

10.0 FLORA AND FAUNA

10.1 INTRODUCTION

This chapter of the EIS describes the flora and fauna within and surrounding the study site at Lumcloon, Co. Offaly. This Ecological Impact Assessment describes and evaluates the current nature conservation interests of the application site, assesses the predicted effects of the proposed development and outlines mitigation measures incorporated in the development design to minimise the impacts of the proposed development on the environment. The application site is not located within any designated sites of ecological importance.

10.1.1 Legislative Context

This report is formulated in the context of the Wildlife Act, 1976 (S.I. No. 39 of 1976), The Wildlife (Amendment) Act, 2000 (S.I. No. 71 of 2001), the EC Council Directive on the Conservation of Natural Habitats of Wild Fauna and Flora 92/43/EEC normally referred to as the Habitats Directive and the subsequent transposition of this directive into Irish law – The European Communities (Natural Habitats) Regulations (S.I. No. 94 of 1997), the European Communities (Natural Habitats) (Amendment) Regulations, 1998 (S.I. No. 233/1998), the Wildlife (Amendment) Bill, 1999 (S.I. No. 38 of 1999) and the European Communities (Natural Habitats) (Amendment) Regulations 2005 (S.I. No. 378 of 2005). Other relevant Directives include the Council Directive 79/409/EC on the conservation of wild birds, known as the Birds Directive which is implemented under the Wildlife Acts. This study also considers IUCN Red listed species and the Irish Red Data Book 1: Vascular Plants (Curtis & McGough, 1988) and the Irish Red Data Book 2: Vertebrates (Whilde, 1993).

Most bird species are protected under the Wildlife Act (1976), except those regarded as pest species and those considered as game species (where they may be hunted under specified conditions). It is an offence to interfere with the breeding place of protected species, though there are exemptions for developments, such as road construction and building works. For the generally common species, best practice provision is made to limit season of removal of vegetation and nesting habitat during the breeding season.

A number of mammalian species, including bats, otters, Irish hares, pine martens and badgers, are protected under the Wildlife Act (1976 and Amendment 2000) and it is an offence to wilfully interfere with or destroy the breeding or resting place of these species, though there are exemptions. In addition many mammals and their habitats have legal protection under Annex IV of the EU Habitats Directive. Otters and certain bat species

including the lesser horseshoe bat which is found in Ireland are afforded additional protection under the Habitats Directive as they are covered in Annex II of the legislation.

Ireland has also ratified the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982) and The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, enacted 1983). These conventions were instigated in order to protect migratory species across all European countries, regardless of borders.

10.2 METHODOLOGY

The study methodology comprised consultation with relevant authorities, a desk study and field surveys. The desk study encompassed a wider area up to 10km from the site boundary while the field survey included the site and up to approximately 0.5km outside the site boundary. The baseline ecological conditions are described, including the nature conservation status of the habitats and species present. The results of the survey were used to inform the assessment of potential impacts on ecology and nature conservation interests. Consequently, appropriate mitigation measures are outlined which avoid, minimise or compensate for the potential negative effects identified.

10.2.1 Consultation

A review of the National Parks and Wildlife Service (NPWS), database (www.npws.ie) was carried out to identify designated sites in the area. The Department of the Environment, Heritage and Local Government was consulted with respect to the proposed development and its potential impact on River Boyne and River Blackwater cSAC. The desk study also involved consultation with relevant statutory and non-statutory bodies including:

- Department of the Environment, Heritage and Local Government
- Shannon Regional Fisheries Board
- Central Fisheries Board
- BirdWatch Ireland,
- Irish Peatland Conservation Council
- Bat Conservation Ireland
- Irish Grey Partridge Association
- Irish Wildlife Trust
- Coillte Teoranta
- Fáilte Ireland

To date, responses have been received from the Applications Unit of the Department of the Environment, Heritage and Local Government, Shannon Regional Fisheries Board, Fáilte Ireland and Coillte Teoranta. These responses to relevant bodies consulted are discussed below in Section 10.2.2.1 and written responses in full are contained in Appendix 1.4.

As part of the EIS scoping process the need for an Article 6 Appropriate Assessment as per the Habitats Directive (1992) was communicated by the National Parks and Wildlife Service. This has been completed and can be found in Appendix 10.1.

10.2.2 Desk Study

A desk study was carried out as part of the habitat survey which involved the following elements:

- A review of relevant Ordnance Survey maps,
- A review of relevant literature and reports,
- A review of the National Parks and Wildlife Service database, files and maps of existing designations of nature conservation interest,
- A review of the Environmental Protection Agency website
- Review of Irish Red Data Books and Lists Curtis & McGough (1988) and Whilde (1993)

10.2.3 Field Surveys

10.2.3.1 Flora Survey

A habitat and fauna survey field survey was carried out on 2nd March 2009 by WYG. The weather during the site visit was overcast with light showers.

Habitats present were classified according to Fossitt (2000) and in accordance with the *Draft Habitat Survey Guidelines: a Standard Methodology for Habitat Survey and Mapping in Ireland* (Heritage Council, 2005). Habitats were mapped with Target Notes to describe features of interest. A detailed habitat map is presented in Figure 10.1. Nomenclature follows Webb *et al.*, (1996). Identification keys included Rose (1989) and Rose (2006).

10.2.3.2 Fauna Survey

A survey for vertebrate fauna was also carried out by WYG by means of a search within the site and the immediate locality on the same day as the habitat survey. Species observed

during the survey were recorded and an assessment of the faunal interest of the site is included with probable species of conservation interest likely to be using the site.

10.2.3.3 Breeding Bird Survey

Two breeding bird surveys were conducted. These commenced in early morning at the proposed site on 3rd June and 22nd June 2009 by Dr. Fintan Bracken MIEEM. The point count method (Bibby *et al.*, 2000) was used to survey birds at Lumcloon with three sampling points located at least 140 metres apart spread positioned around the proposed site. In addition to the point counts all additional species seen or heard while walking between the sampling points or before or after the point counts were recorded. More details of the bird survey can be found in Appendix 10.2 – Bird Study Report.

Survey Limitations

The site walkover was conducted outside the botanic growing season, generally considered to be May to September (NRA, 2006). Flora recorded from the site may not provide a full representation of species, due to additional species optimum flowering period being earlier in the year. Despite this, the habitat mapping of the site is considered to be accurate given the identification of the species present, the habitats encountered and abiotic features recorded on site.

