al.* 2009). They are also categorised as a Species of European Conservation Concern (SPEC). Two pairs of grey partridge *Perdix perdix* were recorded within the horse-grazed and arable fields of the site.

4.3.5 The grey partridge is also listed within the Barnsley Biodiversity Action Plan (Species Action Plan SAP5) and, although a comprehensive survey has not been undertaken, there are thought to be over 100 pairs within the borough (Barnsley Metropolitan Borough Council 2009). These birds nest on the ground in hedge bottoms, grass margins and nettle beds. Dead, tussocky grass and tall ruderals left over from the previous year such as that recorded along the perimeter of the site (TN 4 and TN 10) is therefore particularly attractive as nesting cover. So, too is the woody vegetation recorded on the banks of the watercourse and the vegetation beneath some of the perimeter hedgerows.

Great Crested Newts

4.3.6 It is likely that the records for great crested newts *Triturus cristatus* within the Barnsley Canal at Wilthorpe LWS No. 633 are part of a metapopulation i.e. a series of sub-populations that are linked by dispersal of individuals. Thus the various ponds and/or areas of standing water within LWS No 633 are likely to be part of a 'pond cluster' between which individual great crested newts (and hence genes) can move with varying frequency. It should also be noted that a large sluice pond, with suitable habitat for breeding great crested newts, was recorded at just over 100m to the west of the proposed development (Figure 1, Target Note 12). It is thus possible that this pond may also be part of the 'pond cluster' described above.

4.3.7 Of particular relevance to this report is that whilst great crested newts rely on waterbodies for breeding they will otherwise spend much of their lives on land. Thus adults may hibernate in the winter underground between tree roots, in mammal burrows, or above ground under suitable refuges like deadwood or rubble piles. Outside of the hibernation period, great crested newts require refuge from extremes of weather and will rest in dense vegetation, under refuges or underground but will also forage on land, taking a range of invertebrate prey. During their terrestrial phase great crested newts can move over considerable distances (up to 1.3km from breeding sites) and may often use sites with terrestrial refuges (such as grassland, scrub, woodland or hedgerows) within 500m of a pond. Thus, the quality of terrestrial habitat near to breeding ponds is important, as are the lack of barriers to dispersal (such as fast flowing rivers, or very busy roads).

4.3.8 In this case, the mosaic of habitats recorded on the embankments and cuttings of the railway line along the northern border of the site, described in Target Notes 9 – 11, will provide ideal terrestrial habitat for great crested newts. The fast moving trains along the railway line are intermittent and, whilst providing a 'part-time' barrier to dispersal, great crested newts are therefore also often likely to successfully cross over the line. There is therefore a high risk that outside of the breeding season great crested newts will be present within suitable terrestrial habitats of the proposed residential development.

4.3.9 There are a number of suitable habitats with terrestrial refuges for great crested newts within the proposed development site. These include the strip of dead, tussocky grass and tall ruderals recorded along the perimeter of the site (TN 4 and TN 10) and the streamside habitats of the small watercourse that bisects the site (TN 1b - f). Additional habitats include all the hedgerows that partially border the site (H1 – H6) as well as the adjacent broadleaved plantations and woodland (TN 6, 7 and 12) to the west.

5 ECOLOGICAL IMPACT ASSESSMENT

5.1 Introduction

5.1.1 Of major importance in the assessment of an overall impact score for any development is whether the development is considered in isolation and/or in the context of other potential development within the area. In either case the ecological impacts of such development work and the degree of impact on a semi-natural habitat (and/or protected species) is dependent on:

the area of the habitat(s) directly and indirectly affected;

the value of the habitat(s) affected;

the duration of the disturbance;

the success of best practice and mitigation measures;

the potential success of habitat re-creation during and after site development work.

5.1.2 An Indicative Masterplan of the proposed residential development is illustrated in Figure 5 and in this report the terms used to describe ecological impacts are outlined briefly in Table 4.

Table 4: Criteria for Determining the Magnitude of Impact

Magnitude of Impact	Definition of impact
Major negative	The proposal (either on its own or with other proposals) may adversely affect the integrity of the site, in terms of the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and / or the population levels of species of interest.
Intermediate negative	The sites integrity will not be adversely affected, but the effect on the site is likely to be significant in terms of its ecological objectives. If, in the light of full information, it cannot be clearly demonstrated that the proposal will not have an adverse effect on integrity, then the impact should be assessed as major negative
Minor negative	Neither of the above apply, but some minor negative impact is evident. (In the case of Natura 2000 sites a further appropriate assessment may be necessary if detailed plans are not available).
Neutral	No observable impact in either direction
Positive	Impacts which provide a net gain for wildlife overall.

Magnitudes of impact follow those shown in Table 4.11 of the 'Guidance on the Methodology for Multi-Modal Studies – Volume 2' (DETR 2000)

5.1.3 Impacts can be divided into two main types, direct or indirect. For example the removal of existing vegetation to enable the proposed residential development would constitute a direct impact. Indirect impacts are where other areas of habitat or species are affected by the scheme. An example would be increased disturbance to animals during the proposed works. These

indirect impacts need to be predicted and are based in this report on ecological principles and previous experience.

