



## **APPENDIX 12A: AVIFAUNAL SURVEYS**



**REPORT ON ORNITHOLOGICAL STUDIES UNDERTAKEN  
FOR PROPOSED M28 CORK TO RINGASKIDDY  
MOTORWAY SCHEME**



Prepared for RPS



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## 1 Introduction

Glas Ecology have been commissioned by RPS to undertake ornithological studies in relation to the proposed upgrade of the M28 Motorway Scheme, linking Cork to Ringaskiddy. Field studies and desktop research were carried out to look at the following aspects of the existing bird populations within the vicinity of the proposed route for the road upgrade scheme:

- General wintering birds
- Barn Owl breeding survey

Following initial results of fieldwork and after consultation with National Parks and Wildlife Service (NPWS), the following additional studies were commissioned:

- Peregrine survey of Ballyhemiken quarry
- Curlew field feeding areas
- Impacts of habitat fragmentation on Curlew

The general wintering birds surveys comprised of two elements, one to describe the wintering bird populations along the route corridor and secondly to count wetland birds at Lough Beg. Lough Beg forms part of the Cork Harbour Special Protection Area (SPA), with Barnahely an area lying in the northwest of Lough Beg and forming part of the Lough Beg proposed Natural Heritage Area (pNHA). The Barn Owl survey was to determine if there are any Barn Owls occurring along the route, Barn Owls are a species that can be impacted by new roads.

Lough Beg lies to the south of Ringaskiddy and, as already mentioned, forms part of the Cork Harbour SPA. Some of the initial route corridor options passed through fields just north of Lough Beg. As a consequence, the Curlew field feeding area survey work was undertaken to locate the key field feeding areas in the vicinity of the route corridor and to determine if the route corridor could potentially impact on wintering Curlew populations. Curlew are one of the species that the Cork Harbour SPA has been designated for. Initial fieldwork also indicated that Curlew do use some of the fields as a feeding sites. Similarly, a field study was undertaken to determine if existing roads would deter Curlew from reaching feeding habitat.

Peregrine Falcon is a species listed under Annex I of the E.U. Birds Directive. Consultation with respect to the scheme has indicated that Ballyhemiken quarry is a site used by breeding Peregrines (Irish Raptor Study Group, *pers comm*) and therefore a survey was undertaken to determine if Peregrines are still using the site and also to identify any regularly used ledges within the quarry.

### 1.1 Description of Route Corridor

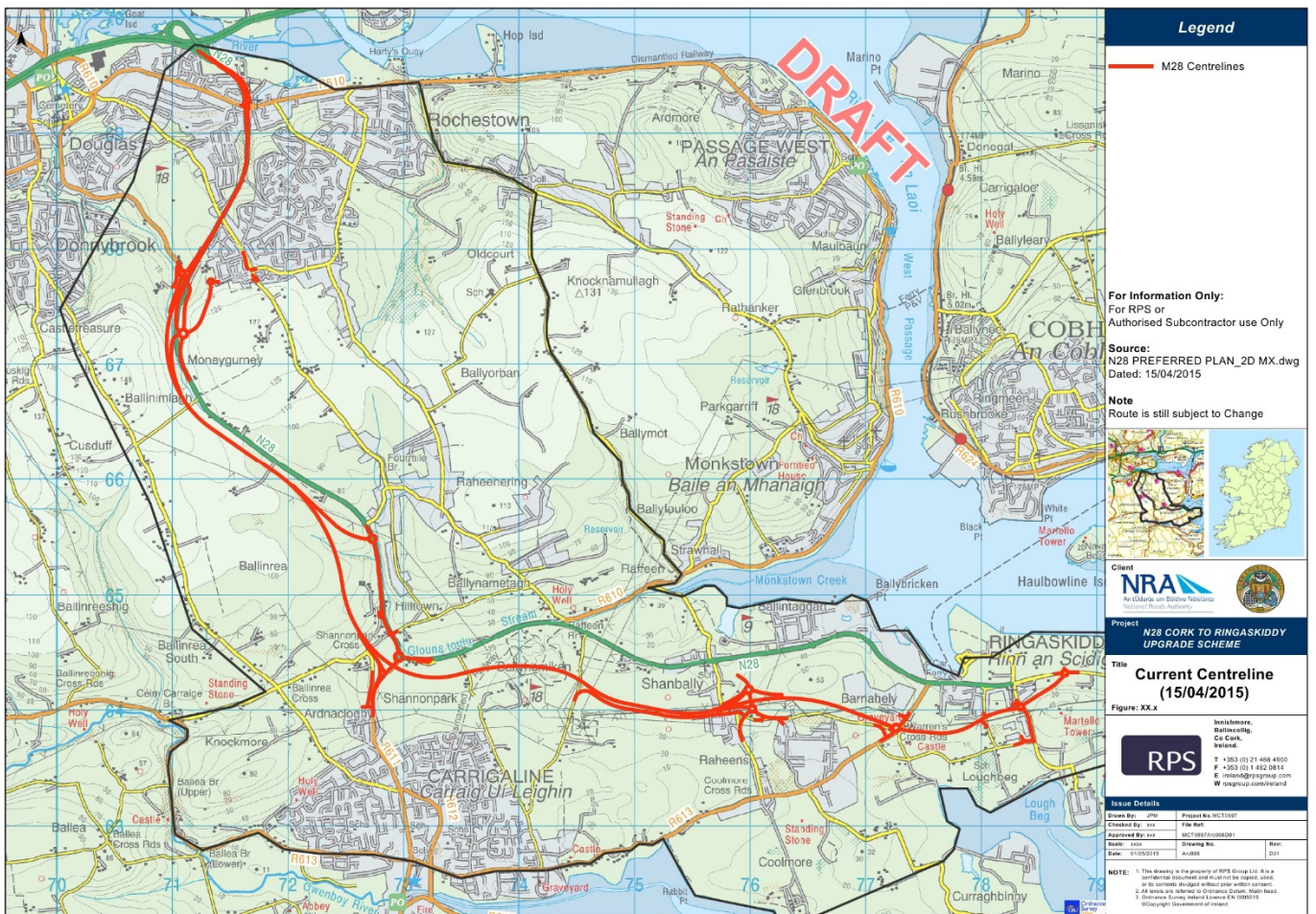
The proposed scheme comprises of the upgrade c. 12.5km of the N28 National Primary Route from the N28/N40 South Ring Road Bloomfield Junction to Ringaskiddy.

The proposed M28 Cork to Ringaskiddy Motorway scheme is a motorway route from the interchange with the N40 (Bloomfield Interchange) to the R613 Carrigaline to Ringaskiddy road at Barnahely. From

Barnahely, the scheme consists of an upgrade of the existing R613 to national road status. Also, a proposed single carriageway regional road will link to the east side of Ringaskiddy village.

The upgrade is substantially on-line between Bloomfield and Carrs Hill. South of Carrs Hill the route runs on the eastern side of the existing N28 to Shannonpark where it veers to an easterly direction, staying south of the existing road as far as the R613 at Barnahely. From there, local and port-bound traffic would continue either along the upgraded R613 (proposed N28) to the existing western entrance to the port, or along the new single carriageway link road running immediately south of Ringaskiddy village to a proposed new eastern entrance to the port. Figure 1 below shows the proposed route. This figure has been produced by RPS and is reproduced here.

Figure 1: Proposed route of M28 Motorway Scheme



## 2 Methodology

### 2.1 General wintering birds

The general wintering birds survey comprised of two elements:

- A transect based survey to look at wintering bird populations along the route of the road
- Wetland bird counts at Lough Beg

A series of transects were chosen along the route in order to cover the range of habitat types present in the area and to be able to describe the wintering populations throughout the route corridor. Each transect included had a minimum length of 250m and was located at least 350m apart from the next transect in order to avoid overlap and double counting of birds. A walkover survey of each of the transects was undertaken and any bird sightings or calls were recorded in distance bands from the transects as follows:

- 0-25m from the observer
- 25-100m from the observer
- Greater than 100m or flying over the transects

For analysis, only birds recorded within 100m were taken into account. Birds recorded at more than 100m or flying overhead were noted as casual or incidental species only.

Wetland bird counts were conducted at Lough Beg and coincided with high tide, analogous to the method used for the Irish Wetland Bird Survey (IWeBS). All birds seen within the Lough Beg count area were recorded. Data was compiled and analysed for reporting. Counts were conducted in weather deemed suitable for carrying out bird survey work, i.e. avoiding periods of high winds, heavy rainfall and poor visibility (Bibby *et al*, 2000).

### 2.2 Breeding Barn Owl

The Barn Owl survey follows the recommendations set out in Hardy *et al*, 2013, for carrying out Barn Owl surveys. It involves the identification of potential or previously known nest sites during the winter (i.e. outside of the breeding season). Follow up visits are made in the period April to June to check for active nests. Where buildings access was not possible, dusk visits were undertaken to look for Barn Owl activity. The Irish Raptor Study Group (IRSG) and local NPWS staff were also consulted to advise of any available information on Barn Owl activity in the area.

### 2.3 Peregrine Falcon Survey

A Peregrine Falcon survey of Ballyhemiken quarry was undertaken following the guidelines in Hardy *et al*, 2013. It involved carrying out two site visits, the first to check for site occupancy in the period of March to mid-April, with a second visit to check for breeding activity in the period between early May and mid-June. Again, the IRSG and NPWS were consulted to advise of any information on previous breeding activity at the site.

## 2.4 Curlew Field Feeding Areas

Key feeding areas for Curlew were identified by carrying out monthly counts from October 2014 to March 2015 inclusive. Counts were undertaken within four hours of high tide (*i.e.* two hours before and two hours after high tide), this period ties in with the IWeBS count period and covers the key wintering period. The areas covered by these counts are indicated in Figure 2 below and are outlined as follows:

- Lough Beg, fields to the west and to the north (to include the previously recorded Curlew feeding areas).
- Barnahely.
- Fields to the east of Warren's Cross Roads.
- Fields to the north of Lough Beg to include the field running north towards Ringaskiddy where Curlew have been recorded previously.
- The wetland adjoining Douglas Estuary.
- Fields around Ballinimlagh.

Additionally, other fields along the route between the Ringaskiddy roundabout and the eastern end of the route were scanned from adjacent roads or walked in order to locate any other regularly used feeding areas.

All key bird species (*i.e.* birds listed as key species for the Cork Harbour SPA) were counted and recorded and locations marked on maps. Counts were conducted in suitable weather conditions (Bibby *et al*, 2000).

There are a number of wind turbines associated with the pharmaceutical companies located within the Ringaskiddy area. As part of the planning applications for these developments, radar studies were undertaken to identify the movements of birds between Cork Harbour, Lough Beg and the surrounding area and to determine regularly used flightlines, roosts and feeding areas. These radar studies have been reviewed as part of this study. NPWS low water count data (Cummins & Crowe, 2011) was also reviewed to identify any known key field feeding areas around Lough Beg and the surrounding area.

## 2.5 Fragmentation of Curlew Feeding Habitat

As part of the consultation process for the scheme NPWS requested field studies to be undertaken to determine whether there is any evidence that road schemes deter Curlew from flying over roads to reach feeding areas, as the NPWS was concerned that this may lead to fragmentation of feeding habitat. Following this request a series of site visits were undertaken to an area located at the eastern side of Little Island to identify whether Curlew would feed close to the N25 or cross this road to reach suitable feeding habitat. Three visits in total were carried out in the period October 2014 to March 2015. The first site visit took place in October/November, the second site visit took place in December/January and the third site visit took place in February/March. Field surveys covered both low and high water to determine if there was any difference in the pattern of usage of fields over the tidal cycle. Desktop research was carried out to identify any published information on the impacts of road schemes on Curlew feeding habitat and usage.



### 3 Results

#### 3.1 General Wintering Birds

##### 3.1.1 Wintering Birds Transect Surveys

A total of seven transects were surveyed along the route. The transects were distributed along the route in order to cover all of the typical habitats present. Figure 2 shows the location of the transects whilst Table 1 below gives the transects’ GPS co-ordinates and a summary description.

Figure 2: Location of Wintering Birds Transects



Note: For example, ‘T7S’ equates to start of Transect 7, ‘T7E’ equates to end of Transect 7

**Table 1: Wintering Birds Survey Transects**

Transect number	Transect start (TS)	Transect end (TE)	Notes on habitats present
T1 (Lough Beg)	IW 78250, 63238	IW 78250, 63238	Lough Beg shoreline and local roads. Estuary, hedgerows, improved grassland and arable
T2 (Barnahely)	IW 77733, 63556	IW 77298, 63783	Improved grassland, arable, tidal inlet and wetland
T3 (Shanbally)	IW 75762, 63976	IW 74856, 64066	Improved grassland, hedgerows and arable
T4 (Ballyhemiken)	IW 74526, 64272	IW 74307, 64249	Adjacent to quarry and golf course. Habitats are arable, scrub and golf course
T5 (Shannonpark)	IW 72886, 64392	IW 72391, 65379	Rough grassland, stream and arable
T6 (Ballinimlagh)	IW 71120, 66624	IW 70951, 67279	Improved grassland, hedgerows
T7 (Donnybrook)	IW 71123, 67794	IW 71272, 68108	Improved grassland, scrub, mixed woodland

Each transect was surveyed twice; on 21st February and 19th March, 2014. These dates cover the latter part of the winter survey period, with surveys commencing as soon as the work was commissioned. The general small bird (passerine) community is likely to be the same between the early and later winter periods, but the late start date for these surveys may have missed early winter passage of birds such as Golden Plover. Weather conditions during the surveys were acceptable for undertaking bird survey work. Table 2 below outlines the peak figures (i.e. the highest number of birds recorded, taken over both survey visits) for bird counts recorded along each of the transects. Table 2 also gives the number of species recorded per transect.

**Table 2: Peak Numbers of Birds Recorded along the Transects**

Species	T1	T2	T3	T4	T5	T6	T7	BOCCI Status
Blackbird	2	2	4	1	2		3	Green
Blue Tit	5	8	3		3		4	Green
Brent Goose	1							Amber
Buzzard						2		Green
Chaffinch	5	3	1	3	6	2		Green
Coot				1				Amber
Cormorant	2							Amber
Curlew	56	1						Red
Dunnock	6	9	3	1	5		2	Green
Feral Pigeon	4							n/a
Goldcrest	2		2	2	1		4	Amber
Great Tit		2						Green
Greenfinch		1		4	2			Amber
Grey Heron	2							Green
Hooded Crow	13	1	2	1	6		2	Green

Species	T1	T2	T3	T4	T5	T6	T7	BOCCI Status
Jackdaw	12	12	4	7	5			Green
Little Grebe				1				Amber
Linnet						8		Amber
Long-tailed Tit	2							Green
Magpie	10	3	2				2	Green
Mallard		5		3				Green
Meadow Pipit						2		Red
Moorhen		3		1				Green
Oystercatcher	2							Amber
Pied Wagtail	1					2		Green
Raven	2							Green
Redshank	2	1						Red
Redwing	2				1			n/a
Robin	6	4	2	3	7	1	6	Amber
Rook		1	18		3	7		Green
Shelduck	2							Amber
Snipe					2			Amber
Song Thrush	1	1						Green
Starling	12							Amber
Woodpigeon	45	11	19		7	27		Green
Wren	10	4		1	2		2	Green
Yellowhammer					2			Red
<b>No of species</b>	25	18	11	13	15	8	8	

During the winter surveys, a total of 36 species were recorded. None of the species recorded during the field surveys are species that are listed under Annex I of the E.U. Birds Directive. Birdwatch Ireland and Royal Society for the Protection of Birds (RSPB) have produced a report detailing the conservation status of bird species in Ireland entitled; 'Birds of Conservation Concern in Ireland (BOCCI) (Colhoun & Cummins, 2013). In this document, birds of high conservation concern are placed on a red list, those of medium conservation concern are amber listed, whilst those of low or no conservation concern are green listed. Birds can be listed because of decline in their numbers or their range across Ireland. These declines can be the result of breeding and/or wintering populations. Four species that are red listed were recorded during the surveys including: Curlew, Meadow Pipit, Redshank and Yellowhammer. Twelve species that are amber listed were recorded including: Brent Goose, Coot, Cormorant, Goldcrest, Greenfinch, Little Grebe, Linnet, Oystercatcher, Robin, Shelduck, Snipe and Starling. The remaining species are either green listed or not listed (e.g. Feral Pigeon and Redwing).