Ecological Conservation Evaluation

The habitats and fauna within the site were evaluated in terms of their conservation value and assigned an evaluation rating based on the criteria outlined below in Table 10.1 in accordance with standard guidelines (NRA, 2006).

Table 10.1 Site Conservation Evaluation: Rating Qualifying Criteria

Rating	Qualifying Criteria
A	<p>Internationally Important Sites designated (or qualifying for designation) as an SAC* or SPA* under the EU Habitats or Birds Directives. Undesignated sites containing good examples of Annex I priority habitats under the EU Habitats Directive. Major salmon river fisheries. Major Salmonid (salmon, trout or char) lake fisheries.</p>
B	<p>Nationally Important Sites or waters designated or proposed as an NHA* or Statutory Nature Reserve. Undesignated sites containing good examples of Annex I habitats (under EU Habitats Directive). Undesignated sites containing significant numbers of resident or regularly occurring populations of Annex II species under the EU Habitats Directive or Annex I species under the EU Birds Directive or species protected under the Wildlife (Amendment) Act 2000. Major trout river fisheries. Water bodies with major amenity fishery value. Commercially important coarse fisheries.</p>
C	<p>High Value, Locally Important Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or significant populations of locally rare species. Sites containing any resident or regularly occurring populations of Annex II species under the EU Habitats Directive or Annex I species under the EU Birds Directive. Large water bodies with some coarse fisheries.</p>
D	<p>Moderate Value, Locally Important Sites containing some semi-natural habitat or locally important for wildlife. Small water-bodies with some coarse fisheries value or some potential salmonid habitat. Any water body with unpolluted water (Q-value 4-5).</p>
E	<p>Low Value, Locally Important Artificial or highly modified habitats with low species diversity and low wildlife value. Water bodies with no current fisheries and no significant potential fisheries value.</p>

(After Natura Site Evaluation Scheme, NRA, 2006).

SAC = Special Area of Conservation; SPA = Special Protection Area; NHA = Natural Heritage Area.

10.3 RECEIVING ENVIRONMENT

10.3.1 Conservation Status of Site

The application site itself is not contained within any EU or Irish designated sites of ecological interest. Several other designated areas occur within 10km of the site. The designated areas are listed and described in Table 10.2 and their locations relative to the application site presented in Figure 10.2.

Table 10.2 Nature Conservation Designations

Site	Designation	Site Code	Description	Distance from Site	Direction
Lough Boora	NHA	001365	This drained lake, surrounded by cutaway bog. Lough Boora is of interest botanically due to the mixture of fen and bog species on the former peatland lake-bed.	c. 2.5 km	South east
Lough Coura	NHA	000909	Lough Coura is a small in-filled lake that has evolved from lake to dry fen	c. 7 km	South west
Royal Canal	NHA	002103	The Royal Canal is anthropogenic habitat that is protected due to its heritage value and the diversity of species it supports along its linear habitats.	c. 1.5 km	North
Ferbane Bog	NHA SAC	000575	Ferbane raised bog is a priority Annex I Habitat under the EU Habitats Directive	c. 6 km	North west
Moyclare Bog	NHA SAC	000581	Moyclare Bog is an active raised bog with a largely intact, relatively wet dome	c. 7 km	North west

*(Source: NPWS website, June 2009)

10.3.2 Consultation Responses

As noted above, consultation responses were received from the Applications Unit of the Department of the Environment, Heritage and Local Government, Shannon Regional Fisheries Board, Fáilte Ireland and Coillte Teoranta.

The National Parks and Wildlife Service of the Department of the Environment, Heritage and Local Government noted that the Silver River adjoins the proposed development site and recommend that the developers ensure that there is no adverse effect to water quality. The surrounding area is Bord na Mona cutaway bog which is important for breeding birds such as

hen harrier, whooper swans, grey partridge, wintering waders and wildfowl. They also note the new power plant and that the effect of power lines should also be assessed.

Verbal consultation with the Shannon Regional Fisheries Board was undertaken on the in April and July 2009 where it was highlighted that the Fisheries main concerns related to the effect of abstraction of groundwater during summer months (low flow) and the effect of temperature of wastewater discharges on the Silver River. Both these queries are dealt with in Chapter 8 Groundwater and Chapter 9 Hydrology. The results of the assessments show no significant impact on low flow or water temperature.

Fáilte Ireland note that Lough Boora Parklands is a tourist amenity site used for angling, walking and cycling and hosts a range of wetland habitats and fauna. They therefore recommend that all potential impacts on the environmental and amenity values of the site should be considered as part of the planning process.

Coillte Teoranta noted that their only concern was emissions, in particular the use of sulphuric acid and defoliation of forest crops through acid rain. This is discussed under Air Quality in Chapter 11.

10.3.3 Flora

The Habitat Survey findings are illustrated in an indicative habitat map, which can be found in Figure 10.1. The layout of the proposed development has been overlaid with the habitat map in Figure 10.3. Habitats identified within the site boundary are as follows:

- Hedgerow (WL1)
- Treeline (WL2)
- Conifer plantation (WD4)
- Recolonising bare ground (ED3)
- Dry meadow and grassy verges (GS2)
- Wet grassland (GS4)
- Earth bank (BL2)
- Buildings and artificial surfaces (BL3)
- Drainage ditches (FW4)

10.3.3.1 Hedgerow

Two hedgerows are present within the site, the internal hedgerow along the site entrance appears to be planted originally for aesthetic purposes with a mix of ornamental species

compared to the functional hedgerow on the west of the site forming the site boundary. The internal hedgerow is unmanaged with brambles *Rubus fruticosus* agg., cleavers *Galium aparine*, plantain, hard rush *Juncus inflexus*, dandelion *Taraxacum officinale* agg, ragwort *Senecio jacobaea*, present in addition to hedging species such as escallonia sp., cotoneaster *Cotoneaster* sp., variegated laurel *Prunus* sp., Leylandii *Cupressocyparis leylandii* and willow *Salix* spp. The hedgerow forming a portion of the western site boundary comprises a mix of hawthorn *Crataegus monogyna*, ash *Fraxinus excelsior* and gorse *Ulex europaeus*.

Ecological Evaluation

The hedgerow provides important resources for fauna and flora. A small proportion of the hedgerow maybe lost to the proposed development at the site entrance. The hedgerow is considered to be of **moderate** importance at a **local** level and its conservation rating is evaluated as D.