5.1.4 Additional factors are the time-scale of the impact, long term impacts generally being worse than short term ones, and the reversibility of the impact. For example, the proposed residential development would entail short-term impacts such as a temporary increase in disturbance levels but would also include long-term impacts such as permanent losses of terrestrial habitat and a reduction in some species.

5.1.5 An overall assessment score was determined for the proposed residential development by combining the nature conservation value of habitats and/or species with the appraisal of the magnitude of the impacts. The terms used to estimate the overall assessment score are shown in Table 5, and the scores are given in the last column of Table 6.

Table 5: Estimating the Overall Assessment Score

Magnitude of potential impact	Nature conservation value of sites damaged or improved				
	Very high	High	Medium	Local (High – Low Local)	Negligible
Major negative	Very serious adverse effect	Very serious adverse effect	Significant adverse effect	Minor - Significant adverse effect (depending on local category)	Neutral
Intermediate negative	Serious adverse effect	Serious adverse effect	Significant adverse effect	Minor – Significant adverse effect (depending on local category)	Neutral
Minor negative	Minor adverse effect	Minor adverse effect	Minor adverse effect	Minor adverse effect	Neutral
Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Positive	Major gain	Major gain	Significant gain	Minor - Significant gain (depending on local category)	Neutral

The overall assessment score follow those shown in Table 4.14 of the 'Guidance on Methodology for Multi-Modal Studies – Volume 2' (DETR 2000)

5.2 Direct Impacts

5.2.1 The magnitudes of the direct impacts from the proposed residential development are summarised in the penultimate (seventh) column of Table 6. The format of Table 6 follows the guidance set out in the Biodiversity Sub-Objective described in the 'Guidance on Methodology for Multi-Modal Studies – Volume 2' (DETR 2000). The overall impact assessment score, taking into account the various assumptions described in Table 6 and the recommended mitigation measures described in Chapter 6, is summarised in the final column of Table 6.

5.2.2 Direct impacts include the clearance of vegetation and the Indicative Masterplan (Figure 5) indicates that 5.9ha of arable land and 1.32ha of horse-grazed pasture (total 7.22ha) would be lost to the residential development. Whilst of low botanical value these fields are, nevertheless, used by grey partridge *Perdix perdix* a Red List bird of high nature conservation priority. This bird is strictly a ground bird, preferring continuous grass or herbage, not appreciably higher than its head, and it usually occurs within at most a few hundred meters of fairly tall or dense cover, which plays an essential role in nesting (Cramp *et. al.* 1982). The proposed residential housing development would displace this bird.

5.2.3 Vehicle access into the site from the Redbrook Business Park would also require the removal of several trees and shrubs (approximately 240m^2 woody vegetation). In addition, internal vehicle access into the adjacent tennis courts and across the watercourse would require further tree and shrub removal (approximately 10m section of hedge, H4, and 100m^2 of wooded bank vegetation respectively). Finally, small areas of tall ruderal and rough grassland habitats would also require removal at these access points.

5.2.4 Of particular relevance to the ecological impacts of the proposed residential development at Wilthorpe, however, is the advice within the Barnsley Draft Allocations DPD Document to develop such sites in the context of the 'Dayhouse Farm Park'. JRP Associates explain that the "… Dayhouse Farm Park is in Urban Barnsley between Wilthorpe and Barugh Green and is currently a large area of open space providing a buffer between the settlements and countryside. Due to the proposed housing and employment sites in this location there is potential to secure improvements to further enhance this function, primarily focusing on habitat improvement and existing facilities such as Wilthorpe Park. This will strengthen the relationship between the settlements and countryside and provide a gateway to the countryside, encouraging users to enjoy the nearby Dearne Valley Park and Local Wildlife Sites such as the Barnsley Canal at Withorpe" (JRP Associates 2012).

5.2.5 The proposed residential development has therefore taken into account the aspirations of the 'Dayhouse Farm Park' and has allocated 4 hectares to the north of the site for retention as green space, as shown in Figures 5 and 6. In addition, a central area has been allocated as an informal public open space (which may also include a minimum LEAP standard play area). Also, a central buffer zone or 'greenway' has been allocated to the west of the watercourse, effectively linking the green space to the north with Wilthorpe Road to the south.

5.2.6 Finally, a potential location for a SUDS (Sustainable Urban Drainage System) detention basin has been allocated within the northern part of the site as illustrated in Figures 5 and 6. As noted in paragraph 4.1.8 the construction of a detention basin can achieve multiple objectives such as removing pollutants from urban run-off at source and controlling surface water run-off. At the same time the detention basin can be designed to provide a permanent pool of water with rich habitats important for aquatic invertebrates, wetland plants and amphibians. Such careful design and planting would enhance both its amenity and wildlife value.

5.2.7 The magnitudes of the direct impacts from the proposed residential development are summarised in the penultimate (seventh) column of Table 6.