T1 recorded the highest number of species (25). This is not surprising given that T1 contains a diversity of habitats including Lough Beg and the adjacent shoreline. T6 and T7 both held only 8 species. T6 contains improved grassland with some hedgerows, the grassland is intensively managed and therefore is unlikely to support a diversity of bird species. T7 contains areas of mixed woodland and scrub and is a habitat type that would be expected to hold a higher diversity of species (Nairn & O'Halloran, 2012).

The majority of what may be regarded as wetland species (Brent Goose, Cormorant, Curlew, Grey Heron, Oystercatcher, Redshank and Shelduck) were recorded on T1, on Lough Beg or the adjacent land. Four wetland species (Curlew, Mallard, Moorhen and Redshank) were recorded on T2, this transect includes the wetland area at Barnahely, the north-western end of Lough Beg. T4 also held four wetland species (Coot, Little Grebe, Mallard and Moorhen). These species were all recorded within a shallow pond area that occurs within Ballyhemiken Quarry.

The remaining species are all terrestrial species that are typically associated with the habitats present along the route (Balmer *et al*, 2013). Buzzard is a species that is of interest in that is increasing and expanding its range in Ireland, with breeding first confirmed in Cork in 2004 (Cronin *et al*, 2009). Its conservation status is secure and it is Green listed on the BOCCI. Two birds were recorded in a mature treeline in T6. The two birds were recorded in area where nesting Buzzards have previously been reported (IRSG, *pers comm*). Yellowhammer was recorded on T5, a transect that contains a large area of arable fields with winter stubbles. This is a habitat that is associated with Yellowhammers, particularly in winter (Nairn & O'Halloran, 2012). As previously noted, Yellowhammer is a species that is red listed on the BOCCI list. It is a species that has undergone a decline in both breeding populations and range over the last 25 years (Colhoun & Cummins, 2013).

### 3.1.2 Lough Beg Counts

Three counts were carried out in February and March, 2014 on the following dates; 21st February, 18th and 19th March, 2014. Two of the counts (21st February and 18th March) were conducted at high tide, with the third count (19th March) taking place approximately two hours after high tide. The results from the counts are outlined in Table 3 below

**Table 3: Lough Beg Counts**

Species	BOCCI Status	21 Feb	18 March	19 March	Notes
Black-headed Gull	<b>Red</b>	20		15	
Black-tailed Godwit	<i>Amber</i>	85	190	4	18 March, most birds on 2 small islands
Brent Goose	<i>Amber</i>	5			
Common Gull	<i>Amber</i>	16		78	
Cormorant	<i>Amber</i>	2			
Curlew	<b>Red</b>	16	190	17	37 in field at western end of Lough on 21 Feb 18 March most birds are on shore on SE side of Lough
Golden Plover	<b>Red</b>		69		18 March most birds are on shore on SE side of Lough
Greenshank	Green	1		1	
Grey Heron	Green		4		
Herring Gull	<b>Red</b>	2			
Lesser Black-backed Gull	<i>Amber</i>			26	
Mallard	Green		2		
Oystercatcher	<i>Amber</i>	4	5	12	

Redshank	<b>Red</b>	34	9	12	18 March, most birds on 2 small islands
Shelduck	<i>Amber</i>	12	2	12	
Teal	<i>Amber</i>	18			
Wigeon	<b>Red</b>	12			

A total of 17 species were recorded during the counts. Of these six species are red listed under BOCCI including; Black-headed Gull, Curlew, Golden Plover, Herring Gull, Redshank and Wigeon. Eight of the species are amber listed including; Black-tailed Godwit, Brent Goose, Common Gull, Cormorant, Lesser Black-backed Gull, Oystercatcher, Shelduck and Teal. The remaining three species are green listed.

### 3.2 Breeding Barn Owl

During the winter transect surveys, only two areas where potential Barn Owl nest sites occur were identified. Potential nest sites include derelict buildings, large cavities in trees and stacks of bales, Hardey *et al*, 2013. Both of these potential Barn Owl nest sites lie at the south-eastern end of the route. The first of these is Barnahely Castle. The castle has no roof but the walls of the building are still intact and potentially could offer a nest site for Barn Owls. The second is a collection of buildings close to the National School near Barnahely. There are two old buildings close to the school that are heavily covered in Ivy, both no longer have the roof intact but do offer some potential for Barn Owl sites. The Barnahely Castle and one of the buildings close to the National School were fenced, with the second building surrounded by dense bramble growth and it was not possible to access any of the buildings.

The Barnahely survey visits were undertaken on 10th and 29th July, 2014. The surveys were carried out between 9pm and 1am. The Barn Owl activity surveys comprised of building surveillance in order to identify any potential Barn owl activity. It also included driving around the lanes within the Barnahely area and the surveillance of the tidal inlet in the north-west corner of Lough Beg area where the habitat appears to be suitable for the Barn Owl. No Barn Owls were identified within the Barnahely area during the site surveys.

NPWS and the IRSG local staff were consulted to identify any Barn Owl sites in the locality and no records were present.

### 3.3 Peregrine Falcon in Ballyhemiken Quarry

Two site surveys were undertaken to Ballyhemiken Quarry on 5th June and 11th July, 2014. These visits lie within the accepted periods for Peregrine surveys (Hardey *et al*, 2013) although an early season visit was not undertaken as the final route of the road had not been chosen at that time. No definite evidence of breeding was recorded on either occasion. On the first site visit, a male Peregrine was present and called frequently during the survey visit, indicating that there may have been a nest present. No birds were seen during the second site visit. A reliable report was received that a pair of birds was present in the quarry in late May (IRSG *pers comm.*). The results from the Peregrine Falcon survey undertaken as part of the ornithological studies for the M28 suggest that a breeding attempt was made but was not successful.

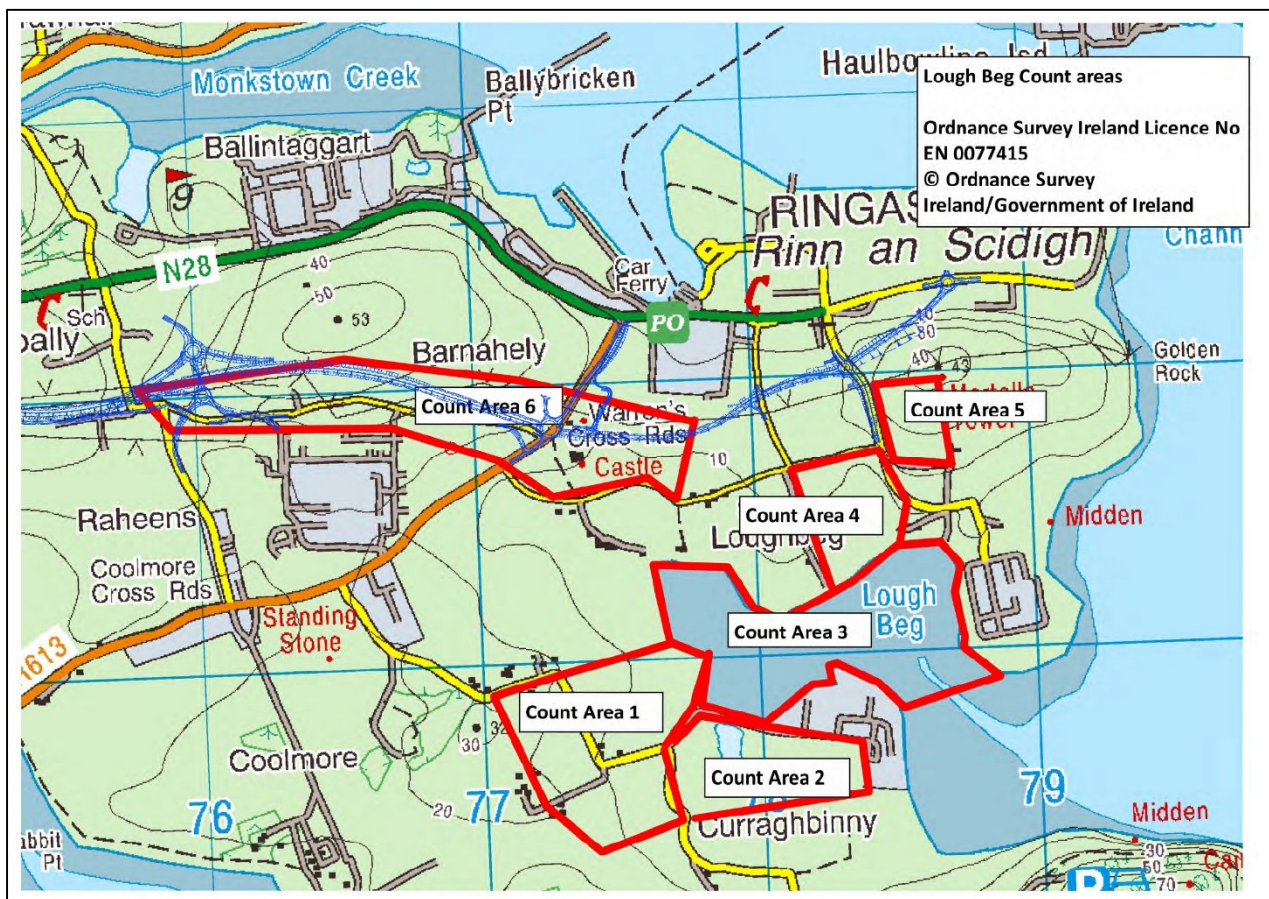
Peregrine Falcons have been known to breed at this location for at least the ten years. The nest site used in the past is on the south face of the quarry (IRSG, *pers comm.*).

The site survey did find that a pair of Kestrels did breed successfully in the quarry. Both birds were seen on both survey visits and a young bird was heard on the second survey. It is thought that the nest site was in the south-east of the quarry, possibly in the old Peregrine nest.

### 3.4 Curlew Field Feeding Areas

Monthly site visits with respect to Curlew field feeding areas were undertaken between October 2014 and March 2015. On each occasion, the location of birds feeding in fields and numbers of birds were mapped. Bird counts on Lough Beg were also undertaken. The key species for these counts are wading birds that feed in fields and that are features of the Cork Harbour SPA, i.e. Curlew, Oystercatcher, Golden Plover, Lapwing, Black-tailed Godwit and Redshank. The count areas were largely concentrated around the Lough Beg and Barnahely areas. However the proposed M28 route was also surveyed by scanning from roads or sections walked on each survey visit. Fields were scanned to identify any other flock of wintering birds. The count areas along with the proposed route alignment are shown in Figure 3.

Figure 3: Count Areas used for Field Feeding Studies



The only areas where wading birds were recorded comprised of the count areas centred on Lough Beg, i.e. Count Areas (CA) 1 to 5. Although no birds were recorded in CA6, this area was included as the bird studies for the Cork Harbour wind turbine developments had noted that wading birds would feed in the Barnahely area. CA2 is the wildlife reserve on the GlaxoSmithKilne land, nine Curlew were recorded in October and a single bird in November. This area lies to the south of Lough Beg and will not be impacted by the proposed road. CA3 is Lough Beg itself, whilst Curlew were recorded in each month over the winter survey period, it

is not an area that is used as a high tide feeding area by wading birds. The wading birds recorded in CA3 (including Redshank, Black-tailed Godwit and Dunlin) all use this area as a high tide roost, although it is highly likely that these species will also feed in areas at appropriate states of the tide as feeding areas are available. CA2 and CA3 are not considered relevant to the feeding area studies as they will not be impacted by the proposed scheme and are not considered further in this section as these areas are not likely to be impacted by the proposed scheme.

CA1 is an area of improved grassland fields lying to the west of Lough Beg. It lies approximately 1 km to the south of the proposed route, see Figure 3. The results of the counts for this area are outlined in Table 4 below. It identifies that Curlew were present in October, November, January and February. Black-tailed Godwit were only present in January.

**Table 4: Results from Count Area 1**

	31.10.2014	28.11.2014	22.12.2014	12.01.2015	13.02.2015	19.03.2015
Black-tailed Godwit				52		
Curlew	9	56		45	4	
Redshank				22		
Shelduck		4				

CA4 is an area of relatively small fields, the majority of which are improved grassland, but the southern area contains some areas of tilled land. This area lies to the south of the proposed route, see Figure 3. Counts from this area are outlined in Table 5 below. Small numbers of Curlew were recorded in this area in January and February. During the general winter bird transect survey, carried out in February 2014, 31 Curlew were recorded in this area. It appears that this area is occasionally used by Curlew but only in the late winter period.

**Table 5: Results from Count Area 4**

	31.10.2014	28.11.2014	22.12.2014	12.01.2015	13.02.2015	19.03.2015
Curlew				4	7	
Oystercatcher					5	

CA5 is an area of improved grassland that lies to the east of the proposed route (see Figure 3). Table 6 below gives the results of the counts from this area. Key species were only recorded from this area during the January count. During the general winter bird transect survey, carried out in February 2014, 25 Curlew were recorded in this area. It appears that this area is occasionally used by Curlew but only in the late winter period

**Table 6: Results from Count Area 5**

	31.10.2014	28.11.2014	22.12.2014	12.01.2015	13.02.2015	19.03.2015
Curlew				42		
Kestrel			1			
Oystercatcher				28		

Snipe		3				
-------	--	---	--	--	--	--

No key species were recorded feeding in CA6 or anywhere else along the proposed route as part of the Curlew feeding site visits. Reports of Curlew using the area around Ballinimlagh were received from surveyors undertaking habitat survey work for this proposed scheme and 35 birds were seen flying over this area in November. No feeding birds were recorded however.

### 3.5 Curlew Feeding Habitat Fragmentation

Three survey visits were made to the eastern end of Little Island on 3rd November 2014, 19th January and 27th March 2015. The visits covered the period of low and high tides. The aim of these site visits was to determine whether Curlew would be deterred from crossing between two areas of feeding habitat located on either side of the N25 Cork to Midleton road. During the November and January site visits, Curlew, Black-tailed Godwit, Redshank and Lapwing were all seen to be feeding in fields immediately south of the N25. Small numbers of these birds were seen to fly across the road, generally at approximately 10m above the road surface. In general the numbers of birds using the fields were small and maximum numbers are given in Table 7 below. No birds were recorded using these fields during the March site visit.