10.3.3.2 Treeline

The northern and western site boundary is delineated by treelines along the roadside. Immature beech *Fagus sylvatica* approximately 6-7m in height has been planted as part of the treeline however the mature species are dominated by elder *Sambucus nigra*, alder *Alnus glutinosa*, ash, blackthorn *Prunus spinosa* with ivy *Hedera helix* and brambles also present. A security fence comprised of concrete posts and wire fencing is present within the treeline along the site boundary. Mature ash and alder trees are present along the north western site boundary.

Ecological Evaluation

The treelines surrounding two sides of the perimeter of the application site are important linear corridors within the surrounding landscape, providing important resources for flora and fauna. The treelines are evaluated as being of **moderate** importance at a **local** level and its conservation rating is evaluated as D.

10.3.3.3 Conifer plantation

A small patch of mature conifer plantation approximately 75m² is located at the north western corner of the site. Scots pine *Pinus sylvestris* is the dominant species with Sitka spruce *Picea sitchensis* and leylandii also present along the woodland edge. The understorey of the woodland patch is dominated by elder, with ivy dominating the ground flora. Large areas of the terrain were bare with evidence of ongoing disturbance by mammal species.

10.3.3.4 Ecological Evaluation

Such woodland types are artificial in origin and common in Ireland however this woodland habitat provides important resources for mammals including badgers. This patch of woodland is therefore important on a local level and rated as D.

10.3.3.5 Recolonising bare ground

The majority of the site is under recolonisation since the decommissioning of the former power plant on the site. Concrete slabs are still evident in areas with tarmac and other artificial surfaces. Recolonisation of these surfaces is developed more in some areas than other however due to the history of the site it is mapped as one. The areas to the north of the site undergo a higher level of disturbance than to the south, evident by the varying stages in recolonisation of the area. Grasses and bryophytes dominate the recolonisation process with trees and rushes also present. Nettles *Urtica dioica*, Yorkshire fog *Holcus lanatus*, cocksfoot *Dactylis glomerata*, plantain *Plantago lanceolata*, hard rush, false oat grass *Arrhenatherum elatius*, mouse-ear *Cerastium* sp., clover *Trifolium* sp. and meadow buttercup *Ranunculus acris* are a selection of species recolonising the area. Damper patches within this area are evident by the presence of rushes and pooling of rainfall in areas of remaining hard standing. Two patches of young birch *Betula* spp. trees are present, one at the northern end of the site with ornamental cherry trees *Prunus* sp. shown in Figure 10.1 as Target Note 6 with the other at the centre of the site.

Ecological Evaluation

This habitat is of local importance and is normally of low ecological value, however, due to some patches recolonising more successfully than others with potential to provide important resources for invertebrates, it is rated as D.

10.3.3.6 Dry meadows and grassy verges

Unmanaged areas of grassland surrounding the woodland patch to the north and south are dominated by grass species including Yorkshire fog, meadow foxtail *Alopecurus pratensis*, meadow grass *Poa* spp., bentgrass *Agrostis* sp., cocksfoot, fescue *Festuca* sp., timothy *Phleum pratense*, sedges *Carex* spp., brambles, nettles, and small patches of rubble. Three large electricity pylons are located here as shown in Target Note 3, Figure 10.1.

Ecological Evaluation

This habitat is diminishing throughout Ireland owing to intensive agricultural practices. This is a species rich habitat of moderate conservation value on a local level and evaluated as D.

10.3.3.7 Wet grassland

The grassland patch to the east of the site contains species typical of wet grassland including hard and soft rush *J. effusus*. Other species present include creeping buttercup *R. repens*, carex species, red clover *Trifolium pratense*, false oat grass, fescue and thistles *Cirsium* sp.

Ecological Evaluation

This habitat is diminishing throughout Ireland owing to intensive agricultural and land drainage. This habitat is of moderate conservation value on a local level. Its conservation rating is evaluated as D.

10.3.3.8 Earth bank

An earth bank approximately 2m in height and 2-3m wide is located at the north eastern corner of the site parallel to the drainage ditch before it turns southwards along the site boundary for approximately 30m. The earth bank is vegetated with grassland species such as cocksfoot, Yorkshire fog and nettles.

Ecological Evaluation

The earth bank is artificial in origin and of moderate ecological value on a site level due to its covering with vegetation. It however would not likely be used by mammal species as a cover due to its exposure and lack of cover and is therefore rated as D.

10.3.3.9 Buildings and artificial surfaces

No buildings are present within the site boundary. Remnants of buildings and usage of the site previously in the form of wall gate posts, tarmac surfacing and road kerbs, concrete slabs are however present throughout the site.

Ecological Evaluation

The remaining hard standing within the site is of low conservation value and evaluated as E.

10.3.3.10 Drainage ditches

A drainage ditch flanks the northern site boundary and flows in an easterly direction towards the Silver River. The ditch contains foals water-crest *Apium* spp. and duckweed *Lemna* spp. and at its widest location is approximately 2-3m wide.

Ecological Evaluation

The drainage ditch is common within the local area yet provides important habitat for amphibians such as the common frog and freshwater invertebrates. It is therefore evaluated as D.

10.3.3.11 Habitats Surrounding the Site

The site was originally part of a larger site as such the area to the south of the study site has also been decommissioned resulting in areas of exposed soil and bare ground (ED2) with heaps of rubble and consolidated material around the area as marked as Target Notes 5 on Figure 10.1. A conifer plantation is located to the south east with an area of managed grassland to the east bordering the Silver River which runs in a north south direction less than 50m from the north eastern corner of the site boundary.

Water quality data from the EPA notes that in 2002 and 2005 the Q-value at Lumcloon Bridge was 4, of good status. Water quality data approximately 6km upstream also shows good status in 2005. Stream Risk Assessments were developed by the EPA to determine the risk of streams failing to meet "Good Status" under the water Framework directive (WFD) based on the macroinvertebrate ecology. The Silver River and the Brosna River are both "at risk of not achieving Good Status" (EPA, 2005). The main tributaries of the Silver River are classified as "possibly at risk of not achieving Good Status" (EPA, 2005).

Agricultural land is located to the north and west on the opposite sides of roadways delineating the north and western boundaries of the site. A derelict house is located less than 50m to the north western corner of the site.

10.3.4 Fauna

The potential of the application site to provide habitat for various species of fauna was assessed and any evidence of faunal activity was recorded during the survey. With the exception of the breeding bird survey, no other protected species surveys were carried out for the purposes of this report. The potential of the application site to support any one species is based on the existence of habitat appropriate for that animal. It is important to note that the terms "moderate" or "high" do not refer to the *likelihood* of animals being present, but merely to the *capacity* of that habitat, in its own right and in the absence of other factors to support such animals.