These include the clearance of vegetation and its replacement by a significant amount of hard, impermeable surfaces which would lead to a substantial increase in surface water run-off. The latter, however, could be mitigated by the construction of a detention basin which could also provide significant wildlife benefits. Additional mitigation could include the enhancement of the retained green spaces of the proposed development to provide significant biodiversity improvements. The overall impact assessment score, taking into account the various assumptions described in Table 6 and the recommended mitigation measures described in Chapter 6 of this report, is summarised in the final column of Table 6.

5.2.8 Provided all the assumptions included in Table 6 and recommended mitigation measures outlined in Chapter 6 are implemented the table shows that the minor negative impacts from the proposed residential development could mostly be transformed into positive outcomes.

Table 6: Ecological Impact Assessment of the proposed residential development on the land to the north of Wilthorpe Road, Barnsley

Area / Species	Description of feature/ attribute	Scale	Importance	Trend	Value	Magnitude of Impact	Overall Impact Score*
Non-statutory undesignated habitats							
The study area	Arable land and species-poor pasture	Low	Low botanical value	Both habitats are abundant	Negligible	Major negative (conversion of permeable ground to impermeable hard surfaces with increased flood risk)	Neutral[1]
Woody vegetation and tall ruderals	Broadleaved plantation; bankside scrub and trees along a small section of watercourse	Low	Low botanical value	Continuing loss of tall ruderals and woody habitats through development and disturbance, including recreation; possible increased flood risk due to increased surface water run-off.	Low local	Minor negative (permanent loss of c.340m^2 vegetation and of c.10m length of hedgerow)	Positive[1] (significant gain)
Protected and/or Notable Species							
Bats	All British bat species	County	All bat species are protected both nationally and in Europe[2].	British bats have undergone significant declines in numbers in this country[2].	Local	Minor negative Small loss of foraging and/or roosting habitat from the loss of woody vegetation.	Positive[1,3] (significant gain)

Area / Species	Description of feature/ attribute	Scale	Importance	Trend	Value	Magnitude of Impact	Overall Impact Score*
Protected and/or Notable Species							
Great Crested Newts	Great Crested Newts	County	Great crested newts are protected both nationally and in Europe[2].	Great crested newts have undergone significant declines in numbers in this country[2].	Local	Minor negative Small loss of foraging and/or sheltering habitat from the loss of woody vegetation.	Positive[1,4] (significant gain)
Grey Partridge	Grey Partridge	District	Red List Bird of high nature conservation priority	This bird declined by over 50% over the entire period used for assessments since 1969[5]	Local	Minor negative Loss of foraging habitat	Minor negative

* The Overall Impact Score assumptions are described in the following footnotes

(1) Four important assumptions of the positive overall impact score are:

- Four hectares to the north of the site and an additional central buffer zone fringing the watercourse would be allocated for retention as green space, as shown in Figure 5.
- All the habitats within the allocated green spaces of the proposed residential development that are shown in Figure 5 would be significantly enhanced to improve their biodiversity value as illustrated in Figure 6. Refer to Chapter 6 for further details.
- A detention basin would be constructed for SUDS as illustrated in Figures 5 and 6 and this would be designed to provide a permanent pool of water with rich habitats important for aquatic invertebrates, wetland plants and amphibians. Refer to Chapter 6 for further details.
- A temporary fence would be erected around the proposed residential development to ensure that adjacent habitats were protected during the construction period.

(2) Selman, R., Dodd, F. and Bayes, K. (1999) *A Biodiversity Audit of Yorkshire and The Humber*. ISBN 1 901930 12 2.

(3) The overall positive impact score assumes that active measures for the conservation of bats would be undertaken as part of the development. These include the provision of artificial bat roosts and the provision of further on-site bat foraging habitat such as the extension and enhancement of woody communities and provision of a new wetland habitat. Refer to Chapter 6 for further details.

(4) The overall positive impact score assumes that active measures for the conservation of great crested newts would be undertaken as part of the development. These include the provision of further on-site foraging and sheltering habitat, such as an extension and enhancement of woody communities as well as the provision of a new wetland habitat for, possibly, breeding purposes. Refer to Chapter 6 for further details.

(5) Eaton MA, Brown AF, Noble DG, Musgrove AJ, Hearn R, Aebischer NJ, Gibbons DW, Evans A and Gregory RD (2009) *Birds of Conservation Concern 3: the population status of birds in the United Kingdon, Channel Islands and the Isle of Man.* British Birds 102, pp296-341.

5.3 Indirect Impacts

5.3.1 During the course of any proposed development there would be a number of indirect impacts arising from the process. Disturbance can arise from a variety of sources such as noise, vibration, incidental vehicle traffic and trampling. The severity of any impact depends upon the type of disturbance, duration and sensitivity of the area. In addition, whilst some species can adapt to an increase in such pressure, many species are unable to cope with a generally higher level of disturbance and may therefore be reduced in the short-term.