**Table 7: Maximum Numbers of Birds using Fields Adjacent to N25**

	03.11.2014	09.01.2015
Curlew	19	6
Black-tailed Godwit	9	45
Oystercatcher	26	
Lapwing		90
Redshank		1



## 4 Potential Impacts and Recommendations

Road schemes can impact on bird populations by direct loss of habitat, fragmentation of habitat, disruption of flightlines, indirect loss of habitat and by disturbance both during construction and whilst the road is in operation. These potential impacts are discussed within the separate sections of this ornithological study report. In describing impacts, reference is made to the definitions used in the EPA's 'Guidelines on the information to be contained in Environmental Impact Statements' (EPA, 2002).

### 4.1 General Wintering Birds

In general, the route largely passes through a farmed landscape including both tillage and grassland. The fields tend to be large with hedgerow boundaries of varying quality. The northern section in particular contains large arable fields. The wintering population studies showed a typical assemblage of birds that use lowland farmland in winter, with a relatively low number of species recorded. It is likely that the breeding bird assemblage will contain a similarly low diversity of species, with typical species such as Skylark and Meadow Pipit using the open grassland habitats and species such as Yellowhammer, Rook, Pheasant and small passerines using the hedgerow and associated cover as breeding habitat (Nairn & O'Halloran, 2012). Two notable species recorded during the winter surveys are Yellowhammer and Buzzard. Yellowhammer is a Red listed species on BOCCI, whilst Buzzard is of interest only in that it is a species that has undergone population increase and expansion of its range in Ireland in recent years. Buzzard is Green listed on the BOCCI and its conservation status is of low concern.

Construction of the road will lead to direct loss of habitat for wintering and breeding bird populations. Removal of hedgerows will lead to the loss of breeding habitat, whilst removal of grassland will lead to the loss of foraging areas for both breeding and wintering bird populations. Removal of areas of arable land will lead to the loss of wintering foraging areas for Yellowhammers. Temporary impacts could potentially arise through increased disturbance from construction traffic and temporary storage areas for spoil arising from construction.

In general, for species associated with grassland, the loss of habitat is likely to be an imperceptible impact due to the availability of alternative habitat in the vicinity. The red listed species, Meadow Pipit, was recorded but only on low numbers (two birds) on one transect. Meadow Pipit is red listed due to a decline in breeding populations. For a bird that is widespread throughout the County and country, it is likely that impacts arising from the construction of the road will be imperceptible and that changes in land use in the wider countryside are more likely to be important for maintaining populations of this species. Therefore, the final design of the road should allow for adjacent fields to still be viable for farming. Similarly, Yellowhammers will likely be more dependent on land use and again that the road design should allow arable fields to still be viable to ensure that winter stubbles are still present in the area, in which case the impact on Yellowhammer will be imperceptible. Loss of hedgerows and scrub can be mitigated for with appropriate planting schemes associated with the new road.

Buzzard is a species that is increasing in numbers and range in Ireland (Balmer *et al*, 2013). The construction of the road will potentially lead to the loss of the current breeding site. Within the wider landscape, mature trees within hedgerows are common and provide alternative nest sites. Buzzards will defend a territory

that can contain several nest sites (Cramp *et al*, 1980), and the loss of one nest site may not lead to an abandonment of a territory. The potential impact on Buzzards is likely to be imperceptible. If the existing nesting tree is to be removed, then tree felling must take place in the winter period, avoiding the breeding season.

## 4.2 Breeding Barn Owl

No breeding Barn Owls were identified as part of the surveys undertaken for this study. The local NPWS Ranger and IRSG have no records of Barn Owls presence within this area. Therefore it appears that Barn Owl does not occur as a breeding species in the locality. Outside the breeding season, Barn Owls can disperse widely throughout the countryside outside of known breeding areas. Road schemes can impact on Barn Owl populations through direct collisions with traffic. This has been highlighted recently with the deaths of Barn Owls along the Tralee by-pass. Shawyer & Dixon (1999), recommend mitigation measures that are to be used in areas which are potential or known 'blackspots' for Barn Owls. These potential blackspots include areas where the new road is intersected by ditches and streams. Mitigation measures include the use of banks in order to force Barn Owls to fly up and across the road at a height above the traffic. The main area along the route of the proposed road is in the Shannonpark area, in the vicinity of the existing roundabout. A qualified ecologist with ornithological expertise should be involved in the final design of the road in order to ensure appropriate measures are located accurately.

It is predicted that impacts on breeding Barn Owl will be neutral.

## 4.3 Breeding Peregrine Falcon

The proposed route of the road passes through the southern section of the Ballyhemiken Quarry. Potentially, construction of the road will lead to a temporary impact on the nest site through disturbance during the construction phase. Peregrine Falcons are well known to nest successfully in active quarries (e.g. Ruddock & Whitfield, 2007) with high levels of disturbance. However, the road will be constructed on an embankment which will require the importation of material into the quarry in order to construct the embankment. It is proposed that the embankment will be constructed so that the final height is approximately equal to the existing height of the southern quarry face. The nest site that has been used by Peregrines will therefore, be just below the height of the final, finished road surface. The foot of the embankment will be between 50-100m from the cliff face.

Given the proximity of the embankment to the cliff and the volume of traffic that will be required in order to import the material for building the embankment, it seems highly likely that the existing nest site will not be used during the construction phase, leading to a temporary negative impact on the nest site. Timing of works in the quarry should aim to start in late summer and be complete within 18 months so that this temporary impact only lasts for one breeding season.

It is difficult to predict whether the nest site will be used once the road is in operation. The road will be close to the nest site, but the nest site will no longer be subject to human disturbance. In the event of the nest site being abandoned, it is possible that alternative nest sites may be used. Alternative nest sites include other cliff faces within the quarry; there is another quarry at Coolmore which may provide suitable nesting ledges. Increasingly, Peregrine Falcon are using man-made structures including buildings and using urban areas (Madden *et al*, 2009), with successful nesting taking place in Cork City (Nairn & O'Halloran,

2012). In the event of the Peregrines continuing to use the existing nest site or an alternative nest site within the quarry, there is the potential for newly fledged birds to be killed by colliding with traffic on the road. This again is difficult to predict but once the road is operational, monitoring of the quarry for Peregrines and the potential loss of young birds to collision with traffic should be carried out for the first five years of operation. In the event that any fledged young from the nest within the quarry are killed on the road, then measures to prevent birds from nesting in the quarry should be undertaken. This will require full consultation with NPWS.

The recent Bird Atlas (Balmer *et al*, 2013) shows that Peregrine Falcon population in Ireland continues to increase in number and range, it is Green listed on BOCCI. Whilst construction of the road may lead to a temporary negative impact on the Peregrines that use the quarry during the construction phase, and potentially a permanent negative impact following construction, it will not have any impact on the Irish Peregrine Falcon population.

#### 4.4 Curlew Field Feeding Areas

Surveys were undertaken to determine whether any regularly used Curlew (and other wading birds) feeding areas occur along the proposed route. Curlew is a feature of interest for the Cork Harbour SPA, results of these surveys are also used to determine whether there will be any impact on this designated site.

Figure 2 above shows the count areas used for the survey and section 3.4 details the results of the surveys. These show that they only regularly used area is CA1 (fields to the west of Lough Beg). CA4 and CA5 (fields lying adjacent or close to the north shore of Lough Beg) held birds only in the late winter period and during high tide period. None of these areas lie along the route of the road, with CA1 lying approximately 1km from the proposed route, meaning that disturbance impacts are unlikely. The surveys also covered the rest of the route and no other feeding areas were recorded. There are no regularly used feeding sites on the route of the road and therefore, there will be no impact on the wintering Curlew population and consequently no impact on the Cork Harbour SPA as a result of the construction and operation of the proposed road scheme.

#### 4.5 Curlew Feeding Habitat Fragmentation

The field studies carried out were inconclusive as the numbers of birds using the chosen study area were relatively low. It was recorded that wading birds do use fields immediately adjacent to the N25 road and do fly over the road in order to reach mudflats and roosting areas to the north of the road. This indicates that Curlew, Oystercatcher and Black-tailed Godwits will fly over roads in order to reach feeding areas.

The field feeding studies (see sections 3.4 and 4.4) identify that there are no feeding areas along the route and the fields that Curlew use regularly for feeding will not be impacted by the proposed route of the M28 Motorway Scheme. The field feeding studies undertaken for this scheme did not find any other feeding areas within the vicinity of the proposed route. There will be no impact on wintering wading birds and their feeding areas through habitat fragmentation as a result.

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**M28 UPGRADE SCHEME: WINTER BIRD  
SURVEYS 2015/16**

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## **SUMMARY**

Transect surveys were carried out to characterise the general wintering bird populations along the route corridor for the proposed M28 upgrade scheme. A total of 53 species were recorded on these transects, including eight species that are red-listed in Birds of Conservation Concern in Ireland, and a further 16 amber-listed species. The bird species recorded represent a typical bird assemblage for lowland agricultural habitats in southern Ireland. Apart from the waterbird species recorded in Lough Beg, none of these represent populations of specific conservation importance that require site-specific conservation measures.

Surveys of field feeding waders were carried out around Lough Beg and the eastern end of the route corridor, repeating work carried out in 2014/15. Across both these surveys, the only wader species (apart from Snipe) that was regularly recorded feeding in fields in these areas was Curlew, although Black-tailed Godwit have also been regularly recorded field feeding around Lough Beg in previous winters. The mean peak daily count of Curlew in field areas within, and adjacent to, the proposed route corridor was 11.8 birds. This probably represents around 0.5-0.8% of the Cork Harbour mid-winter Curlew population.

A review of a long-term dataset on Curlew field feeding in another part of Cork Harbour (the Glounthaune Estuary/Slatty Water area) shows that Curlew routinely feed on fields immediately adjacent to the N25 dual carriageway, and found no evidence that fields further from the dual carriageway were preferred by Curlew.

The results of this study indicate that:

- Any Curlew displaced from field feeding areas by direct habitat loss due to the proposed road scheme are likely to be able to find suitable alternative habitat.
- There is no potential for any fragmentation impacts to affect Curlew usage of field feeding areas.
- Any disturbance impacts (from the operational road) to adjacent habitats will be minor and will not cause large-scale exclusion of Curlew from adjoining habitats.



## **1. INTRODUCTION**

### **1.1. CONTEXT**

This report presents the results of winter bird surveys for the M28 upgrade scheme, commissioned by the RPS Group Ltd. This work is a continuation of survey work carried out in the winters of 2013/14 and 2014/15 by Glas Ecology. The results of that work were presented in *Report on Ornithological studies undertaken for the proposed M28 Cork to Ringaskiddy Motorway Scheme* (Glas Ecology, 2015; referred to as the Glas Ecology report hereafter).

### **1.2. TERMS OF REFERENCE**

The terms of reference for the work included:

- Transect surveys to characterise the general wintering bird populations along the route corridor.
- Surveys of Curlew, and other field feeding waders, across six designated count areas.
- High tide counts of Lough Beg. In order to allow the counts to be carried out on the same days as the field feeding surveys, the counts were restricted to wader species that routinely feed in fields (Oystercatcher, Golden Plover, Lapwing, Black-tailed Godwit and Curlew).
- A review of data on wader field feeding in the Cork Harbour area, and assessment of potential habitat fragmentation impacts, based on my own personal data and other published studies.

### **1.3. STRUCTURE OF THIS REPORT**

Section 2 of this report presents the results of the transect surveys and provides an assessment of the conservation importance of the general wintering bird populations along the route corridor. The remainder of the report provides an assessment of the status of field feeding wader populations in areas that may be affected by the proposed scheme (Section 3), analyses a long term dataset on field feeding Curlew in another area of Cork Harbour (Section 4), and provides a review of the potential impact of the proposed route on the Cork Harbour Curlew population (Section 5).

## 2. GENERAL WINTERING BIRDS

### 2.1. METHODOLOGY

The general wintering bird populations along the route corridor were surveyed by repeating the transect counts carried out in 2014/15.

The same seven transects were used for the survey as in 2014/15. The Glas Ecology report on the 2014/15 surveys only gives the start/end points for the transects. Therefore, to determine the exact routes of the transects, the author of that report was consulted. The transect routes used in 2015/16 are shown in Figure 1. These are considered to be as close as possible to the routes used in 2014/15, although there may be some minor differences.

The transect counts used the same recording methodology as in 2014/15. This is based on the standard Countryside Bird Survey (CBS) methodology (BirdWatch Ireland, 2012) and involves recording birds separately in three distance bands (0-25 m, 25-100 m and > 100 m), as well as overflying birds. Any additional notable bird species detected on the return walk along the transect route were also recorded separately. Each transect took 5-34 minutes to complete, depending upon the length of the transect and the level of bird activity encountered (Table 1). Weather conditions during the transect counts were generally good (Table 1). Showers/drizzle occurred on two of the transects during the January count, but did not appear to affect bird activity on these transects. Traffic noise affected the detectability of birds on T6, T7 and parts of T1 and T5.

Table 1 Timings of, and weather conditions during, the transect counts, 2015/16.

Date	Transect	Start	Finish	Cloud	Wind	Rain
11/12/2015	T1	09:24	09:58	1	W2	1
	T2	10:11	10:23	1	W2	1
	T3	10:48	11:04	1	W3	1
	T4	11:30	11:36	1	W4	1
	T5	11:49	12:13	1	W3	1
	T6	12:44	13:00	1	W2	1
	T7	13:08	13:19	1	W2	1
29/01/2016	T1	16:23	16:56	3	SW4	2/3
	T2	16:00	16:12	3	SW4	2
	T3	15:04	15:20	3	SW4	1
	T4	14:50	14:54	3	SW4	1
	T5	13:56	14:22	3	SW4	1
	T6	13:18	13:31	3	SW3	1
	T7	13:01	13:07	1	SW4	1
15/02/2016	T1	12:53	13:24	1	W1	1
	T2	13:36	13:48	1	E2	1
	T3	14:26	14:45	1	no wind	1
	T4	15:08	15:13	1	no wind	1
	T5	15:29	15:56	2	no wind	1
	T6	16:20	16:34	2	no wind	1
	T7	16:49	16:57	3	SE1	1

Cloud cover: 1 = 0-33%, 2 = 34-66%, 3 = 67-100%.

Wind: compass direction and Beaufort scale.

Rain: 1 = on rain; 2 = showers; 3 = drizzle.

### 2.2. GENERAL WINTERING BIRDS

A total of 47 species were recorded in the 0-25 m and 25-100 m distance bands along the transect counts (Table 2), with an additional six species recorded outside these distance bands, overflying the transects, or on return walks along the transect routes (Table 3). These included eight species

that are red-listed in Birds of Conservation Concern in Ireland (BoCCI) (Colhoun and Cummins, 2013): Curlew, Dunlin, Redshank, Black-headed Gull, Herring Gull, Grey Wagtail, Meadow Pipit and Yellowhammer. A further 16 BoCCI amber-listed species were recorded: Shelduck, Teal, Sparrowhawk, Oystercatcher, Jack Snipe, Snipe, Common Gull, Stock Dove, Goldcrest, Skylark, Starling, Mistle Thrush, Robin, House Sparrow, Greenfinch and Linnet. BoCCI red and amber-listing can refer to large-scale declines in species population and distribution, and listed species may still be widespread and common. The red- and amber-listed species recorded on the transect counts are mainly species that are widespread in lowland agricultural landscapes in southern Ireland in winter, as well as a few waterbird species recorded in Lough Beg on transect T1. The most notable species recorded was Jack Snipe: a single bird was flushed from improved grassland on the return walk along transect T6 on 15/02/2016. This is a widespread, but scarce, wintering species that typically occurs in freshwater marshes and wetlands. The record from transect T6 presumably refers to a casual visitor, as the habitat is not typical for the species. Therefore, this record does not indicate the presence of a regular wintering population and is not of any conservation significance.