10.3.4.1 Avian Fauna

Twenty-five bird species were recorded during the site visits and these are listed in Table 2 of Appendix 10.2 – Bird Study Report. The species present at the site were typical of farmland and coniferous woodland. The most abundant species were meadow pipit *Anthus pratensis*, swallow *Hirundo rustica*, coal tit *Periparus ater*, wren *Troglodytes troglodytes*, woodpigeon *Columba palumbus* and robin *Erithacus rubecula*. Pheasant may be breeding at the site as during the first visit a female pheasant *Phasianus colchicus* and seven to ten fledglings were flushed from tall grass in the northeast corner of the site. During the first visit one lapwing was recorded at the site and during the survey this bird flew over the site several times and landed in the centre of the site where it appeared to forage for food. No lapwings were recorded during the second visit and it is very unlikely that lapwing are breeding at the Lumcloon site and there was no evidence of any breeding found during the site visits. Lapwing *Vanellus vanellus* is the only species recorded during the survey that is on the current red list of species of conservation concern in Ireland (Lynas, Newton & Robinson, 2007). Three other species (swallow, house martin *Delichon urbicum* and starling *Sturnus vulgaris*) recorded at the site are of medium conservation concern and are on the amber list of species (Lynas, Newton & Robinson, 2007). Further details of the birds recorded during the breeding bird surveys can be found in Appendix 10.2 – Bird Study Report.

10.3.4.2 Mammals

As a result of the habitats present, the application site is likely to support a range of mammal species. The species most likely to be supported on the site include bats, badgers *Meles meles*, pine martens *Martes martes*, foxes *Vulpes vulpes*, hares *Lepus timidus hibernicus*, rabbits *Oryctolagus cuniculus* and other small mammal species such as wood mouse *Apodemus sylvaticus*. The application site contains habitat which is suitable for foraging badgers and also contains areas of woodland to the north west of the site which are suitable for badgers to build their setts. Mammal pathways were noted during the habitat field survey at two locations shown in Figure 10.1 as Target Note 1 and 2 and snuffle holes were found within the conifer plantation at various locations. It appeared that the conifer plantation provided cover for commuting badgers through the landscape. No sett was identified onsite however the potential of the application site to host badgers is considered to be **moderate** to **high**.

Evidence of the presence of hares within 100m of the site was identified by the occurrence of droppings, the location of which is illustrated as Target Note 4 in Figure 10.1. The potential of the application site to host a range of mammal species, other than badgers and Irish hares is considered to be **high**.

The application site also has potential to support a number of bat species. The dwelling house and sheds to the northwest of the site, the shed to the east of the site and mature trees surrounding the site all provide potential shelter for a range roosting bat species. The dwelling house is stone built and has numerous gaps and cracks in the exterior walls which are suitable places for roosting bats. Connectivity both within the site and surrounding environment is good as vegetation, including treelines, hedgerows and woodland patches provide corridors through the landscape for foraging and commuting. The potential of the application site to provide habitat for bats is **moderate to high**.

Otters occur close to major water bodies such as the Silver River. No signs were recorded for otters *Lutra lutra* along the Silver River or drainage ditch within the site however potential does exist for their use of the Silver River. The NPWS database has recordings of otters within 10km of the site (see Appendix 10.3) however within the 10km square of the study site no recording for otter area noted, therefore potential for the use of the area by otters can be regarded as **low to moderate**.

10.3.4.3 Reptiles and Amphibians

The common frog *Rana temporaria* and smooth newt *Triturus vulgaris* are the only two species of amphibians native to Ireland and are protected under the Irish Wildlife Acts (1976 and 2000). The application site has potential to provide ideal habitat for amphibians in the form of drainage ditches and isolated temporary pools formed by remnant hard standing and therefore is of **moderate** value to amphibians.

The viviparous lizard *Lacerta vivipara* is also protected under the Irish Wildlife Acts (1976 and 2000). It can be found in a variety of habitats including wood margins, hedgerows, scrub, grassland and embankments, preferring open, sunny areas. The application site provides a mix of these habitats and is therefore likely to support the viviparous lizard. Thus the application site's suitability to host viviparous lizard is **moderate**.

10.3.4.4 Invertebrates

The mix of habitats provides ideal habitat for a variety of invertebrates, which would in turn provide a valuable food source for foraging bats, birds, amphibians and reptiles. As a result of the survey period and unsuitable weather conditions at the time of the survey few invertebrate species were noted. The drainage ditch within the site has a slow flow yet would be suitable for a range of freshwater invertebrates. The suitability of the site to provide habitat for invertebrates is slightly reduced as a result of the remnant artificial surfaces

however the application site's suitability to host a variety of invertebrates is regarded as **moderate**.

Ecological Evaluation

It is assumed that a range of protected species may roost/den, commute and forage within the application site examples of which, such as bats and otters, are of **international** importance. Badgers were noted to be foraging and commuting within the site and as a result of their protected status in Ireland any badgers using the site would be of **national** value. Several woodland and grassland bird species are breeding on the application site including meadow pipit, wren, coal tit and robin and their populations are of **local** value.

Nature Conservation Evaluation

The nature conservation value of the application site was assessed using the Ratcliffe (1977) criteria for site evaluation. The four primary criteria include extent, diversity, naturalness and rarity (EHS, 1999). This is currently accepted as being the most effective method of assessing the nature conservation value of the application site.

Extent – A habitat's importance for nature conservation generally increases with its size.

The application site is relatively small, covering an area of 11 acres. The application site is dominated by recolonising bare ground but areas of woodland and grassland occur within the site. The application site has the potential to support a moderate variety of flora and fauna.

Diversity – Variety is better than uniformity, species or habitat richness is generally better than a poor species or habitat complement.

The application site is dominated by recolonising bare ground, grassland and woodland which has the potential to provide foraging habitat for a variety of fauna. Several linear features are present on the application site and have the potential to form important foraging and commuting routes for bats.

Naturalness – Sites, which have remained relatively unaltered by man, tend to be the most valuable. Further the sites which are considered most natural are generally those which are hardest to recreate

The site cannot be considered as natural as it is a brown field site recently disturbed in the past evident by recolonisation of the remaining artificial surfaces by vegetation.

Rarity – A site where rare or protected species or habitats exist is considered of higher value.

Evidence of mammal activity was found onsite and the application site has potential to provide habitat for foraging, commuting and roosting bats. The habitats onsite are not rare within the surrounding landscape.