5.3.2 For example, indirect impacts of the scheme to populations of bats may include an increase in the artificial lighting of the site having an adverse effect on the nocturnal foraging patterns of some bat species. Other indirect impacts may include the increase in rubbish within adjacent areas and also an increase in the local predation rates of small mammals and birds by domestic cats. However, provided the mitigation measures outlined in Chapter 6 are implemented, the indirect impacts regarding these issues are predicted to be negligible.

6 RECOMMENDED MITIGATION MEASURES

6.1 Introduction

6.1.1 This Chapter outlines mitigation work to reduce the ecological impact of the proposed residential development as described by the seventh (penultimate) column in Table 6 and to largely transform them into a positive outcome. These should be carried out both prior to and during the schedule of works. The recommended mitigation measures are divided into sections on the following issues:

- the timing of works
- the methods of working
- the retention, maintenance and enhancement of existing habitats
- habitat creation measures
- fauna
- access and lighting
- future management and monitoring.

6.2 Timing of works

6.2.1 To reduce the impact of the proposed residential development it is important that the works are timed to minimise the effects on breeding species and/or sensitive habitats. Times for the work are listed in Table 7.

Table 7 Timings for the works

Species	Sensitive period	Time for works
Bats	Summer and/or Winter	If any trees to be removed include those identified with a medium or high bat roost potential then the work should be undertaken when any impact(s) to roosting bats are minimised i.e. when bats have finished hibernating but not started breeding (April) or have finished breeding but not started hibernating (October). In addition, before felling the tree it should be examined for the presence/absence of a bat roost using ladders and tree climbing equipment or be accessed using a mobile elevation work platform. Should bats be present then appropriate precautions should be implemented to transfer the roost *in situ* onto an adjacent tree during the felling operation.
Birds	1st March – 31st August	Generally avoid felling of trees during this period to reduce any impact to breeding birds.

6.2 Methods of working

6.2.1 A detailed method statement should be prepared for adherence by the contractor to ensure retention where possible of existing vegetation within a proposed landscape scheme and after-care treatment. In addition, the methods by which all retained trees are protected (for example by temporary fencing) during the construction phase should be clearly described. Also

important is that the document addresses issues such as the retention of any felled timber to decay in mitigation areas of the site for the provision of invertebrate habitats, and shelter and/or hibernation sites for other wildlife.

6.2.2 From an ecological perspective the statement should also ensure that the location of stored topsoil and building materials be addressed. Such materials should not, for example, be stored in the vicinity of the central watercourse or adjacent trees or shrubs.

6.3 Retention, maintenance and enhancement of existing habitats

Adjacent hedgerows

6.3.1 The locations of the existing hedgerows are illustrated in Figure 4 and these should all be protected during the construction period by a temporary fence. In addition, it is recommended that the existing, intermittent lengths of hedgerow bordering the western edge of the site (H5) be linked together with new sections of native, species-rich, hedgerow. This is illustrated in Figure 6 and such a mitigation measure would contribute to the overall positive ecological outcome of the scheme due to the inherent value of native hedgerows for biodiversity.

6.3.2 Research has shown that native trees and shrubs support much greater numbers of species of insect and mite species than exotic or recently naturalized species (Kennedy and Southwood, 1984). For this reason the use of native shrubs for the creation of any proposed hedgerow is extremely important for nature conservation. The aim would be to create small hedgerow thickets that provide dense shelter for breeding and feeding birds, mammals, amphibians and invertebrates. A recommended specification for the planting of such a native hedgerow is shown in Table 8.

Table 8 Planting specification for new native hedgerows (Figure 6)

Habitat	%	Latin name	Common name
New native hedgerow (planted at 6 whips/m)		Shrubs and climbers (94%):	
	36.0	*Crataegus monogyna*	Hawthorn
	36.0	*Corylus avellana*	Hazel
	8.0	*Prunus spinosa*	Blackthorn
	7.0	*Sambucus nigra*	Elder
	4.0	*Viburnum opulus*	Guelder rose
	3.0	*Lonicera periclymenum*	Honeysuckle
		Trees (6%):	
	1.0	*Quercus robur*	Pedunculate oak
	1.0	*Quercus petraea*	Sessile oak
	1.0	*Ulmus glabra*	Wych elm
	1.0	*Betula pendula*	Silver birch
	1.0	*Ilex aquifolium*	Holly
	1.0	*Sorbus aucuparia*	Mountain ash

6.3.3 The trees and shrubs should be planted in double staggered rows at 300mm spacing, with the rows about 500mm apart and each one should be protected from rabbit grazing by a tree guard, 750mm high. The latter should be removed and disposed of c. 5 years on from the planting period. Once established (c.5 year period) it is recommended that trimming be done in autumn on a rotational basis, every 3-4 years, to allow some berries to remain on the bushes to feed birds in winter and avoid disturbing nesting birds in spring. It is also important to ensure that some of the trees within the planted hedgerow are marked and allowed to grow into maturity.