The highest number of species were recorded on T1 (32 species), and the lowest numbers on T4 (6 species). Overall, the main factor explaining variation in species number between transects was the transect length (Text Figure 1). In addition, the species numbers recorded along T1 were increased by the proximity of the transect to Lough Beg, which allowed various waterbird species to be recorded that were not recorded along the other transects. When these additional species are factored out, the transect with the highest number of species relative to its length was T2 (Text Figure 1). This transect followed well-developed hedgerows/treelines along its entire route, unlike the other transects (except T1), which all included sections crossing open fields. Therefore, the route of T2 maximised opportunities for recording bird species (as the majority of species are mainly associated with the field boundary habitats, rather than the open fields). The circular route of T1 meant that the transect covered a smaller area, relative to its length, compared to the other transects.

The overall number species recorded was higher on the 2015/16 transects compared to the 2014/15 transects, reflecting the increased number of counts (there were only two transect counts in 2014/15, compared to three in 2015/16). The general pattern of increasing species numbers with increasing transect length is also shown by the 2014/15 data, as well as the relatively high numbers recorded on transect T2 (Text Figure 1). However, higher numbers of species were recorded on transect T4 in 2014/15. These included two wetland species (Moorhen and Coot) that were recorded in a pond in the quarry in 2014/15.

Table 2 Maximum numbers of birds recorded on the transect counts, 2015/16.

Species	Transect							BoCCI
	T1	T2	T3	T4	T5	T6	T7	
Shelduck	4							Amber
Teal	4							Amber
Mallard					3			Green
Pheasant	1							
Little Egret		1						Green
Grey Heron	1							Green
Sparrowhawk					1	1		Amber
Buzzard						1		Green
Oystercatcher	3							Amber
Curlew	12	4						Red
Turnstone	1							Green
Greenshank	2							Green
Redshank	5							Red
Snipe			1		1	1		Amber

Species	Transect							BoCCI
	T1	T2	T3	T4	T5	T6	T7	
Black-headed Gull	15							Red
Herring Gull	1							Red
Feral Pigeon	1							
Stock Dove					13			Amber
Woodpigeon	22	9	3		7	21	3	Green
Magpie	5	1		1		1		Green
Jackdaw	24	50		1	40			Green
Rook	7	200	5		60			Green
Hooded Crow	4		1		1		4	Green
Raven	1							Green
Goldcrest	1	1	1			1		Amber
Blue Tit	1	1	2		1	1	2	Green
Great Tit	1	1	3		1	1	1	Green
Long-tailed Tit	3		3					Green
Chiffchaff		1						Green
Wren	2	3	3	1	2	2		Green
Starling			1			1		Amber
Blackbird	6	4	4	1	3	3	2	Green
Song Thrush	3	2	3		1	2		
Redwing	1	3	2		54	6		
Mistle Thrush							1	Amber
Robin	8	6	3	2	3	3	3	Amber
Dunnock	2	3	4	1	3	1	2	Green
House Sparrow			7					Amber
Pied Wagtail	1	1	2					Green
Meadow Pipit	2	1	8		1			Red
Chaffinch	26	15	1		40			Green
Bullfinch		1				2		Green
Greenfinch							1	Amber
Linnet					110			Amber
Goldfinch	1	1						Green
Siskin						1		
Yellowhammer					6			Red
No of species	32	21	19	6	20	17	9	

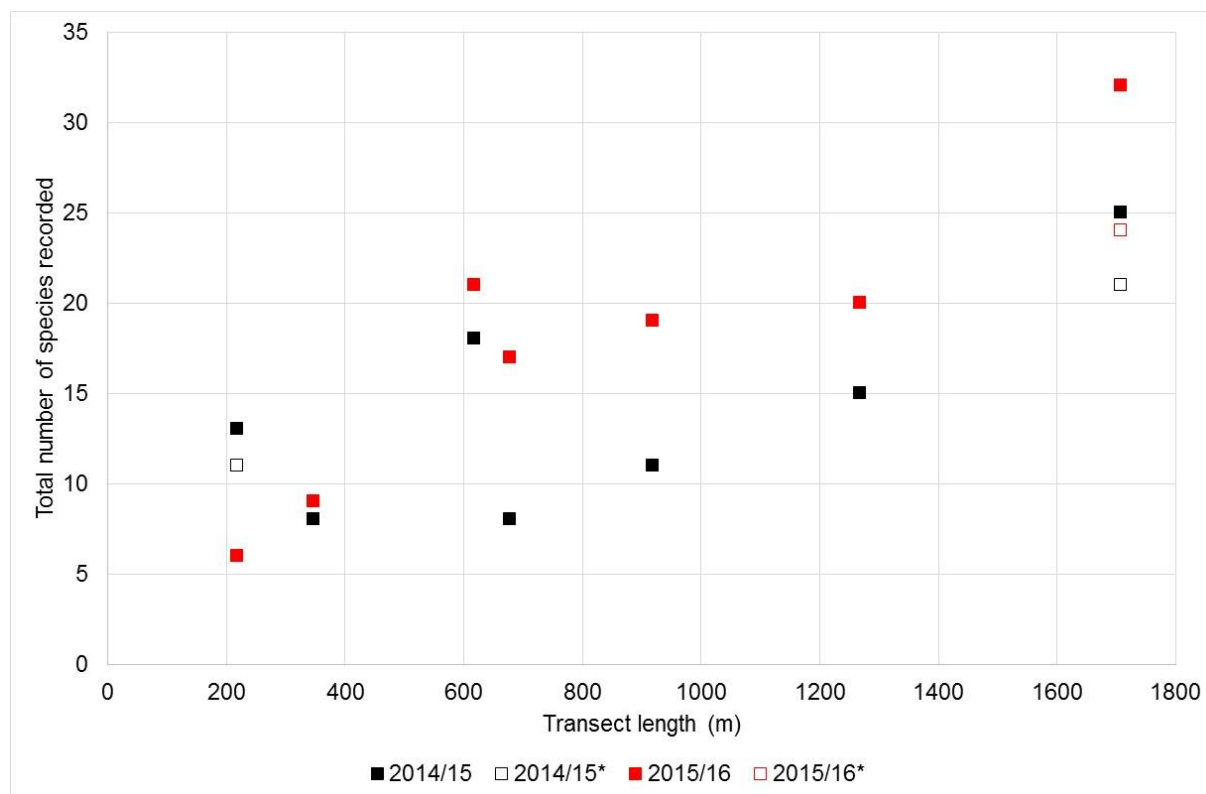
The data in this table only includes birds recorded within the 0-25 m and 25-100 m distance bands.

BoCCI = Birds of Conservation Concern Ireland listings (Colhoun and Cummins, 2013); note that no listings are given for Pheasant, Feral Pigeon, Song Thrush, Redwing and Siskin.

Table 3 Additional species recorded on the transect counts, 2015/16.

Species	Category	Transect	BoCCI
Dunlin	> 100 m	T1	Red
Jack Snipe	return walk	T6	Amber
Common Gull	> 100 m overflying	T1 and T2 T2	Amber
Coal Tit	> 100 m	T6	Green
Skylark	return walk	T5	Amber
Grey Wagtail	overflying	T1	Red

BoCCI = Birds of Conservation Concern Ireland listings (Colhoun and Cummins, 2013).



Text Figure 1. Relationship between the total number of bird species recorded and the transect length for the 2014/15 and 2015/16 datasets (2014/15 and 2015/16). The graph also shows the data for T1 and T4 excluding wetland species (2014/15\* and 2015/16\*).

### 2.3. CONCLUSIONS

The bird species recorded on the transect counts represent a typical bird assemblage for lowland agricultural habitats in southern Ireland. While a number of red and amber-listed species were recorded, apart from the waterbird species in Lough Beg, none of these represent populations of specific conservation importance that require site-specific conservation measures.

### 3. FIELD FEEDING WADER SURVEY

#### 3.1. INTRODUCTION

The field feeding wader survey was carried out on six dates between October 2015 and March 2016. The survey covered seven count areas along the eastern end of the proposed route corridor, and around Lough Beg. On each count day, two complete surveys of the count areas were carried out: one at high tide, and one on the ebb/flood tide. In addition, dusk counts were carried out at Lough Beg. Additional searches of the remainder of the route corridor were carried out on three of the count days, and during each of the transect counts.

#### 3.2. METHODOLOGY

##### 3.2.1. Count areas

The survey covered the six count areas defined in the map on page 14 of the Glas Ecology report. These count areas include four areas of fields (CA1 and CA4-CA6), as well as the lagoon and intertidal habitat at Lough Beg (CA2 and CA3). An additional count area (CA7) was also defined, covering the outer part of Lough Beg and the shoreline around Lough More. Inclusion of CA2, CA3 and CA7 allowed the number of birds using the fields to be compared to the numbers using the intertidal and lagoon habitats. Descriptions of the count areas are provided in Table 4.

Table 4 Count areas used for the field feeding survey.

Count area	Type	Description
CA1	Fields	Large fields of improved grassland, mainly lacking field boundary vegetation, on the hillside above the western side of Lough Beg. Additional fields to the south were also covered (CA1*).
CA2	Wetland	Tidal lagoon and brackish marsh.
CA3	Intertidal	The main area of intertidal habitat in Lough Beg, which consists of large areas of intertidal mudflat, as well as areas of <i>Spartina</i> -dominated saltmarsh along the western side of the CA, and narrow strips of shingle and littoral rock around the shoreline.
CA4	Fields	An area of small fields of improved grassland, with three maize fields in the south-eastern corner, divided by hedgerows.
CA5	Fields	Two large fields of improved grassland on a hillside rising up to the Martello Tower. Two additional fields to the east were also covered (CA5*)
CA6	Fields	A large CA extending along the proposed route from Castlewarren to Shanbally. Contains several large fields of improved grassland, although the fields to the south of the Janssen access road are less intensively managed and probably best described as semi-improved. The CA, as defined in the Glas Ecology report, also includes arable fields, a section of the landscaped grounds around the Novartis factory, and a quarry. Several additional fields to the east, south and west were also covered (CA6*).
CA7	Intertidal	The coastline around Lough More and the outer part of Lough Beg. This mainly consists of narrow strips of littoral rock, with areas of sandy shoreline at Lough More and to the south of the GSK factory.

See Figure 2 for boundaries of the count areas and other details.

The boundaries of count areas CA1-CA6 were based on the map on page 14 of the Glas Ecology report, but were redrawn on aerial imagery to follow defined field boundaries (Figure 2). Some additional areas of fields adjacent to these count areas were also surveyed (labelled CA1\*, CA5\* and CA6\* in Figure 2).

The field count areas (CA1 and CA4-CA6) were mainly surveyed by driving along bordering roads and stopping as required to scan the fields. However, CA4 was surveyed by walking up to the Martello tower, as the upper slopes of the fields in this count area were not visible from the adjacent roads (Figure 2). Similarly, in CA6, two section of fields had to be surveyed by walking the fields due to limited visibility from the adjacent roads (Figure 2). During the high tide and ebb/flood tide counts, the wetland/intertidal count areas (CA2-CA3 and CA7) were surveyed from a series of

shoreline vantage points (Figure 2). The dusk counts of Lough Beg (CA3) were carried out from a single vantage point (Figure 2), which covered the main Curlew nocturnal roost.

### 3.2.2. High tide and ebb/flood tide counts

On each count day, two complete surveys of the count areas were carried out: one at high tide (during the three hour period centred on high tide), and one on the ebb/flood tide (outside the three hour period centred on high tide, when mudflats were exposed in Lough Beg). The purpose of carrying out two sets of counts was to test whether the occurrence of field feeding waders was related to the tidal cycle: i.e., were birds feeding on mudflats at low tide and moving to fields at high tide? Apart from the first survey day, the counts of the field count areas (CA1, and CA4-CA6) were started/finished at least 90 minutes after dawn/before dusk, as field feeding waders in Cork Harbour are known to roost in estuarine areas at night. On the first survey day, the ebb tide count overran and did not finish until one hour before dusk.

The timings of the high tide and ebb/flood tide counts are shown in Table 5. On some days, it was necessary to split the ebb/flood tide counts into periods before and after the high tide counts. However, when this was the case, coverage of individual count areas were not split between these periods. The weather conditions during the high tide and ebb/flood tide counts are shown in Table 6. While periods of windy and/or rainy weather occurred on some of the counts, the weather conditions never affected bird detectability (as the field feeding counts are entirely based on visual observation, the weather constraints for carrying out the counts are less stringent than those required for the transect counts).

The target species for the high tide and ebb/flood tide counts were the following wader species that feed on fields in the Cork Harbour area: Oystercatcher, Golden Plover, Lapwing, Black-tailed Godwit and Curlew. In addition any other waterbird species encountered in the field count areas (CA1 and CA4-CA6) were also recorded. Only the target species were counted in the lagoon/intertidal count areas (CA2-CA3 and CA7) due to the time limitations.

For each observation, the bird behaviour was classified as feeding, flying, flushed, or roosting/other. The flushed category distinguishes birds that had been settled in the count area but flushed before their behaviour could be observed, as opposed to birds that were only observed overflying the count area. The roosting/other category includes all non-feeding behaviour of birds that were observed on the ground. For most observations, the locations of the birds, and or their flight paths, were recorded on maps. The exceptions were dispersed birds in intertidal areas.

Table 5 Timing of the high tide and ebb/flood tide counts.

Date	High tide		High tide counts		Ebb/flood tide counts	
	time	height (m)	start time	finish time	start time	finish time
04/11/2015	11:14	3.4	09:48	12:53	13:20	16:37
20/11/2015	11:42	3.6	10:29	12:56	09:26 13:55	10:01 16:15
22/12/2015	14:38	3.9	13:10	15:40	10:20	12:12
05/01/2016	12:39	3.4	11:15	14:09	09:43 14:18	11:09 15:09
03/02/2016	12:41	3.1	11:53	14:18	09:08	11:03
03/03/2016	11:50	3.2	10:20	12:59	13:17	15:53

20/11/2015: CA6 counted on flood tide; other CAs counted on ebb tide.

05/01/2016: CA6 counted on ebb tide; other CAs counted on flood tide.

Table 6 Weather conditions during, the field feeding counts, 2015/16.

Transect	High tide counts				Ebb/flood tide counts			
	Cloud	Wind	Rain	Visibility	Cloud	Wind	Rain	Visibility
04/11/2015	3	no wind	1	1	3	no wind/SE2	1	1
20/11/2015	2	W4	1-2	1	2-3	W4-5	1-2	1
22/12/2015	2-3	SW4	1-2	1	3	SW4-5	1	1
05/01/2016	2-3	NW4	1	1	2-3	NW3-4	1	1
03/02/2016	2-3	W3-4	1	1	1-2	W2-4	1	1
03/03/2016	3	S3	3	2	3	S3/SW2	1-2	1

Cloud cover: 1 = 0-33%, 2 = 34-66%, 3 = 67-100%.