Fragility – A habitat that is fragile is one that is sensitive to changing influences. Habitats which are liable to such influences are likely to be of higher value than those which are not.

The conifer woodland, treelines and hedgerows are vulnerable to cutting and root compaction from building work. In addition the linear features are vulnerable to disruption and interruption which would reduce the value of such features for commuting and foraging bats.

Typicalness – Those habitats which are representative or typical of good examples of their type are considered of higher value than those which are not.

The habitats onsite are typical of those in the surrounding countryside. The previous use of the site has resulted in a reduced range of semi-natural habitats evident by the recolonising habitat which is of low conservation value.

10.3.5 Baseline Assessment Summary

Generally the habitats and species present on the application site are of **moderate** importance to wildlife. The habitats have been disturbed by activities in the past including forestry plantation and commercial energy production however since the cessation of activity onsite, the site is undergoing natural recolonisation by both flora and fauna.

10.4 IMPACT ASSESSMENT

The assessment identifies sites, habitats, species and other ecological features that are of national, regional or local ecological value. Key areas and/or species of ecological value within the application site of the proposed development are identified. The main factors contributing to their current ecological value are described. The methodology for evaluation of the nature conservation value (sensitivity) of ecological receptors (habitats and species) affected by the proposed development is adapted from the current Institute of Ecology & Environmental Management (IEEM) guidelines (IEEM 2006). A summary of the guidelines and scales used in this assessment can be found in Appendix 10.4. This section summarises the assessment of the construction and operation impacts on the habitat and fauna.

10.4.1 Construction Phase

10.4.1.1 Habitats

The magnitude of construction impacts on the habitats are considered to be negative and of negligible significance at local level for the majority of habitats on site. The magnitude of construction impacts on the Silver River are considered to be negative, and of minor to negligible significance at local level.

The construction of the proposed development, including the buildings, hard landscaping and associated infrastructure will result in the direct loss of a patch of conifer plantation, wet grassland and proportion of recolonising bareground. These habitats are described above as being of moderate value at a local scale. Potential exists for small proportions of hedgerows, young scattered trees and dry meadows and grassy verges to be lost however the impact to the overall site and surrounding area is expected to be minimal due to the quality of habitat and disturbed nature of these habitats caused by the industrial use of the site in the past. The loss of conifer plantation on the application site is unlikely to lead to fragmentation of the existing linear features of the site if appropriate mitigation is implemented including the retention of the treelines onsite.

This loss of habitat is **permanent, negative** and of **negligible** significance at **local** level for the majority of habitats. The conifer plantation permanently lost to the proposed new building development will be of **moderate** significance at **site** level. However this level of impact has been reduced to **minor** at a **local** level due to the existence of conifer plantation within 100m south east of the site and the continuation of the treeline and hedgerow surrounding the site. The loss of wet grassland habitat will be of **minor to negligible** significance at a **local** level due to the small patch size and the presence of grassland in the surrounding landscape. The construction of the proposed development will mostly be on brown field land which is of lower quality to the surrounding habitats.

Where habitats or features are to be retained in the final development suitable mitigation measures (as listed in Section 10.4) have been put in place to protect these habitats during construction. Without appropriate mitigation these features would be subject to indirect impacts associated with construction activities including accidental damage, root compaction, storage of materials, pollution which could lower the value of these habitats as permanent and temporary habitat. Dust and sediment deposition on both aquatic and terrestrial flora affects photosynthetic rates, affecting productivity and growth. The use of artificial light and the increase in noise during construction can reduce the attractiveness of the habitat for

wildlife and this could impact on bats which potentially roost in the mature trees and surrounding habitats.

The Silver River is located to the east of the site. Run-off from the site, during the construction and operation phase without appropriate mitigation may contain pollutants, such as silt, which could increase sediment loading potentially affecting organisms within the river system and further downstream. These impacts can be negated and re-evaluated as an imperceptible negative impact on the basis that the construction mitigation measures as outlined in chapter 9.7 are carried out.

10.4.1.2 Fauna

Bats

The mature trees in both the woodland and treelines have potential to provide roosting, commuting and foraging habitat for bats. The loss of these habitats would have a direct, negative impact on the bat population in the area however as the treelines will remain, the impact will be significantly reduced and bats will be able to continue to use these habitats for commuting, foraging and potentially for roosting. Other factors associated with the construction process may also have an indirect impact on bats, in particular the use of artificial lighting. Lighting will lower the value of some of the retained areas of the site to bats, potentially creating barriers along vegetated corridors to commuting bats and possibly encouraging more common species to feed on the invertebrates attracted by the lights at the expense of the rarer bat species. As a result of the conservation and protection status of bats the impact is of **minor** significance at **international** level.

Badgers and other mammal species

Evidence of badger activity within the conifer plantation in the form of snuffle holes and commuting corridors was identified onsite. The loss of this habitat will reduce the foraging habitat for badgers resulting in a **negative** indirect impact of **moderate** significance at a **site** level. Construction noise may cause fauna to avoid the area although this is expected to only be temporary with the return of fauna post construction. Lighting will lower the value of some of the retained areas of the site, for badgers and other mammals, potentially creating barriers to dispersal. Elevated noise levels may temporarily deter badgers and other mammals from using established corridor routes. In addition, any mammals which pass through the site at night risk injury from unattended machinery and open trenches. The impact is of **minor to moderate** significance at **site** level.

Breeding birds

The loss of the small coniferous plantation and other trees would result in a direct **minor negative** impact on the bird community of the **site** as breeding and foraging habitat would be lost.

The proposed development will remove all of the grassland areas from the site and this will result in the loss of breeding habitat for species such as meadow pipit and pheasant and foraging habitat for several species. The only red-listed species found at the site was lapwing but this species was not believed to be breeding on the site but seems to occasionally use the site for foraging. The amber listed starling may also use the grassland habitats on site for foraging. The loss of grassland habitat would also result in a direct minor negative impact on the bird community of the site.

The other amber listed species to occur on the site, swallow and house martin, would not be negatively impacted by the proposed scheme and would continue to forage for flying insects over the development site and the boundary hedgerows.

The areas surrounding the proposed site contains suitable woodland, hedgerow and grassland habitats which could provide alternative breeding and feeding habitats for birds displaced from the proposed site due to the development.

Reptiles and Amphibians

The loss of potential habitat for reptiles will result in a **negative impact** and of **negligible** significance, at **site** level as the site is surrounded by similar habitat in the wider countryside.