Enhancement of the allocated green space areas

6.3.4 There are opportunities to enhance the wildlife habitat within the allocated green space areas of the scheme, which are currently arable and horse-grazed fields (refer to Figure 6). These have both been categorised as species-poor areas of low ecological value and it is recommended that a range of enhancement and diversification techniques are used to increase their species richness, as illustrated in Figure 6. These include the following techniques:

- Build on what already exists: introduce appropriate wild flower plugs and transplants where the turf has been removed at the point of planting into some of the grassland/arable areas. Appropriate herbs for introduction are listed in Table 9. In addition, research has shown that yellow rattle *Rhinanthus minor*, a hemiparasitic plant that inhibits the growth of the surrounding grass species, could be used to manipulate the balance between grass and flower species in established grasslands and/or arable areas (Crofts and Jefferson 1999). The seed should be sown in late summer or autumn onto the short grass which allows it to overwinter and vernalise. The grass should not be cut from early March through until the end of July to allow the seed to ripen and set. If allowed to flower and set seed and other conditions are favourable, yellow rattle will spread rapidly and it will suppress grass growth and help the establishment of other wild flowers from seed in following years.

- Strip the topsoil in other sections to a depth of 20-25cm to remove most of the soil nutrients and seed bank which can contain some highly competitive species such as docks, thistles and arable weeds. The topsoil could be sold or used for planting trees and shrubs. The range of plants in the recommended grassland mixes for these areas should include species characteristic of species-rich neutral grassland communities (such as National Vegetation Classification, NVC MG5). However, additional species may be included to suit the soils within the study area. The mix should be sourced from wild seed stock which is obtained from good quality wild populations and making hand collections of the species. Particular care should be taken to ensure that non-native wildflowers, or fodder varieties such as Fodder bird's foot trefoil *Lotus corniculatus* var. *sativus*, are excluded from the mixes. A recommended specification for the planting of an appropriate neutral grassland seed mix is shown in Table 9.

Table 9 Planting specification for neutral grassland

Habitat	%	Latin name	Common name	No.
Neutral grassland (NVC MG5 seed mix)		Grasses (75%):		
	10.0	*Agrostis capillaris*	Common Bent	
	3.0	*Alopecurus pratensis*	Meadow foxtail	
	3.0	*Anthoxanthum odoratum*	Sweet Vernal Grass	
	3.0	*Briza media*	Quaking Grass	
	30.0	*Cynosurus cristatus*	Crested Dog's-tail	
	3.0	*Festuca pratensis*	Meadow Fescue	
	16.0	*Festuca rubra*	Red fescue	
	3.0	*Poa pratensis*	Smooth meadow-grass	
	2.0	*Poa trivialis*	Rough meadow-grass	
	2.0	*Trisetum flavescens*	Yellow oat-grass	
		Herbs (25%):		
	0.5	*Achillea millefolium*	Yarrow	
	2.0	*Centaurea nigra*	Common Knapweed	
	1.0	*Hieracium officinarum*	Mouse-ear hawkweed	
	1.0	*Hypericum perforatum*	Perforate St. John's -wort	
	1.5	*Knautia arvensis*	Field Scabious	
	1.0	*Lathyrus pratensis**	Meadow vetchling*	
	1.0	*Leontodon autumnalis*	Rough hawkbit	
	1.0	*Leucanthemum vulgare*	Oxeye Daisy	
	1.5	*Lotus corniculatus**	Bird's foot trefoil*	
	1.0	*Pimpinella saxifraga*	Burnet-saxifrage	
	1.0	*Plantago lanceolata*	Ribwort Plantain	
	1.5	*Primula veris*	Cowslip	
	1.5	*Prunella vulgaris*	Selfheal	
	1.0	*Ranunculus acris*	Meadow Buttercup	
	1.0	*Ranunculus bulbosus*	Bulbous Buttercup	
	1.0	*Ranunculus repens*	Creeping Buttercup	
	1.0	*Rhinanthus minor*	Yellow Rattle	
	1.5	*Rumex acetosa*	Common Sorrel	
	1.0	*Saxifraga granulate*	Meadow Saxifrage	
	1.0	*Tragopogon pratensis*	Goat's-beard	
	1.0	*Vicia cracca**	Tufted Vetch*	
	1.0	*Vicia sepium**	Bush Vetch*	

* = legume (use native strain only)

6.3.5 An equally important mitigation measure essential to the overall enhancement of the proposed green space areas would be to incorporate them into a long-term management scheme and after-care treatment. Long-term management measures include only cutting parts of the enhanced, more species-rich grasslands, once a year in rotation (in late September) and removing all the cuttings from the site. This method would leave some areas uncut each year to ensure that patches of tall grass as well as bare ground were retained to provide shelter and roosting cover for a range of invertebrates and amphibians. In addition, it is recommended that some areas are left uncut to maintain controlled areas of scrub and tall ruderals (refer to the section 6.4 on the creation of small thickets). Finally, this grassland should not be ploughed, cultivated, re-seeded or fertilized and should not be topped at any time.