Wind: compass direction and Beaufort scale.

Rain: 1 = on rain; 2 = showers; 3 = drizzle.

Visibility: 1 = good; 2 = moderate.

### 3.2.3. Dusk counts

In addition to the two complete surveys of the count areas, on each count day (apart from the first count day) counts were also carried out of waders in Lough Beg (CA3) at dusk to record the numbers of roosting field feeding waders. An additional dusk count was also carried out after completion of the transect surveys on 29/01/2016.

These counts were started at least 40 minutes before dusk, and were continued until dusk. An initial count of all the target species was carried out (using the same methodology as for the ebb/flood tide counts). Repeat counts were then carried out until it was too dark to accurately count birds in the *Spartina* (where the main Curlew roost occurred). The watch was then continued until dusk to record any new birds arriving at the roost. The repeat counts, and roost watch, focused on Curlew because there was no evidence of any of the other target species using Lough Beg as a nocturnal roost. The final count was derived by summing the totals of the latest accurate count and any subsequent arrivals.

On the first count day, the ebb/flood tide count overran into the dusk period. Therefore, the ebb/flood tide count for CA3, combined with observations of flock movements from CA7, provides an indication of the roosting numbers, but may be an underestimate.

In the results, the numbers of Curlew considered to be field feeding birds flying into Lough Beg to roost are distinguished from birds considered to be part of the intertidally feeding population (i.e., present in Lough Beg throughout the day). On most count days, this was an easy distinction to make as the dusk fell during the latter part of the ebb tide period, or during low tide, and there were extensive areas of mudflat exposed, which the intertidally feeding birds were dispersed across. In these situations, dispersed roosting birds out on the mudflats were taken to be part of the intertidally feeding population. On 22/11/2015, the dusk count period fell at the start of the ebb tide and the mudflats were still largely flooded. However, the intertidally feeding Curlew continued to occupy roosts along the eastern shoreline of Lough Beg (which they had occupied at high tide), while the presumed field feeding birds flew into the *Spartina* roost, allowing the two groups to be distinguished.

The timings of, and weather conditions during, the dusk counts are shown in Table 7.



Table 7 Timing of, and weather conditions during, the dusk counts, 2015/16.

Date	Start time	Dusk	Cloud	Wind	Rain	Visibility
20/11/2015	16:34	17:15	3	W5	2	2
22/12/2015	15:55	17:06	2	SW4	2	2
05/01/2016	16:00	17:18	2	NW4	1	2
29/01/2016	16:53	17:53	3	SW4	2	1
03/02/2016	17:03	18:03	3	W4	1	1
03/03/2016	16:54	18:52	2	W4	1	1

Cloud cover: 1 = 0-33%, 2 = 34-66%, 3 = 67-100%.

Wind: compass direction and Beaufort scale.

Rain: 1 = on rain; 2 = showers; 3 = drizzle.

Visibility: 1 = good; 2 = moderate (note visibility refers to conditions at the start of the count, before the fading light started to have major effects).

### 3.2.4. Additional searches

Searches of the remainder of the route corridor (i.e., west of CA6) for field feeding waders were carried out on 04/11/2015 (between the high tide and ebb tide counts), 03/02/2016 (between the high tide and dusk counts) and 03/03/2016 (before the high tide count). Searches were also made during the transect counts (while walking the transects and while moving between the transects). Searches were not made on three of the field feeding count days (20/11/2015, 22/12/2015 and 05/01/2016) due to lack of time resulting from the short day length on these days.

The searches were all carried out at least 1.5 hours after dawn/before dusk, when field feeding waders should be active. The searches were made by driving the route and stopping frequently to scan fields from suitable vantage points. Apart from on the transect count days, no fields were walked so some areas will not have been visible. However, I consider that the searches covered the vast majority of potential field feeding habitat along the route corridor.

## 3.3. RESULTS

### 3.3.1. Curlew field feeding

Field feeding Curlew were recorded on all the count days, and on all but one of the counts (Table 8). On the one exception (the ebb tide count on 04/11/2015), the main field feeding count area (CA1) was counted between 01:20 and 01:27 hours before dusk and, by this time, the field feeding birds may already have gone to roost.

In the November, February and March counts the field feeding birds occurred mainly in CA1, while in the December and January counts, the field feeding birds occurred mainly in CA6. Smaller flocks were recorded in fields to the east of CA5 on three of the counts (and may have occurred there more regularly; see discussion). On 03/03/2016, the flock from CA5 flew to CA4 and briefly settled before being presumed to have flown on and joined the birds in CA1.

During the transect counts (which included transects covering CA4 and part of CA6), the only records of field feeding birds were of single Curlew in a maize field in CA4 on 11/12/2016, and flying south-west across CA4 (from CA5) on 29/01/2016. No field feeding Curlew were recorded anywhere else along the route corridor during the general searches of the route corridor made on the three transect counts and on 04/11/2015, 03/02/2016 and 03/03/2016.

The field feeding Curlew flocks in CA1 were widely distributed but mainly occurred along the lower slopes adjacent to CA2 and CA3 (Figure 3). In CA6, the field feeding Curlew flocks mainly occurred along the top of the ridge to the east of Castlewarren, with one record from the eastern end of the fields to the south of the Janssen access road at Barnahely (Figure 3).

Table 8 Numbers of field feeding Curlew recorded during high tide (HT) and ebb/flood tide (E/F) counts during the field feeding survey, 2015/16.

Count area	04/11/2015		20/11/2015		22/12/2015		05/01/2016		03/02/2016		03/03/2016	
	HT	E/F	HT	E/F	HT	E/F	HT	E/F	HT	E/F	HT	E/F
CA1	43	0	41	43	1	1	0	0	76	19	32*	64
CA4	0	0	0	0	0	0	0	1	0	0	0	19
CA5	14**	0	0	6*	0	0	0	3	28*	0	5*	19*
CA6	0	0	0	0	51	39	46	41*	0	0	0	0
Total	57	0	41	47	52	39	46	45	76***	19	37	83***

\* recorded in fields adjacent to, but outside, the count area, or flying from those fields (i.e., areas labelled as CA1\*, CA5\* or CA6\* in Figure 2).

\*\* 2 birds in CA5 and 12 birds in CA5\*.

\*\* totals excludes birds considered to be duplicate counts.

### 3.3.2. Overall pattern of Curlew occurrence in the Lough Beg area

Field feeding Curlew in the Cork Harbour area feed on fields during the day and roost in estuarine areas at night. These nocturnal roosts use traditional roosting sites (often the same as high tide roosts). The Curlew that use intertidal habitat in Cork Harbour for feeding appear to show a different diel pattern of activity, feeding at low tide and roosting at high tide. While the nocturnal activity of these birds has not been directly observed, when low tide occurs around dawn or dusk, repeat counts of Curlew feeding in intertidal habitat show no evidence of birds leaving roosts at dawn, or going to roost at dusk.

At any one point during the period of exposure of intertidal habitat some of the intertidally feeding Curlew will be roosting. However, these birds usually roost individually out in the middle of the intertidal zone. Therefore, at dawn/dusk, these birds can usually be distinguished from the field feeding Curlew that come to the estuarine areas to roost in discrete communal roosts. However, it is possible that some intertidally feeding Curlew that choose to roost at dusk could join the communal roosts of the field feeding birds (it would be difficult to detect such behaviour by direct observation).

In the Lough Beg area, most/all field feeding Curlew roosted nocturnally in/along the edge of the *Spartina* at the western side of Lough Beg (Figure 2). On some count days, a pre-roost gathering was observed on the mudflats in the outer part of Lough Beg, with these birds then moving to the *Spartina* roost. The dusk counts recorded the numbers of Curlew using these roosts, as well as the numbers of intertidally feeding Curlew present at dusk. The results of these dusk counts, combined with the results of the daytime high tide and ebb/flood tide counts, are presented in Table 9. These counts show that the numbers of the intertidally feeding birds normally remained fairly constant across the day. The exceptions were on 22/12/2016, when there were very low numbers on the flood tide, and on 03/02/2016, when much larger numbers occurred at high tide compared to on the flood tide and at dusk. There is no evidence from the count data of intertidally feeding Curlew leaving Lough Beg at high tide to feed on fields. The numbers of nocturnally roosting birds were always significantly higher than the numbers of field feeding birds recorded during the day in CA1 and CA4-CA6, indicating that field feeding birds from further afield were commuting to Lough Beg to roost at night. Direct observations supported the latter conclusion: flocks of Curlew were observed flying into Lough Beg from beyond Currabinny around 30-60 minutes before dusk on four of the six count days, as well as during the additional dusk count on 29/01/2016 (Table 10); on 21/11/2015 (one of the two count days when this movement was not observed), the dusk count may have started too late to have detected the movement. These birds were presumably field feeding birds coming from fields above Crosshaven.

Table 9 Overall numbers of Curlew recorded during high tide, ebb/flood tide and dusk counts.

Date	Count	Intertidally feeding birds	Field feeding birds	Nocturnally roosting birds	Total
04/11/2015	High tide	46	57	0	103
	Ebb tide/dusk	46	0	129	175
20/11/2015	High tide	50	41	0	91
	Ebb tide	65	49	0	114
	Dusk	45	0	112	157
22/12/2015	Flood tide	14	40	0	54
	High tide	62	52	0	114
	Dusk	72	0	171	243
05/01/2016	Flood tide	35	45	0	80
	High tide	42	46	0	88
	Dusk	28	0	201	229
29/01/2016	Dusk	20	0	163	183
03/02/2016	Flood tide	23	19	0	42
	High tide	107	76	0	183
	Dusk	39	0	108	147
03/03/2016	High tide	33	37	0	70
	Ebb tide	27	83	0	110
	Dusk	16	0	163	179

Intertidally feeding birds include birds that were roosting at the time of the count, but, from their behavior, are considered to belong to the intertidally feeding population (see text).

Table 10 Observations of Curlew movements into Lough Beg from beyond Currabinny near dusk.

Date	Time	Dusk	Flock size
04/11/2015	16:34	17:37	70
22/12/2015	16:28	17:06	120
05/01/2015	16:25	17:18	45
29/01/2016	16:53	17:53	70
03/03/2016	18:15	18:52	10

### 3.3.3. Other species

Apart from Curlew, eight other waterbird species were recorded during the field feeding counts in CA4-CA6 (and adjacent fields) (Table 11).

Sizeable flocks of Black-headed Gull and Common Gull occurred regularly, mainly in CA1 and/or CA6 and adjacent fields. There were occasional records of other gull species (Mediterranean Gull and Lesser Black-backed Gull) associated with these flocks. During dusk watches at Lough Beg, large numbers of Black-headed Gull and Common Gull were recorded flying south into Lough Beg, where they would settle on intertidal habitat, or in subtidal water, at the mouth of the lough before flying on to roost in open waters between Fort Camden and Spike Island.

Small numbers of Little Egret and Snipe also occurred regularly. The Little Egret mainly occurred in CA6 (particularly around Castlewarren). Snipe were only recorded from CA5, but this was because Snipe were only detected when they were flushed and CA5 was the only count area where extensive areas of fields were walked. Oystercatcher and Black-tailed Godwit (which regularly feed on fields in other areas around Cork Harbour) were only recorded field feeding occasionally and in small numbers in this survey. The Oystercatcher flock on 04/11/2015 was recorded in the fields to the east of CA5, while the Black-tailed Godwit flock on 03/02/2016 was recorded in the north-eastern part of CA1.

Table 11 Numbers of field feeding waterbirds (excluding Curlew) recorded during high tide (HT) and ebb/flood tide (E/F) counts during the field feeding survey, 2015/16.

Species	04/11/2015		20/11/2015		22/12/2015		05/01/2016		03/02/2016		03/03/2016	
	HT	E/F	HT	E/F	HT	E/F	HT	E/F	HT	E/F	HT	E/F
Little Egret	0	0	1	1	8	1	0	3	2	1	0	0
Oystercatcher	34	0	3	0	0	0	0	0	0	0	0	0
Snipe	2	2	0	0	0	2	0	3	2	2	2	0
Black-tailed Godwit	1	0	0	0	0	0	0	0	26	0	0	0
Black-headed Gull	0	26	14	48	75	0	0	99	26	83	17	16
Common Gull	0	3	32	48	131	0	0	163	43	118	0	97
Mediterranean Gull	0	0	0	0	1	0	1	0	1	0	0	1
Lesser Black-backed Gull	0	0	0	1	0	0	0	0	0	0	0	0

### 3.4. DISCUSSION

#### 3.4.1. Introduction

This section reviews the patterns of field feeding behaviour observed in this study, and compares the results with the 2014/15 Glas Ecology surveys, as well as other previous studies/observations from the Lough Beg area. The latter include:

- Atkins - surveys of fields around the Martello Tower (including CA5, CA5\* and fields to the east) carried out by Atkins on behalf of Cork County Council in 2014/15. These surveys also included some coverage of CA1 and CA4. The results cited from the Atkins surveys are based on personal communications from Paul O'Donoghue and John Deasy.
- FERA - combined radar and vantage point surveys covering the Lough Beg, Monkstown Creek and Owenboy Estuary areas, carried out by FERA in 2010/11 for the Cork Lower Harbour Wind Turbine Development project (Simms et al., 2011a, b).
- NEC - counts, and vantage point watches, of the Lough Beg and Monkstown Creek area carried out by Natura Environmental Consultants in 2009/10 for the Cork Lower Harbour Wind Turbine Development project (DePuy, 2011; Janssen, 2011; Novartis, 2011; SKB, 2011).
- TCK - comments from the Irish Wetland Bird Survey counter for the Lough Beg I-WeBS subsite (Dr T.C. Kelly, pers. comm.)

#### 3.4.2. Curlew field feeding in the Lough Beg area

This study found that field feeding by Curlew occurred regularly in the Lough Beg area, including in the vicinity of the eastern end of the route corridor between Castlewarren and Ringaskiddy.

The most frequently used area was CA1, on the western side of Lough Beg. This was also the most frequently used area in the 2014/15 Glas Ecology survey. Field feeding by Curlew in this area has also been reported by other observers:

- In 2014/15, field feeding in this area was regularly observed during the Atkins survey work.
- In 2010/11, Curlew field feeding appears to have been regularly observed in the southern part of CA1 (area F in Figure 5 of Simms et al., 2011b) during the FERA survey work (although the report is not very clear about the locations of field feeding areas).
- In 2009/10, Curlew were recorded in "agricultural fields immediately west and south west of Lough Beg Estuary ... every month during the winter period except for September 2009, with the largest number recorded being 127" (NEC survey).
- The I-WeBS counter for the Lough Beg subsite (TCK) has stated that Curlew "use the very large fields which can be seen from the hide to the west of the marsh ... and ... the fields on both sides of the road leading down to the causeway".