Invertebrates and Fish

The drainage ditch will remain onsite therefore there will be no direct loss of habitat. This habitat is of low value to freshwater invertebrates and fish.

10.4.2 Operational Phase

10.4.2.1 Habitats

The impact of operational activities on these habitats is **negative** and of **minor** significance, at **site** level for all retained habitats.

Surface water run-off and waste water from the power plant will be directed to a waste water treatment works prior to discharge into the Silver River. An Assimilative Capacity Study was undertaken as part of the hydrology study (see Section 9.2.5) considering the highest potential discharge rate of 250m³/day. A slight increase in background Ortho-phosphate

concentration from the proposed development is predicted to result in a negligible impact on the water quality in the river. The predicted Ammonia, pH, temperature, suspended solids and BOD5 concentrations in the Silver River are within the permitted level set by the European Communities (Quality of Salmonid Waters) Regulations 1988 (S.I. 293/1988) therefore the impact on the Silver River water quality is perceived as negligible.

Owing to the fact that the footprint of the proposed development is contained within the site, the surrounding treelines will remain onsite and continue to act as a wildlife corridor for faunal species around the site. Management of the habitats which remain on site, such as mowing parcels of grassland and pruning bushes and trees, could also potentially affect the value of these retained habitats and landscaped areas to wildlife. However, good practice guidelines such as avoiding the bird breeding season, reduced use of pesticides and herbicides and delaying grass cutting to allow flowers to set seed will help to reduce these effects.

10.4.2.2 Fauna

The main threats to fauna include the use of artificial lighting onsite and increased noise levels from site activities which may alter the suitability of the site to foraging and commuting fauna. The use of artificial lighting will also alter the distribution of invertebrates within the site and around the site edges and impact on the value of the site as foraging habitat, mainly for bat species.

Bats

If appropriate mitigation is implemented during the construction period then the day to day operation of the final development should not impact negatively on any bats which choose to roost there or nearby. Increased use of artificial lighting and noise within the proposed development may however reduce bat activity in the area, disrupting flight paths and foraging areas. Implementing the appropriate mitigation measures will result in **minor** to **negligible** impacts to bats in the area.

Badgers

The use of artificial light and noise may act as a barrier to movement across or around the site however this is expected to only be temporary with badgers expected to use the area once they have become accustomed to the noise. The implementation of appropriate mitigation will result in **minor negative** impacts to badgers in the area.

Breeding birds

During the operational phase of the development, increased noise from the plant and site traffic may have a temporary **minor negative** impact on birds nesting and foraging in the hedgerows surrounding the site but as these hedgerows are located close to a busy road these birds have already become habituated to a noisy environment.

Reptiles and Amphibians

Levels of disturbance in the form of noise, emissions, general human presence and activity will increase as a result of the operation of the proposed development. This will impact on amphibian habitat onsite. The alteration in drainage ditch flows may cause frog spawn to be washed into the Silver River if present during spawning season however it is important to note that no frog spawn was identified onsite during the site survey which was undertaken during the spawning season (generally accepted to run from February to April). Due to ongoing licensed emissions to the drainage ditch it is unlikely that this habitat will be used by common frogs or newts. Potential impacts on the long-term are therefore expected to be **minor to negligible**.

Invertebrates and Fish

Impacts to terrestrial invertebrates during the operation phase is expected to be negligible. The impact on discharges on freshwater invertebrates and fish within the drainage ditch and Silver River is likely to be negligible as outlined in the assimilative capacity study. No change in water temperature or pH is anticipated with water quality not exceeding Integrated Pollution Prevention and Control Licence (IPPC) standards.

The potential impacts arising from the construction and post construction operation of the proposed development are outlined in Table 10.3 and Table 10.4.

Table 10.3 Summary of Potential Impacts – Construction

Feature	Confidence	Duration	Reversibility	Extent & Complexity	Positive/ Negative	Magnitude	Significance
Hedgerow	Probable	Permanent	Reversible	Direct impact through permanent loss of section of hedgerow	Negative	Slight	Minor - Negligible
Treeline	Probable	Temporary	Reversible	Indirect impact through root compaction and mechanical damage	Negative	Slight	Minor - Negligible
Conifer Plantation	Certain	Permanent	Irreversible	Direct impact through loss of conifer woodland patch	Negative	Slight	Minor
Recolonising bare ground	Certain	Permanent	Irreversible	Direct impact through permanent loss of habitat	Negative	Slight	Minor
Dry meadow and grassy verges	Certain	Permanent	Irreversible	Direct impact through permanent of parcels of grassland	Negative	Slight	Minor
Wet grassland	Certain	Temporary	Irreversible	Direct impact through permanent loss of habitat	Negative	Slight	Minor
Earth bank	Probable	Permanent	Irreversible	Reduction in extent of earth bank	Neutral	Negligible	Negligible
Buildings and artificial surfaces	Certain	Permanent	Irreversible	Loss of hardstanding	Negative	Negligible	Negligible
Drainage ditches	Probable	Permanent	Irreversible	Alteration of drainage channel.	Negative	Slight	Minor – Negligible
	Probable	Temporary	Reversible	Accidental release of pollutants, silts entering the stream from surface water run-off from the site	Negative	Slight	Minor
Silver River	Probable	Permanent	Reversible	Indirect impact on river from accidental release of pollutants, silts entering the drainage ditch from surface water run-off from the site	Negative	Slight	Minor - Negligible
Bats	Certain	Permanent	Irreversible	Direct impact through loss of potential foraging and commuting habitat	Negative	Slight	Moderate - Minor
	Probable	Temporary	Reversible	Indirect impact through disturbance from construction (increased noise, light and vibration)			
Protected mammals (excl bats)	Certain	Permanent	Irreversible	Direct impact through loss of potential foraging habitat	Negative	Slight	Moderate - Minor
	Probable	Temporary	Reversible	Indirect impact through construction works (elevated noise, vibration, lighting & disturbance)			

Feature	Confidence	Duration	Reversibility	Extent & Complexity	Positive/ Negative	Magnitude	Significance
Breeding birds	Certain Probable	Permanent Temporary	Irreversible Reversible	Direct impact through loss of potential foraging and breeding habitat Indirect impact through construction works (elevated noise, vibration, lighting & disturbance)	Negative	Slight	Minor
Reptiles and Amphibians	Certain	Permanent	Irreversible	Direct impact through loss of terrestrial habitats.	Negative	Slight	Moderate – Minor
Invertebrates and fish	Certain Probable	Permanent Temporary	Irreversible Irreversible	Direct impact through loss of terrestrial habitats. Pollutants, silts entering the system from surface water run-off from the site	Negative Negative	Moderate Slight	Moderate – Minor Minor - Negligible