Woodland maintenance and management

6.3.6 It is assumed that the retention, maintenance and enhancement of the existing plantation to the west of the proposed development, but within the study area, could also contribute to the overall minor gain impact score of Table 6. For example, if a diverse bat, bird and/or any other wildlife community is to be achieved and maintained it is necessary to keep appropriate amounts of each regeneration stage within the plantation at all times. As a general principle the existing plantation, which is currently even-aged and planted in rows (Plate 9), should be managed to develop a diverse age of native trees and shrubs, display a diversity of species appropriate to the locality and include dead standing and fallen timber. Thus, one of the main management mitigation measures recommended for this retained plantation (described in Target Note 7) would be to introduce a selective felling or coppicing cycle to restructure its habitat.

6.3.7 Important in any felling or coppicing operations is the retention of at least some of the felled timber to decay in mitigation areas within the site to support the wide range of invertebrates that are known to be dependent on dead wood at some stage of their life cycle. For example, many of the numerous flying insects upon which bats forage spend their immature stages (egg, larva, pupa) in deadwood. In addition, log piles make good hibernation and refuge sites for great crested newts (English Nature 2001). It should be noted that the widespread practice of removing felled trees with chainsaws, chippers and particularly stump-grinders has greatly impoverished this habitat.

6.3.8 Finally, an equally important factor that would enhance the nature conservation (and aesthetic) value of this woodland would be to remove the vast quantities rubbish that has been dumped within it.

Watercourse

6.3.9 As noted in Target Notes 1e and 1f the ecological value of the watercourse adjacent to some of the existing residential dwellings was limited by the fact that parts of it had been “canalised” and the banks replaced by large concrete slabs. To enhance its ecological value it is recommended that works be undertaken to restore the natural bank features of these sections and, if possible, also to re- create natural meanders to the channel (refer to Figure 6). In addition, it is recommended that the vast quantities of rubbish that have accumulated within the channel and banks be removed. Such restoration work would enhance the ecological (and aesthetic) value of the watercourse and contribute towards a positive ecological outcome in the overall impact score of the proposed residential scheme (Table 6).

6.4 Habitat creation

Native hedgerows

6.4.1 Extensive new native hedgerows, similar in structure and species to those described in paragraphs 6.3.1 - 3 should be created along the boundaries of the proposed new housing development as illustrated in Figure 6. These should be planted with gaps (c.1.5m wide) every 15 – 25m to ensure plenty of access for residents into the pedestrian links shown in the Indicative Masterplan and Figure 6. This would contribute to the overall positive

ecological outcome of the scheme due to the inherent value of native hedgerows for biodiversity. In addition, the new hedgerows would link up the mosaic of habitats both within and adjacent to the proposed residential development to the adjacent Barnsley Canal at Wilthorpe Local Wildlife Site No. 633. Also, such new hedgerows would protect the proposed green spaces from the indirect effects of a residential development. The latter may include the dumping of rubbish (which is currently evident adjacent to the existing residential properties) and/or the extension of gardens into the green space areas.

Scattered scrub communities

6.4.2 It is recommended that occasional thickets of scrub (native trees and shrubs under 4m in height) be planted within parts of the green space areas. The aim here would be to help replicate the structural and biological diversity recorded in the adjacent Barnsley Canal at Wilthorpe Local Wildlife Site No. 633. Such thickets should be planted, for example, on an average of every 40m, with a range of native trees and shrubs since these support much greater numbers of species of insect and mite species than exotic or recently naturalized species (Kennedy and Southwood, 1984). The aim would be to create small woody thickets that provide dense shelters for breeding and feeding birds, mammals, amphibians and invertebrates.

6.4.3 The range of plants in the recommended scrub thickets should include species characteristic of native woodland and scrub communities. These include hawthorn *Crataegus monogyna*, blackthorn *Prunus spinosa*, holly *Ilex aquifolium*, rowan *Sorbus aucuparia*, dog-rose *Rosa canina* and hazel *Corylus avellana*. Repetitive, formula-driven patterns of planting should be avoided so that the thickets have a more 'natural' appearance and a greater variety of potential niches for wildlife. Generally, scrub of high conservation value should have the following features:

- A wide range of shrub species with a mixed age structure
- A complex three dimensional structure i.e. variation in physical structure, age composition and spacing
- A well developed marginal zone which contains a range of tall herbs and grasses

Sustainable Urban Drainage (permanent pond feature)

6.4.4 The creation of ponds and wetlands are some of the most important SUDS techniques in terms of providing amenity and wildlife habitats. The creation of a large SUDS pond (which also acts as a detention basin) is therefore a major contributor to the overall positive ecological outcome that is illustrated in Table 6. Important ecological design features for a SUDS pond (detention basin) include:

- an irregular shape with islands and bars
- a length:width ratio of 1.5:1 to 4:1
- a sediment forebay = 20% of the permanent pool volume
- an inlet velocity of 0.3-0.5 m/s
- a pond area = 150 – 250 m^2/impermeable ha
- shallow banks and margins

6.4.5 As noted above a shallow border is one of the features recommended for the proposed new detention basin. This area should be planted with a range of marginal and aquatic plants, similar to those recorded in the adjacent Barnsley Canal at Wilthorpe Local Wildlife Site No. 633. The wetland mix of plants should be composed of 20% native wild flowers and 20% slow growing grasses (by weight) and a list of appropriate marginal plants are shown in Table 10. The seed mix should be sourced from a wild seed stock (e.g. Emorsgate Seeds) and be sown at 3 grams per square metre.