Curlew also occurred regularly in/adjacent to CA5. The larger flocks recorded in this area were all either in the far corner of the field east of the Martello Tower, or birds flying over which were presumed to have come from the next field to the east. In the 2014/15 Glas Ecology survey, Curlew were only recorded once in CA5 (a flock of 42), but this survey did not include the fields to the east of the Martello Tower. 25 Curlew were also recorded in CA5 in February 2014 during the Glas Ecology transect surveys. In the Atkins 2014/15 survey, which included all the fields in this area, Curlew flocks were regularly observed in this area, with a mean count of 11, and a maximum count of 21. The flocks mainly occurred in the far corner of the field east of the Martello Tower (the same location as observed in the present study), or in the fields to the east. Therefore, the results of the present study are consistent with the results of the Atkins survey and indicate that the fields to the east of the Martello Tower regularly hold small flocks of Curlew.

Curlew were recorded in CA4 on two dates during the 2015/16 field feeding survey, with an additional record from one of the transect counts. These records included one record of a flock of 19 birds, which involved a flock that briefly stopped in this area while moving between CA5 and CA1. The other two records were of single individuals. In the 2014/15 Glas Ecology survey, small flocks (< 10 birds) of Curlew were recorded twice in this area, while a flock of 31 was recorded here in February 2014 during the Glas Ecology transect surveys. In the 2014/15 Atkins survey small numbers of foraging Curlew were recorded in these fields, with a maximum count of 20 “but more usually 2-5 birds, if present at all”. There are no records from this area mentioned in any of the reports from the wind turbine studies. Therefore, the overall picture indicates that CA4 is occasionally used by very small numbers of Curlew, with rare records of larger flocks.

Flocks of 41-51 Curlew were recorded in/adjacent to CA6 on two dates during the 2015/16 field feeding survey. On both occasions, the birds occurred in fields around Castlewarren. The favoured area appeared to be the fields on top of the ridge east of the beet field. Large flocks of gulls also occurred in this area. These records came from the period of very wet weather in late December/early January and it may be that the weather conditions had caused a temporary abundance of available prey. There were no records of Curlew from CA6 during the 2014/15 Glas Ecology survey, and this area was not covered by the Atkins surveys. There are, however, some indications of field feeding by Curlew in this area from the wind turbine studies. Figure 15 in Simms et al. (2011) shows wader foraging areas located in the fields to the south of the Janssen access road, the arable field east of the Novartis site, and the grassland fields to the west of the Moog site. The Janssen EIS (Janssen, 2011) refers to the following information from an interim report (Simms, 2011a): “Curlew were recorded feeding on the managed grassland mounds around the Janssen facility and in the improved grassland fields further south, which are grazed by cattle”<sup>1</sup>. Overall, the available information indicates that Curlew usage of CA6 is irregular/occasional, but sizeable numbers can occur.

There were no records of field feeding Curlew from other areas along the route corridor during the 2015/16 surveys, or during the Glas Ecology surveys. However, the Glas Ecology report states that “reports of Curlew using the area around Ballinimlagh were received from surveyors undertaking habitat survey work for this proposed scheme and 35 birds were seen flying over this area in November”.

### **3.4.3. Overall pattern of Curlew occurrence in the Lough Beg area**

The results of the 2015/16 surveys show that Curlew field feeding in the Lough Beg area follows a diel cycle, rather than a tidal cycle. Birds feed on fields during the day and roost in intertidal areas in Lough Beg at night. The numbers of birds using the nocturnal roost was always significantly higher than the numbers recorded field feeding in the Lough Beg area during the day, indicating that birds using the roost range over a wider area. This is supported by the regular occurrence of a flightline of birds coming into the mouth of Lough Beg, presumably from the Crosshaven

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<sup>1</sup> The Novartis EIS (Novartis, 2011) also makes reference to information from this interim report, indicating usage of additional areas: “Curlew were recorded feeding on the managed grassland mounds around the Novartis facility and in the improved grassland fields further south, which are grazed by cattle”. However, due to the identical wording, this is presumed to be a misquote of the information quoted in the Janssen EIS.

direction. Birds feeding in intertidal habitat follow a tidal cycle, feeding at low tide and roosting at high tide. Over short timescales, there appears to be little interchange of individuals between the field feeding and intertidally feeding groups of birds: I did not observe any birds move between fields and intertidal areas, or vice versa, during the day. This pattern of behaviour is consistent with my observations of Curlew behaviour elsewhere in Cork Harbour.

Similar patterns of behaviour were also observed during the FERA surveys (Simms et al., 2011b). The field feeding birds were observed to roost nocturnally in the “saltmarsh at the western end of Lough Beg” (the same location as observed in the present study), with the exception of nocturnal spring high tides when the birds were “were pushed out” and “the roost moved to the brackish marsh in Lough Beg”. In 2015/16, high water levels in the lagoon deterred waders from roosting there during daytime high tides, but the timing of my surveys (with high tides during the middle of the day) meant that I did not observe what the Curlew did when their nocturnal roost was flooded by spring high tides. The FERA surveys also recorded a flightline of birds entering Lough Beg “through the mouth of the estuary from feeding sites elsewhere in Cork Harbour”, which is presumably the same as the flightline recorded in 2015/16 of birds presumed to be coming from the Crosshaven direction. Another flightline was recorded by the FERA surveys of birds leaving/returning to/from the north/north-east. This presumably included birds feeding in the fields to the east of CA5, as well as possibly other locations (the average count was around 50, which is higher than the numbers using the latter area in 2014/15 and 2015/16).

The overall numbers of Curlew recorded in the FERA surveys (Simms et al., 2011b) in 2010/11 appear to have been much higher than those recorded in the present study, with monthly peaks of 220 in November, 680 in December, 420 in January, 410 in February and 82 in March. Although it is not clear exactly what area these peak counts refer to, the text indicates that (apart from in December and March) the majority of birds were field feeding, while the December peak is explicitly stated to refer to the Lough Beg nocturnal roost.

#### **3.4.4. Other field feeding wader species**

The other species of wader that commonly feed in large flocks on fields in the Cork Harbour area were not recorded (Golden Plover and Lapwing), or only recorded rarely (Oystercatcher and Black-tailed Godwit) during the 2015/16 survey. Some of these species have been recorded field feeding more frequently in the Lough Beg area in previous winters.

Oystercatcher were regularly recorded field feeding in the fields to the east of CA5 by Atkins in 2014/15 (mean count of 12, maximum count of 31). These birds mainly occurred in the same areas as the Curlew, and were noted to fly over the cliff onto the adjacent rocky shoreline when disturbed. In 2015/16, the lack of survey of the easternmost of the fields to the east of CA5 may, at least partly, explain the rarity of Oystercatcher records from this area. There are few records of Oystercatcher field feeding elsewhere in the Lough Beg area: there was one record of 5 birds in CA4 from the 2014/15 Glas Ecology surveys, while two birds were recorded feeding in fields north-west of Lough Beg (probably in CA6) in the 2010/11 FERA surveys.

Black-tailed Godwit have been noted by several studies/observers (Atkins; FERA; NEC; TCK) to regularly feed in CA1, although there was only a single record from this area in the 2014/15 Glas Ecology survey. The very wet weather in the winter of 2015/16 may have caused dispersal of birds away from Cork Harbour to feed in flooded fields inland: for example, there was a flock of around 800 Black-tailed Godwit feeding on the Lee Fields for several weeks around Christmas 2015. There do not appear to be any records of Black-tailed Godwit feeding in fields elsewhere in the Lough Beg area.

Irish Wetland Bird Survey (I-WeBS) data indicate that Golden Plover and Lapwing are rare in the Lough Beg area, although Lapwing occur more frequently (but in low numbers) on the Owenboy Estuary. The FERA surveys recorded a flock of around 35 Lapwing feeding in CA5 for a few days in November 2010, while the NEC surveys recorded a flock of 100 Golden Plover on one occasion in CA1. There do not appear to be any other records of Golden Plover or Lapwing field feeding in the Lough Beg area, indicating that it is an occasional, or rare, occurrence.

Overall, it seems that the only regular field feeding sites for waders (other than Curlew) in the Lough Beg area are the fields to the east of CA5 for Oystercatcher and CA1 for Black-tailed Godwit.

#### **3.4.5. Other species**

The other waterbird species recorded in fields during the 2015/16 field feeding survey were Little Egret, Snipe, Black-headed Gull, Common Gull, Mediterranean Gull and Lesser Black-backed Gull. The occurrence patterns of these species in the fields around the Lough Beg are typical of their occurrence patterns in fields around Cork Harbour.

In the 2014/15 Glas Ecology field feeding survey, Shelduck and Redshank were also recorded on fields in CA1. In the Cork Harbour area, these species typically only occur on fields that are immediately adjacent to estuarine areas, and have unrestricted access to the estuarine areas (e.g., at Slatty Pool, near Carrigtwohill), although Redshank may also visit flooded fields further away from estuarine areas. The occurrence of these species in CA1 is, therefore, not surprising but they are unlikely to use fields in any of the other count areas.

## 4. GLOUNTHAUNE ESTUARY/SLATTY WATER

### 4.1. INTRODUCTION

As part of the consultation process for the M28 upgrade scheme, NPWS raised a concern about the potential for road schemes to fragment feeding habitat and deter Curlew from flying over roads to reach feeding areas. In response to this concern, the work carried out in 2014/15 by Glas Ecology included some surveys of field feeding waders in fields on the eastern side of Little Island adjacent to the N25 dual carriageway.

The Glounthaune Estuary/Slatty Water is the estuarine area adjacent to the northern side of Little Island. I have counted this area for the Irish Wetland Bird Survey (I-WeBS) since 1995, and have also carried out many other non-I-WeBS counts of this area. As part of my counts, I routinely record numbers of waders feeding in several areas of fields adjacent to the estuary. Therefore, I have a long-term dataset on patterns of field feeding behaviour in this area of Cork Harbour. For the present study, I have used this dataset to analyse the usage of different areas of fields by Curlew.

### 4.2. COUNT SECTORS

The counts of Glounthaune Estuary/Slatty Water in the dataset are divided into 19 sectors. These sectors subdivide the overall subsite. Six of these sectors represent areas of fields that are used by field feeding waders (Figure 4; Table 12). Each of these sectors comprise a block of fields lacking significant internal divisions. All six sectors mainly comprised intensively managed improved grassland. However, there have been land management changes in two of these sectors (HN and LIWF) in recent years, while a section of LIEF was under arable crops in the early/mid-2000s (Table 12). Three sectors are immediately adjacent to the N25 dual carriageway (HN, LIEF and LIWF), while the other three (SF, SP and WIF) are around 0.5-1.5 km from the dual carriageway (but SP is adjacent to the busy R624 road) (Figure 4). A nocturnal Curlew roost occurs in Slatty Water. This roost uses a saltmarsh island to the north of the dual carriageway at high tide, and an area of mudflat to the south of the dual carriageway at high tide (Figure 4).

Table 12 Sectors of the Glounthaune Estuary/Slatty Water with field feeding habitat.

Code	Sector	Area (ha) of grassland	Description
HN	Harper's North	11.8 (8.9 after 2006)	Low-lying fields on the northern side of Harper's Island. These fields were improved grassland grazed by sheep until the summer of 2006. Since then, the fields have not been managed intensively and now regularly flood in winter. Part of the fields (HN1) have now developed into <i>Salicornia</i> -dominated saltmarsh, while the remainder (HN2) are rough grassland grazed by horses. Since 2006, counts may include birds feeding or roosting in the <i>Salicornia</i> zone, but these birds are counted separately from the birds feeding in the remaining fields and have not been included in the dataset analysed in this report.
LIEF	Little Island East fields	19.7 (11.8 in the early/mid-2000s)	Large fields of improved grassland on the eastern side of Little Island. These are mainly on sloping ground, but include a small section of low-lying fields, which can flood, around a small tidal inlet. A section of the fields were under arable crops for several years in the early/mid-2000s.
LIWF	Little Island West fields	16.5	Two low-lying fields on the northern side of Little Island, adjacent to the western end of the Glounthaune Estuary. These fields were intensively managed as improved grassland but appear to have been somewhat neglected in recent winters. However, these fields have not been routinely counted since the winter of 2005/06, due to the growth of vegetation along the N25 (which have obscured the fields from the vantage points previously used).
SF	Slatty fields	13.7	Low-lying fields of improved grassland to the south-east of Slatty Pool. Parts of these fields occasionally flood.



Code	Sector	Area (ha) of grassland	Description
SP	Slatty Pool	9.1	Slatty Pool is a lagoon formed by the impoundment of the upper end of Slatty Water. The Slatty Pool count sector includes the lagoon and fields of improved grassland to the south of the pool. These fields include low-lying sections along the edge of the pool, which can flood, and areas of higher ground to the south. Counts from this sector may include birds roosting along the edge of the pool, but these birds are counted separately from the birds feeding in the fields and have not been included in the dataset analysed in this report.
WIF	Weir Island fields	22.2	Fields of improved grassland between the inlet at Rossmore and the fields to the north. These fields have been used for licensed waste deposition, which has raised the level of the fields. However, the majority of the sector has remained as improved grassland throughout the period covered by this analysis.

See Figure 4 for sector boundaries and other details.

### 4.3. DATA ANALYSIS AND RESULTS

The analyses in this report use count data from the winters (September-March) of 2001/02-2015/16. A total of 91 counts were included in this dataset, and field feeding Curlew were recorded on 76 of these counts.

Field feeding Curlew showed a strongly seasonal pattern of occurrence: during the November-February period, they occurred on 86% of the counts, with a median number per count of 12-16 birds, while in September-October and March they only occurred on 53% of the counts with a median number per count of 0-1 birds (Table 13).

Table 13 Summary of seasonal pattern of occurrence of field feeding Curlew around Glounthaune Estuary/Slatty Water, 2001/02-2105/16.

Month	Number of counts	Field feeding Curlew numbers:		
		median count	maximum count	% non-zero counts
September	13	1	12	54%
October	13	1	22	69%
November	12	12	53	92%
December	14	8	92	71%
January	16	14	157	88%
February	15	14	111	93%
March	8	0	8	25%

The occurrence of field feeding Curlew in individual count sectors was analysed across two periods: 2001/02-2005/06 and 2006/07-2015/16. During 2001/02-2005/06, the LIWF sector was counted, and the HN sector was intensively grazed by sheep and was not subject to tidal flooding. Also, for some, or all, of this period part of the LIEF sector was under arable crops. From 2006/07, the LIWF sector was not counted, intensive grazing of the HN sector ceased and it was subject to tidal flooding, and all of the LIEF sector was under improved grassland.

Compared to the pattern of field feeding in the Lough Beg area, there does not appear to be a single strongly preferred area for field feeding in the Glounthaune Estuary/Slatty Water area (Table 14). During 2001/02-2005/06, the HN, LIWF and WIF sectors were the most frequently used by field feeding Curlew, and supported the largest numbers. The mean count for the SF sector was also high, but this was due to a single large count of 77 birds. From 2006/07, the frequency of usage of the HN sector decreased (from 62% to 26% of the counts), possibly reflecting the changes in management which reduced the area of grassland, and produced a rougher sward. The frequency of usage of the LIEF sector increased (from 23% to 37% of the counts), possibly reflecting the increased area of improved grassland, following the cessation of grazing. The frequency of usage of the WIF sector was similar between the two periods.

Table 14 Summary of Curlew field feeding records in Glounthaune Estuary/Slatty Water count sectors, 2001/02-2005/06 and 2006/07-2015/16.