Table 10.4 Summary of Potential Impacts – Operation

Feature	Confidence	Duration	Reversibility	Extent & Complexity	Positive/ Negative	Magnitude	Significance
Hedgerow	Probable	Permanent	Reversible	Landscaping of grassland, potential for increase in species	Positive	Slight	Minor
Treeline	Probable	Permanent	Reversible	Landscaping of grassland, potential for increase in species	Positive	Slight	Minor
Dry meadow and grassy verges	Likely	Permanent	Reversible	Potential for increase in species through appropriate management	Positive	Slight	Minor
Drainage ditches	Probable	Permanent	Irreversible	Potential alteration of drainage channel.	Negative	Slight	Minor – Negligible
	Unlikely	Temporary	Irreversible	Pollutants, silts entering the stream from surface water run-off from the site	Negative	Slight	Minor - Negligible
Silver River	Unlikely	Permanent	Irreversible	Output from cooling tower will enter Silver River with potential to alter flow rate and chemical composition	Negative	Slight	Minor - Negligible
Bats	Probable	Temporary	Reversible	Indirect impacts from operational activities (elevated noise, pollution, lighting and disturbance) disrupting retained foraging features and commuting corridors	Negative	Slight	Moderate - Minor
Protected mammals (excl bats)	Probable	Temporary	Reversible	Indirect impacts from operational activities (elevated noise, pollution, lighting and disturbance) disrupting retained foraging features and commuting corridors	Negative	Slight	Moderate - Minor
Breeding birds	Probable	Temporary	Reversible	Indirect impacts from operational activities (elevated noise, pollution, lighting and disturbance) disrupting retained foraging & nesting sites	Negative	Slight	Minor
Reptiles and Amphibians	Probable	Temporary (disturbance)	Irreversible	Disturbance to amphibian habitat through discharge into drainage ditch	Negative	Slight	Moderate – Minor
Invertebrates and fish	Probable	Temporary (disturbance)	Irreversible	Alteration of flow rate within drainage channel and Silver River. Alteration of chemical composition, pH, water temperature within freshwater system. Pollutants, silts entering the system from surface water run-off from the site	Negative	Slight	Minor - Negligible

10.5 MITIGATION MEASURES

Mitigation measures have been outlined to minimise the impacts of the proposed development on the environment. Mitigation may include avoidance, replanting, incorporation of less damaging designs or working methods to reduce impacts on the environment and where possible increase the amount or quality of the wildlife habitat on site.

10.5.1 Construction Phase

10.5.1.1 Environmental Management Plan

An Environmental Management Plan will be compiled prior to works commencing to ensure best environmental practice during construction and to control the implementation of the development to avoid and limit damage to flora and fauna during construction both within the construction site and downstream of the site. This will address the indirect impacts as a result of construction activities, such as elevated levels of noise, dust pollution and surface water run-off. It will include, for example, avoiding sensitive stages of species lifecycles, such as the bird breeding season and salmonid species. The plan will provide long-term management & monitoring objectives for the development during operation.

10.5.1.2 Landscaping Strategy

A Landscaping Strategy will be compiled for the application site as there is an opportunity within the development to undertake landscaping that will benefit the wildlife of the local area and compensate for any direct loss of habitat. Landscape design will reflect the local habitat and species already present on the site and the surrounding landscape. The use of exotic species will be avoided. All proposed planting will comprise locally sourced, nursery grown native species characteristic of the local area. Native landscaping increases biodiversity, attracts a greater variety of wildlife and improves the value of the final development to wildlife. The development can contribute, in a positive way, to targets for conserving protected habitats and species for example, by using bat friendly lighting and by including bat boxes and bird boxes where possible.

10.5.1.3 Disturbance to Habitats

- The existing treelines present on site will be retained in the final development. This will retain trees which are native species and those which form linear features around the site.

- Trees will be cordoned off during construction so as not to impinge on the Root Protection Area (RPA) of the trees, as outlined in *Trees in Relation to Construction – Recommendations (BS 5837: 2005)*. The Root Protection Area is the minimum area in m² which should be left undisturbed around each retained tree. It is calculated as an area equivalent to a circle with a radius 12 times the stem diameter for single stem trees and 10 times basal diameter for trees with more than one stem arising below 1.5 m above ground level. The equation for the calculation of Root Protection Area for a single stem tree is indicated below:

$$RPA(m^2) = \left(\frac{\text{stem diameter (mm)@1.5 m} \times 12}{1000} \right)^2 \times \pi$$

- Where feasible, works, and specifically the removal of vegetation, will be appropriately timed to avoid disturbance of fauna species.
- Where possible areas of grassland within the final development will be reseeded with a native species mix that is representative of the species present within the area and which will provide good habitat for a range of invertebrate species and increase the value of the finished development for wildlife. Species tolerant of mowing should be selected.
- Surface water run-off from the site will enter the drainage ditch and the Silver River. Potential impacts to water quality and indirect impacts on aquatic flora and fauna will be mitigated for using the mitigation measures described in Hydrology Chapter 9. Standard pollution prevention procedures should be implemented during construction and operation to minimise the potential for pollution of surface water and groundwater such as Masters-Williams *et al.* (2001). All instream works should be conducted in close consultation with the Shannon Regional Fisheries Board in the appropriate season and follow industry standard.
- A strip of existing habitat along the drainage ditch bank will be maintained as part of the development as a buffer zone (c10m width). This will maintain the existing wildlife corridor which provides important shelter and movement for many species. The buffer will also minimise direct contamination and will help towards reducing any sediment loading. For instream works, it is recommended that a silt curtain is installed to avoid increased siltation and smothering of habitats downstream.
- Depending upon the design of the buildings it may be possible to incorporate Green roofs on some of the buildings.
- All waste oil, empty oil containers and other hazardous wastes will be disposed of in conjunction with the requirements of the Waste Management Act 1996.
- Mitigation measures will be put in place to reduce the movement of dust associated with the site works to adjacent habitats.

- Refuelling of machinery and mixing of cement should be carried out away from any water course. All efforts will be made to avoid surface runoff and leachate from concrete, as this is a very aggressive material in the aquatic environment.
- Measures to allow appropriate emergency spill responses should be implemented.