6.4.6 The wetland seed mix should be supplemented with a range of native marginal plant plugs and bunches of aquatic plants as shown in Table 10. The specific areas for planting should be indicated on-site by a Supervising Ecologist. In addition, the plants should be sourced from a specialist supplier of native aquatic plants (e.g. Mimmack Aquatics at Woodholme Nursery, Essex).

Table 10 Planting specifications for the proposed SUDS pond

Habitat	%	Latin name	Common name	No.
Wetland		Grasses (80%):		
seed mix	8.0	*Agrostis capillaris*	Common Bent	
(edge of the	4.0	*Alopecurus pratensis*	Meadow Foxtail	
proposed	2.0	*Anthoxanthum odoratum*	Sweet Vernal-grass	
detention	1.0	*Briza media*	Quaking grass	
SUDS basin)	40.0	*Cynosurus cristatus*	Crested Dog's-tail	
	1.0	*Deschampsia cespitosa*	Tufted Hair-grass	
	24.0	*Festuca rubra*	Red Fescue	
		Herbs (20%):		
	0.5	*Achillea ptarmica*	Sneezewort	
	1.6	*Alisma plantago-aquatica*	Water-plantain	
	2.5	*Angelica sylvestris*	Wild Angelica	
	0.5	*Eupatorium cannabinum*	Hemp Agimony	
	3.0	*Filipendula ulmaria*	Meadowsweet	
	1.2	*Geum rivale*	Water Avens	
	0.5	*Hypericum tetrapterum*	Square-stalked St John's Wort	
	3.0	*Iris pseudoacorus*	Yellow Iris	
	1.2	*Lotus pedunculatus*	Greater Bird's foot trefoil	
	1.2	*Lychnis flos-cuculi*	Ragged Robin	
	1.0	*Lycopus europaeus*	Gipsywort	
	0.5	*Lythrum salicaria*	Purple Loosestrife	
	0.3	*Pulicaria dysenterica*	Fleabane	
	0.5	*Scutellaria galericulata*	Skullcap	
	1.0	*Thalictrum flavum*	Common Meadow-Rue	
	1.5	*Vicia cracca*	Tufted Vetch	
Wetland		Ceraophyllum demersum	Hornwort	5
aquatic		Myriophyllum spicatum	Spiked Milfoil	5
plants		Potamogeton crispus	Curled Pondweed	5
(bunches)		Ranunculus aquatilus	Water Crowfoot	5
Wetland		Alisma plantago-aquatica	Water Plantain	5
marginal		Caltha palustris	Marsh Marigold	5
plant (plugs)		Cardamine pratensis	Lady's Smock	5

		Iris pseudacorus	Yellow Iris	5
		Juncus effusus	Soft rush	5
		Lychnis flos-cuculi	Ragged Robin	5
		Lythrum salicaria	Purple Loosestrife	5
		Mentha aquatica	Water mint	5
		Myosotis scorpioides	Water Forget-me-not	5
		Sagittaria sagittifolia	Arrowhead	5

6.5 Fauna

Bats

6.5.1 Active measures to enhance the potential of bat roosts in the study area include the erection of at least 10 bat boxes on trees within the study area to provide further roosting opportunities. These should be placed on trees within the adjacent plantation to the west and also on individual trees that fringe the watercourse. Correct siting of bat boxes is important to increase chances of occupancy. Boxes should be sited at least 4m from the ground and species such as the noctule *Nyctalus noctula* are more likely to be attracted when placed at 5m or 6m. The boxes should be sited with the front facing SW to SE, to ensure that the box warms up during the day and should have clear flight paths to their entrances. Nevertheless, boxes facing other aspects may also be used and a common practice would be to site three boxes on a tree all with different aspects, giving bats a choice of roost sites with different environmental conditions.

6.5.2 In addition, the recommended mitigations measures would provide significant additional habitats within the site that are suitable for foraging bats. These include the proposed new native hedgerows and small thickets as well as the new SUDS pond within the proposed green space areas. These habitats are all host to numerous insects, upon which bats may feed, and so provide additional food sources for bats.

Birds

6.5.3 Similar to bats, active measures to enhance the potential of birds breeding in the study area include the erection of 10 bird boxes on trees within the site to provide further nesting opportunities. In addition, the recommended diversification of the adjacent plantation and arable/horse-grazed pasture, the creation of new scrub and hedgerows and the creation of a new pond and wetland feature would provide further breeding and/or feeding opportunities for a range of birds. This includes additional concealment and nest-site opportunities for grey partridge *Perdix perdix*.