Sector	Area (ha)	2001/02-2005/06 (n= 26 counts)			2006/07-2015/16 (n = 46 counts)		
		number of records:		mean count	number of records:		mean count
		all flocks	>9 birds		all flocks	>9 birds	
HN	11.8/8.9	16	5	12	12	3	12
LIEF	11.8/19.7	6	2	8	17	13	26
LIWF	16.5	11	7	17	-	-	-
SF	13.7	5	2	22	6	1	5
SP	9.1	3	1	7	12	4	10
WIF	22.2	10	6	25	15	10	27

The mean count is the mean across counts where Curlew occurred (i.e., it excludes zero values).

In Table 15, the sectors are grouped by whether they are close to, or distant from, the N25 dual carriageway. During 2001/02-2005/06, the areas of the close and distant sector groups were very similar. During this period, field feeding Curlew occurred more frequently in the close sectors, but, when they did occur in the distant sectors numbers tended to be higher. The area of the close sector groups was lower in the 2006/07-2015/16 period due to the cessation of counting of the LIWF sector. However, both the frequency of occurrence, and the numbers occurring, were very similar between the two sector groups during this period.

Table 15 Comparison of the occurrence of field feeding Curlew in fields close to (near), and distant from (far), the N25 dual carriageway.

	Distance from N25	Area (ha)	Number of records:		Mean count
			all flocks	>9 birds	
2001/02-2005/06 (n= 26 counts)	close	40	24	12	17
	distant	45	13	8	30
2006/07-2015/16 (n = 46 counts)	close	29	28	15	20
	distant	45	29	15	19

The close group includes sectors HN, LIEF and (2001/02-2005/06 only) LIWF. The distant group includes sectors SF, SP and WIF. The area for the close group in 2001/02-2005/06 excludes the area of the arable fields in LIEF, while the area for the close group in 2006/07-2015/16 takes account of the reduction in area of field habitat in HN.

#### 4.4. DISCUSSION

The analysis of my dataset on field feeding Curlew in the Glounthaune Estuary/Slatty Water subsite shows that Curlew routinely feed on fields immediately adjacent to the N25 dual carriageway, and found no evidence that fields further from the dual carriageway were preferred by Curlew.

There are, however, some limitations to the conclusions that can be drawn from this analysis. There are various additional factors that may affect Curlew usage of fields, which could, in theory, obscure any relationship that may exist between field usage and proximity to the dual carriageway. These additional may include the pasture quality, soil type, drainage, proximity to the nocturnal roost, and other disturbance sources. Furthermore, counts of the Slatty Water nocturnal roost indicate that the field areas included in the analysis only support a small proportion of the total field feeding Curlew population in the area. However, notwithstanding these limitations, the analysis does indicate that any disturbance/fragmentation impacts from road development will be of limited magnitude

## 5. IMPACT REVIEW

### 5.1. INTRODUCTION

Curlew is the only field feeding wader that occurs in significant numbers in field areas that overlap the proposed route. Therefore, this impact review is limited to consideration of potential impacts to Curlew.

### 5.2. NUMBERS OF BIRDS AFFECTED

The two count areas that would be affected by the proposed route are CA5 and CA6. The route would go through the middle of CA6 and skirt the edge of CA5. The areas regularly used by Curlew and Oystercatcher to the east of CA5 are over 500 m from the proposed route. Therefore, I have assumed that these areas will not be affected. The numbers of Curlew recorded in the 2014/15 and 2015/16 field feeding surveys within the areas of CA5 and CA6 potentially affected by the proposed route are shown in Table 15. The mean of the peak daily counts across the two seasons was 11.8. This indicates the maximum magnitude of the likely impact, assuming that the road development causes complete displacement of these birds (which is an extremely unlikely scenario; see below).

Table 16 Numbers of field feeding Curlew recorded in areas potentially affected by the proposed route of the M28 upgrade scheme.

Season	Date	CA5	CA6	Total
2014/15	31/10/2014	0	0	0
	28/11/2014	0	0	0
	22/12/2014	0	0	0
	12/01/2015	42	0	42
	13/02/2015	0	0	0
	19/03/2015	0	0	0
2015/16	04/11/2015	2	0	0
	20/11/2015	0	0	0
	22/12/2015	0	51	51
	05/01/2016	3	46	49
	03/02/2016	0	0	0
	03/03/2016	0	0	0

The 2015/16 data shows the maximum of the high tide and flood/ebb tide counts.

Displacement impacts to waterbirds are usually quantified as percentages of the overall size of the relevant population. The Cork Harbour Curlew population is monitored by counts carried out for the Irish Wetland Bird Survey (I-WeBS). The Curlew counts for the most recent four winters available are shown in Table 17<sup>2</sup>. The peak counts occur in September/October, with lower numbers in mid-winter. However, the coverage of field feeding birds by the I-WeBS counts is limited. They may be counted where they occur in fields adjacent to I-WeBS subsites, but many will be missed. Therefore, it is not clear whether the autumn peak is due to passage birds passing through, field feeding birds being missed during mid-winter, or a combination of these factors.

The mean November-February Cork Harbour Curlew count is 865. A major nocturnal Curlew roost occurs in Slatty Water, where an additional 100-800 birds can be present, compared to the numbers counted in the Glounthaune Estuary/Slatty Water subsite during the day (personal data). As well as the Slatty Water and Lough Beg roosts, nocturnal Curlew roosts occur at Rossleague, Rathcoursey and Saleen Creek, and there may be additional roosts elsewhere. As a very rough estimate, I consider that the typical mid-winter Cork Harbour Curlew population may be in the range 1500-2500 birds. This would mean that the potential displacement due to the proposed M28

<sup>2</sup> Count data for the 2015/16 winter has not been collated yet.

upgrade scheme would represent around 0.5-0.8% of the Cork Harbour mid-winter Curlew population.

Table 17 Curlew count totals from Irish Wetland Bird Survey (I-WeBS) counts of Cork Harbour.

Season	Sep	Oct	Nov	Dec	Jan	Feb	Mar
2011/12	1662	978	887	623	1357	1197	324
2012/13	1234	1139	506	-	628	1266	-
2013/14	1163	-	747	846	883	855	527
2014/15	1987	1307	-	662	797	851	-

Source: *Cork Harbour I-WeBS counts: Summary report for the winter of 2014/15* ([www.gittings.ie/downloads](http://www.gittings.ie/downloads)).

### 5.3. POTENTIAL IMPACTS

#### 5.3.1. Habitat loss

The proposed route of the M28 upgrade scheme will cause direct removal of grassland habitat within CA6, which is used by feeding Curlews.

Loss of intertidal habitat is generally considered to be a potentially significant impact because intertidal habitat is a limited resource, so the displaced birds may not be able to find any alternative habitat that is not already at its effective carrying capacity. If this is the case, the displaced birds will have to compete with birds elsewhere in the site for food, and density-dependent reductions in survivorship and/or body condition may occur. Density-dependent reductions in survivorship mean that survival rates decrease as population density increases. Loss of body condition in overwintering bird populations may result in reduced survivorship on spring migration.

Loss of grassland habitats used by field feeding waders present a different scenario. There is, effectively, an unlimited supply of potentially suitable habitat, although there may be variations in habitat quality. Therefore, in general, it is very likely that birds displaced by loss of grassland habitat will be able to find suitable alternative habitat. The alternative habitat may not be of as high quality as the habitat that they were displaced from, but would still be likely to be capable of supporting the displaced birds. There may be exceptions to the above, where an area of fields has features that make it particularly suitable for field feeding birds (as may be the case with CA1). However, the low level of usage of CA6 by field feeding Curlew indicate that it has no such features. Therefore, I consider it reasonable to conclude that any Curlew displaced from field feeding habitat in CA6 by construction of the M28 upgrade scheme will be likely to find suitable alternative habitat.

#### 5.3.2. Disturbance/habitat fragmentation

The proposed route of the M28 upgrade scheme will be adjacent to grassland habitat in CA5 and CA6 used by feeding Curlews. Concern has been raised by NPWS, that road schemes may cause a barrier that prevent Curlew from utilising habitats as they may be deterred from flying over the roads to reach the habitat. In my opinion, a more realistic, but related concern, is that disturbance from major roads cause avoidance, or reduced utilisation, of suitable habitats adjacent to the roads.

The fact that Curlew continue to use intertidal habitat in areas adjacent to major roads (e.g., the Douglas Estuary, Lough Mahon, Dunkettle, and the Glounthaune Estuary/Slatty Water) suggest that disturbance/fragmentation impacts from road development do not cause complete avoidance of affected areas.

The results of the analysis of my data on field feeding around the Glounthaune Estuary/Slatty Water shows that Curlew continue to utilise fields adjacent to the N25 dual carriageway, and there is no evidence of reduced utilisation of these fields compared to more distant fields. The dual carriageway bisects the estuary and Curlew routinely fly across the carriageway to move between feeding areas and roosts, etc. As discussed above, there are limitations to the conclusions that can be drawn from this analysis, but the results do indicate that any disturbance/fragmentation impacts from road development will be of limited magnitude.

There are many studies on disturbance impacts to waterbirds. However, the interpretation of these studies is complicated as disturbance responses are site specific due to habituation effects.

Therefore, for various reasons, many studies with information on disturbance responses of Curlew are not relevant to the present assessment. One study of some relevance was carried out by Burton et al. (2002). They carried out analyses of waterbird distribution (including Curlew) in six estuaries in southern England in relation to the proximity of footpaths and other man-made landscape features. Their study used data from Wetland Bird Survey (WeBS) low tide counts and related bird numbers in individual count sectors to the proportions of the count sectors within defined distances (25 intervals from 0-500 m) of roads and other features. They found that the proportion of the count sector within 25 m of a road caused a significant reduction in Curlew numbers. This study provides some strong evidence indicating that the presence of roads along the shoreline affects the within-site distribution of Curlew, and the geographical scale of the effect (limited to the immediate vicinity of the road) accords with what might be intuitively expected from general experience of Curlew behaviour. However, as the study does not indicate the effect sizes (the magnitude of the reduction in bird numbers caused by a specified level of road development), the ecological significance of this result is difficult to assess.

A study by Hayhow (2009) on Black-tailed Godwits is also of some relevance because this study was carried out across nine sites in southern Ireland, four of which were in Cork Harbour. This study examined the effects of urbanisation on godwit distribution and behaviour. It used an index of urbanisation that included the distance to the nearest road and the traffic levels. The study found that there was no relationship between levels of urbanisation and godwit foraging or vigilance behaviour, although there were higher vigilance levels and a greater frequency of disturbance flights on grasslands compared to mudflats.

#### **5.4. CONCLUSION**

Based on my own experience and knowledge of Curlew behaviour in Cork Harbour, the results of analysis of my data on field feeding around the Glounthaune Estuary/Slatty Water, and the available literature evidence, I consider that:

- Any Curlew displaced from field feeding areas by direct habitat loss due to the proposed road scheme are likely to be able to find suitable alternative habitat.
- There is no potential for any fragmentation impacts (i.e., the impact from the road causing a barrier that prevents Curlew from utilising habitats by deterring them flying over the road to reach the habitat).
- Any disturbance impacts (from the operational road) to adjacent habitats will be minor and will not cause large-scale exclusion of Curlew from adjoining habitats.

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## Appendix 1 Scientific names of bird species mentioned in the text

Common name	Scientific name	Common name	Scientific name
Blackbird	<i>Turdus merula</i>	Lapwing	<i>Vanellus vanellus</i>
Black-headed Gull	<i>Chroicocephalus ridibundus</i>	Lesser Black-backed Gull	<i>Larus fuscus</i>
Black-tailed Godwit	<i>Limosa limosa</i>	Linnet	<i>Carduelis cannabina</i>
Blue Tit	<i>Cyanistes caeruleus</i>	Little Egret	<i>Egretta garzetta</i>
Bullfinch	<i>Pyrrhula pyrrhula</i>	Long-tailed Tit	<i>Aegithalos caudatus</i>
Buzzard	<i>Buteo buteo</i>	Magpie	<i>Pica pica</i>
Chaffinch	<i>Fringilla coelebs</i>	Mallard	<i>Anas platyrhynchos</i>
Chiffchaff	<i>Phylloscopus collybita</i>	Meadow Pipit	<i>Anthus pratensis</i>
Coal Tit	<i>Periparus ater</i>	Mediterranean Gull	<i>Larus melanocephalus</i>
Coal Tit	<i>Periparus ater</i>	Mistle Thrush	<i>Turdus viscivorus</i>
Common Gull	<i>Larus canus</i>	Oystercatcher	<i>Haematopus ostralegus</i>
Common Gull	<i>Larus canus</i>	Pheasant	<i>Phasianus colchicus</i>
Curlew	<i>Numenius arquata</i>	Pied Wagtail	<i>Motacilla alba yarelli</i>
Dunlin	<i>Calidris alpina</i>	Raven	<i>Corvus corax</i>
Dunlin	<i>Calidris alpina</i>	Redshank	<i>Tringa totanus</i>
Dunnock	<i>Prunella modularis</i>	Redwing	<i>Turdus iliacus</i>
Feral Pigeon	<i>Columba livia</i>	Robin	<i>Erithacus rubecula</i>
Goldcrest	<i>Regulus regulus</i>	Rook	<i>Corvus frugilegus</i>
Golden Plover	<i>Pluvialis apricaria</i>	Shelduck	<i>Tadorna tadorna</i>
Goldfinch	<i>Carduelis carduelis</i>	Siskin	<i>Carduelis spinus</i>
Great Tit	<i>Parus major</i>	Skylark	<i>Alauda arvensis</i>
Greenfinch	<i>Chloris chloris</i>	Snipe	<i>Gallinago gallinago</i>
Greenshank	<i>Tringa nebularia</i>	Song Thrush	<i>Turdus philomelos</i>
Grey Heron	<i>Ardea cinerea</i>	Sparrowhawk	<i>Accipiter nisus</i>
Grey Wagtail	<i>Motacilla cinerea</i>	Starling	<i>Sturnus vulgaris</i>
Grey Wagtail	<i>Motacilla cinerea</i>	Stock Dove	<i>Columba oenas</i>
Herring Gull	<i>Larus argentatus</i>	Teal	<i>Anas crecca</i>
Hooded Crow	<i>Corvus cornix</i>	Turnstone	<i>Arenaria interpres</i>
House Sparrow	<i>Passer domesticus</i>	Woodpigeon	<i>Columba palumbus</i>
Jack Snipe	<i>Lymnocyptes minimus</i>	Wren	<i>Troglodytes troglodytes</i>
Jackdaw	<i>Corvus monedula</i>	Yellowhammer	<i>Emberiza citrinella</i>