10.5.1.4 Disturbance to Fauna

- To prevent injury to wildlife all trenches will be fenced or covered at night.
- If badgers or their setts, otters and their holts or smooth newt or viviparous lizard are found on site work will be stopped immediately and a qualified ecologist will identify appropriate mitigation measures. Badgers are fully protected under the Irish Wildlife Acts and amendments 1976 and 2000.
- Best practice should ensure that site clearance works and construction works likely to cause considerable disturbance to birds would take place outside the bird breeding season, which extends from 1 March until the 31 July. All birds are protected under the Irish Wildlife Acts and amendments 1976 and 2000. Any mature trees, dead trees or trees with cavities, loose bark, splits, cracks or significant cover of climbing plants to be removed should first be inspected for the presence of bats. Bats are fully protected under fully protected under the Irish Wildlife Acts and amendments 1976 and 2000 and the EU Habitats Directive, (1992).
- The use of artificial lighting during the construction phase should be minimised and where its use cannot be avoided lighting should comply with the guidelines set down by the Bat Conservation Trust (2008).
- Care will be taken during the clearance of vegetation to avoid killing or injuring small mammals. These species are particularly vulnerable if they are nocturnal, hibernating or breeding. Breeding seasons vary from species to species. Particular care should be exercised when removing the piles of dead wood and other vegetation which are present throughout the site. These areas are of high value to wildlife and could potentially provide shelter for a variety of small mammal species, such as hedgehogs.

10.5.2 Operational Phase

10.5.2.1 Disturbance to habitats

- No protected flora was recorded from the site therefore no specific mitigation measures are required. However, the following measures are recommended to protect water quality and local biodiversity.

- Silt traps, sedimentation tanks and oil separators / petroleum interceptors will be incorporated in the surface water drainage design to protect the aquatic environment.
- All waste discharges will be treated to IPPC standards.
- Care must be taken to ensure that invasive weeds, such as Japanese knotweed *Fallopia japonica* are not brought onto the site during the construction and operation phases.
- Efforts will be made to manage the remaining habitats on site in a manner which is beneficial to wildlife. For instance insuring that pruning of vegetation is carried out outside the bird breeding season will limit disturbance to nesting birds.

10.5.2.2 Disturbance to Fauna

- Effort should be taken to reduce the use of artificial lighting where possible. Where it is not possible to avoid introducing artificial light, light sources used should comply with the guidelines set down by the Bat Conservation Trust (2008) regarding bats and lighting. This is will also applicable to bird and mammal species.
- Bird boxes / bricks (swift bricks) and bat boxes / bricks will be incorporated into the development where feasible thereby compensating and possibly providing additional roosting opportunities for these species.

10.6 RESIDUAL IMPACT

The potential impacts, suggested mitigation and residual significance of the proposed development are summarized in Table 10.5. No significant residual impacts to ecology are anticipated, if all practicable mitigation measures as stated in Chapter 10.4 are implemented for the proposed development.

The application site is not contained within any EU or Irish designated sites of ecological importance. Through the use of appropriate mitigation and standard good practices both during and post construction, it is considered unlikely that the proposed development will impact on designated sites.

No significant impacts are expected within the site during the construction stage of the proposed development or the operation of the treatment plant once the mitigation measures are implemented. It is likely however that the development will lead to some loss of roosting, commuting and foraging opportunities, for birds, badgers and bats, however this is considered to be minor negative once bird and bat boxes, bricks are incorporated into the development. Other potential impacts of the proposed development stem from loss of habitat including small areas of conifer plantation and wet grassland. Mitigation by replanting

and managing the treelines with native species will reduce the impact of the development and may serve to increase the value of the ecological corridors within the site to wildlife.

Operational impacts of the proposed development are limited and can be further reduced by installing bat friendly lighting and producing and implementing a Landscaping Strategy and Ecological Management Plan. Managing the retained habitats within the application site in a manner which is beneficial to wildlife will further reduce the operational impacts of the development. Operation phase of the development will result in regular discharges to the Silver River however the impact once appropriate measures are put in place as part of the proposed development are expected to be **minor to negligible**.

In conclusion, if suitable mitigation is implemented the predicted impact of the proposed development on the application site will be **minor** negative.

Table 10.5 Residual significance of predicted impacts of the proposed development following appropriate mitigation

Description of impact	Impact	Mitigation Measure	Residual Significance
Loss of small proportion of hedgerow	Minor Irreversible Permanent	Compensate by replanting area nearby with native species.	Negligible
Root compaction of trees	Minor Reversible Permanent	Establish root protection zone and exclusion area	Negligible
Loss of conifer plantation during construction	Minor Irreversible Permanent	Replant where possible	Negative Minor
Loss of recolonising bare ground during construction	Minor Irreversible Permanent	None	Negative Minor
Loss of wet grassland during construction	Minor Irreversible Temporary	None	Negative Minor
Loss of dry meadow and grassy verges during construction	Minor Irreversible Permanent	Landscaping works will maintain management of area and increase biodiversity of habitat	Negligible
Drainage ditch	Minor to negligible Irreversible Permanent	Implement sedimentation tanks, oil filters to protect from surface water run-off. Measures to insure water discharge of low temperature, same pH. Creation of buffer zone along drainage ditch	Negative Minor to negligible
Silver River	Minor to negligible Irreversible Permanent	Implement sedimentation tanks, oil filters to protect from surface water run-off. Measures to insure water discharge of low temperature, same pH.	Negative Minor to negligible
Disturbance to foraging and commuting bats during construction and operation	Moderate - Minor Reversible Permanent	Minimize the use of artificial lighting where possible. Use lighting which complies with the recommendations of the Bat Conservation Trust (2008) Retain linear features where possible Install bat boxes	Negative Minor

Description of impact	Impact	Mitigation Measure	Residual Significance
Disturbance to badgers and other mammals during construction and operation	Moderate - Minor Reversible Permanent	Careful removal of woodland, retention of linear features. Cover or fence trenches at night	Negative Minor
Disturbance to breeding birds during construction and operation	Minor Irreversible Permanent	Timing of vegetation clearance to avoid breeding season Protection of retained trees and hedgerow Replant trees and hedgerow Install bird boxes	Negative Minor
Loss of reptiles habitat and disturbance to amphibians habitat	Moderate - Minor Reversible Permanent	Creation of buffer zone along drainage ditch	Negative Minor
Invertebrates	Minor to negligible Reversible Permanent	Implement sedimentation tanks, oil filters to protect from surface water run-off. Measures to insure water discharge of low temperature, same pH.	Negative Minor to negligible

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