Amphibians

6.5.4 As noted in Table 6 a temporary fence should be erected around the proposed residential development to ensure that adjacent habitats were protected during the construction period. Thus, the central watercourse with fringing trees and adjacent hedgerows (within which, for example, there is a high risk that terrestrial great crested newts may also forage and find shelter) would be protected. In addition, the recommended diversification of the adjacent

plantation and arable/horse-grazed pasture, the creation of new scrub and hedgerows and the creation of a new pond and wetland feature would provide further breeding, foraging and/or winter hibernacula for a range of amphibians including, possibly, great crested newts *Triturus cristatus*.

Invertebrates

6.5.5 Invertebrates are a vital part of the food chain upon which many birds, amphibians and mammals are dependent and these invertebrates are, in turn, dependent on a variety of habitats and food plants. One of the principal aims of the mitigation recommendations made in this report is to maximise the habitats and food plants that are available for both freshwater and terrestrial invertebrates (refer to sections 6.3 and 6.4).

6.6 Access and lighting

6.6.1 The incorporation of the 'Dayhouse Farm Park' Concept into the proposed residential development would allow public enjoyment of all the existing habitat mosaics that occur within the locality. The mitigation measures are intended to retain and enhance these habitats and to this end it is recommended that interpretation boards explaining the existing nature conservation interest of the site are placed at intervals along the site.

6.6.2 The installation of lighting within the proposed residential development should, however, be reduced to that necessary for public safety so that the impact of the lighting on wildlife (e.g. bats) is kept to a minimum. For example, low pressure sodium lamps should be used in preference to high pressure sodium or mercury lamps and the times during which the lighting can be used should be limited to provide some dark periods. Other measures include restricting light 'spillage' by fitting hoods that direct the light below the horizontal plane, at preferably an angle less than 70 degrees.

6.7 Future management and monitoring

6.7.1 It is recommended that further details on the future management and monitoring of the proposed green areas within the residential development are included in an Ecological Restoration Method Statement. This should be focused on achieving outcomes, not just following prescriptions, so that there is considerable flexibility in the means by which Barnsley Metropolitan Borough Council can achieve the agreed outcomes. Important in this process are the 'indicators of success' which would link the recommended mitigation measures to its intended outcome and would allow a realistic standard of any future management to aim for. These 'indicators of success' are therefore an important monitoring tool for judging whether the recommended mitigation measures have been successfully implemented and they need to be fully described in a written document.

6.7.2 For example, arrangements should be included for the adoption and long-term management and maintenance of SUDS, so that it can continue to provide effective drainage for properties. In some circumstances this may be through a planning agreement under section 106 of the Town and country Planning Act 1990, which may also include arrangements for funding maintenance for a specific period. Such maintenance may include monthly inspections, monthly

litter removal and the mowing of vegetation and bank clearance as required. Other maintenance issues may include the management of wetland plants and removal of sediment in the forebay (e.g. every three to seven years), repair to damaged vegetation and the removal of sediment in the main pond (25 years or greater).

6.7.3 Equally important issues are the funding arrangements for the long-term management of the proposed species-rich grassland (enhanced from the existing arable and horse-grazed pastures), small thickets and new hedgerows of the scheme. Thus, it is reiterated that specific details on the management of the retained green space areas to enhance their value for nature conservation should be prepared in an Ecological Restoration Method Statement. Such a statement should include a section on a five-year after-care treatment for the proposed landscape scheme, the likely funding arrangements for long-term management and a monitoring system to measure the success of the scheme

7 SUMMARY

7.1 EINC was commissioned to present:

- The findings of a Desktop Study, a Phase 1 Habitat Survey and a Tree Potential Bat Roost Survey undertaken for the proposed residential development in the land north of Wilthorpe Road.
- The criteria used to determine the nature conservation significance of the findings
- A summary of the ecological impacts arising from the proposed residential development together with a range of recommended mitigation and compensation measures.

7.2 The methodologies and results of the Phase 1 Habitat Survey and the Tree Potential Bat Roost Survey are described.

7.3 Evidence from the site surveys indicate that much of the site is of negligible ecological value. However, the central watercourse, boundary hedgerows, adjacent plantation and fringing areas of tall ruderal and rough grassland areas are together considered to be of low local ecological value.

7.4 The direct ecological impacts and overall impact assessment scores of the proposed cycle route are described in Chapter 5 and summarised in the penultimate and final columns of Table 6 respectively. The overall impact scores are dependent on a series of assumptions and mitigation measures, and these are summarised at the end of Table 6 and described in detail in Chapter 6.

7.5 Mitigation measures are described in more detail in Chapter 6. They include recommendations for the timing of works, the methods of working, the retention, maintenance and enhancement of existing habitats, habitat creation measures, issues for fauna, access and lighting and future management and monitoring. It is recommended that the details of planting schemes, specifications and management and maintenance issues for the scheme should be prepared in an Ecological Restoration Method Statement.

7.6 Provided all the assumptions outlined in Table 6 and the mitigation measures outlined in Chapter 6 are implemented most of the negative ecological impacts predicted for the proposed residential development could be transformed into an overall positive outcome.

8 REFERENCES

Barnsley Metropolitan Borough Council (BMBC) (2009) *Barnsley Biodiversity Action Plan 2008 – 2012* Barnsley Biodiversity Trust

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