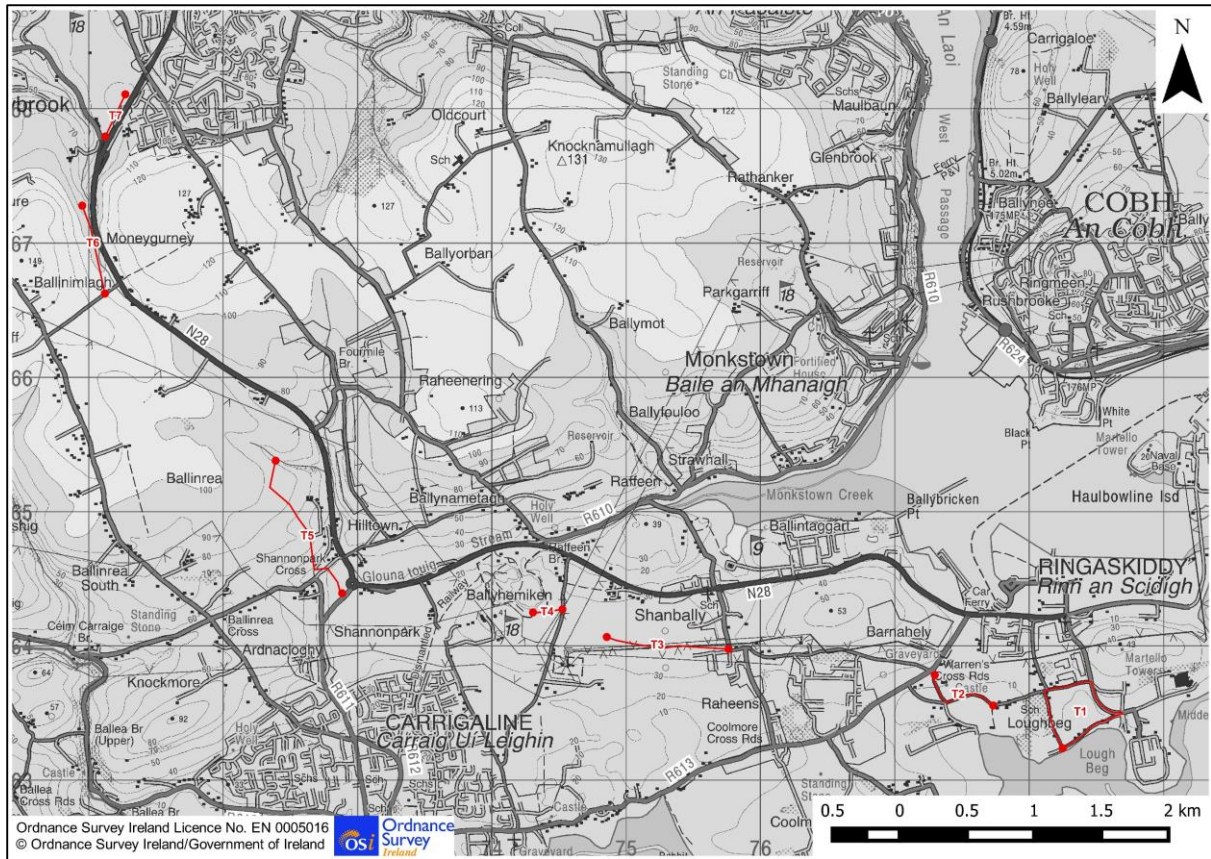


Figure 1. Transect routes.

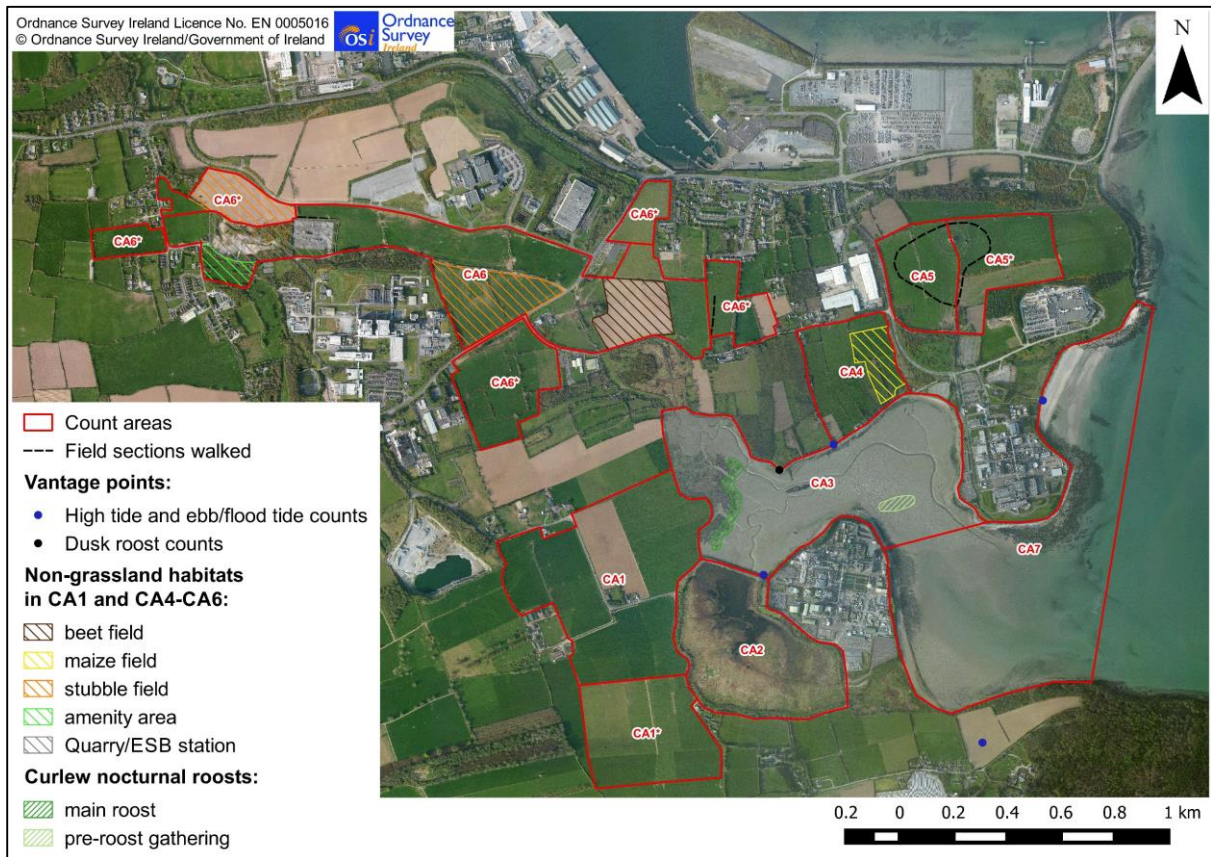


Figure 2. Count areas used for the field feeding wader survey.



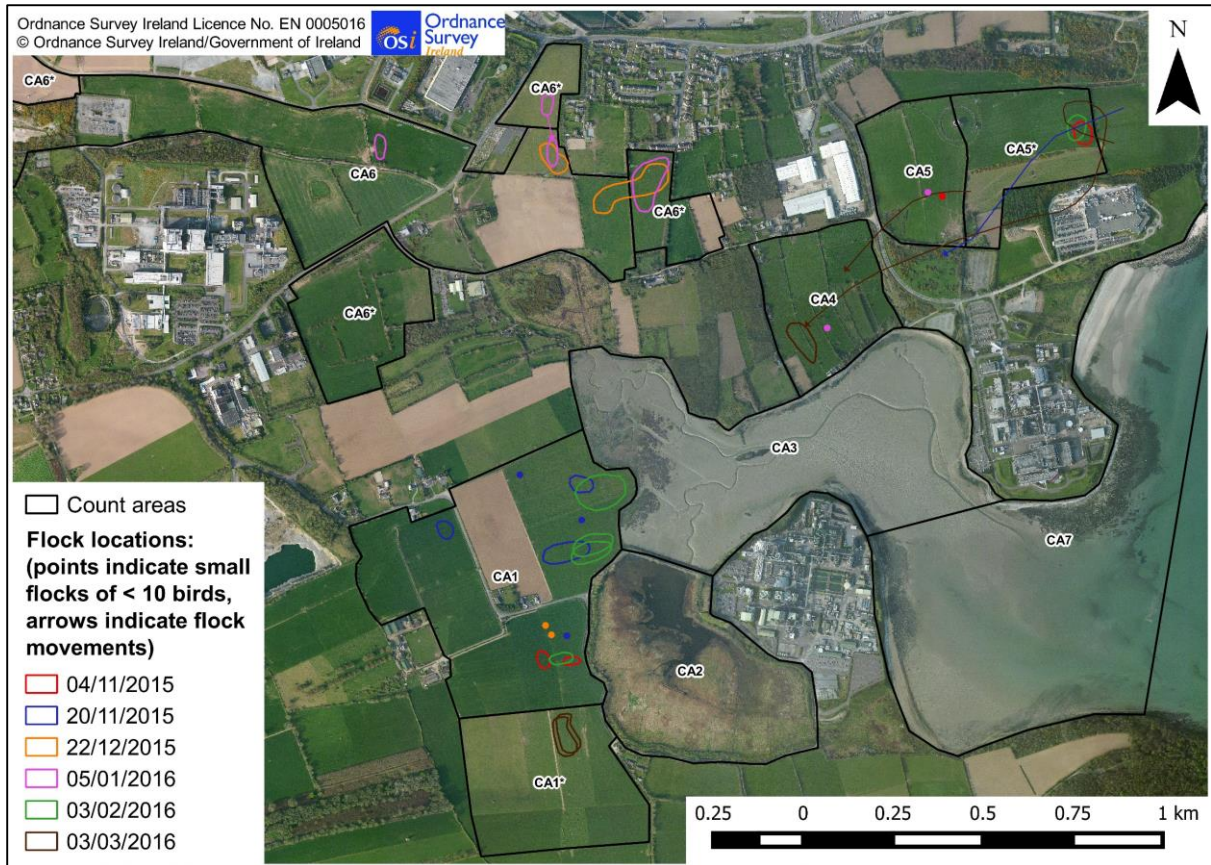


Figure 3. Location of Curlew flocks recorded in CA1 and CA4-6 during the field feeding surveys.

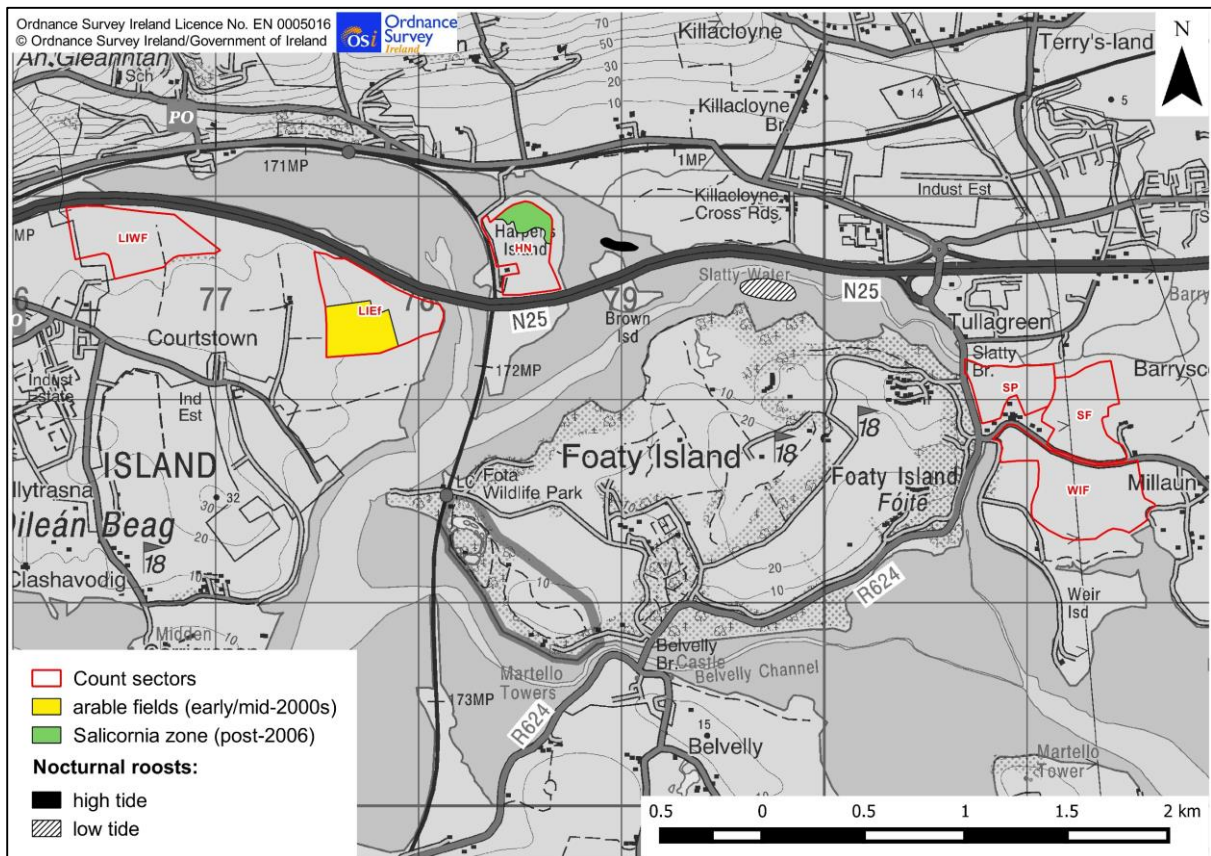


Figure 4. Glounthaune Estuary/Slattery Water count sectors included in the analyses of field feeding Curlew.



## **APPENDIX 12B: HABITAT AND SPECIES MANAGEMENT PLAN**



# M28 Cork to Ringaskiddy Project

## Habitat and Species Management Plan

### Document Control Sheet

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# 1 INTRODUCTION

This Habitats and Species Management Plan (HSMP) is designed to provide full guidance on the implementation of avoidance and mitigation measures required to address ecological impacts associated with the M28 Cork to Ringaskiddy Project (hereafter referred to as the M28 road project), throughout the site clearance, construction, post-construction, operational and maintenance stages of this project.

## 2 BACKGROUND

This document presents the HSMP for the proposed M28 road project. The purpose of the HSMP is to provide detailed guidance for the comprehensive management of ecological impacts that may arise as a result of the project, including pre-construction, construction, operation and decommissioning. It also provides further details on proposed habitat enhancement measures proposed for the M28 road project.

The HSMP has been prepared in accordance with the mitigation requirements described in **Chapter 12: Terrestrial Ecology** of the Environmental Impact Statement (EIS) for the proposed M28 road project (RPS, 2017) and takes account of the published best practice management guideline outlined therein.

An Ecological Impact Assessment completed for the proposed M28 Road Project forms **Chapter 12: Terrestrial Ecology** of the EIS (RPS, 2017). A series of ecological surveys were conducted to obtain baseline information on the habitats and species present within the footprint of the proposed M28 Road Project and its associated Zone of Influence (ZoI). The ZoI extends beyond the study area (environs of the proposed M28 Road Project) to include ecological areas and features (i.e. the ecological receptors) likely to be affected by the biophysical changes caused by the project. These surveys identified sensitive ecological receptors within the project ZoI, their connectivity and potential impact risks to inform requisite mitigation and design measures to avoid or minimise potential impacts to these receptors.

The findings of the site surveys undertaken to inform the EIS and Natura Impact Statement (prepared to inform Stage 2 of the Appropriate Assessment process) inform this HSMP.

## 3 HABITAT AND SPECIES MANAGEMENT OBJECTIVES

The objectives of the HSMP is to manage the impacts on each of the sensitive ecological receptors are outlined under the headings below.

### 3.1 SPECIES

#### 3.1.1 Peregrine Falcon

- Commence construction after the Peregrine Falcon breeding season to protect the falcon and their young;
- During the construction phase to avoid risk of collision with construction machinery, make existing cliff face habitat unsuitable for nesting / breeding by securing wire mesh / netting over cliff face;
- Install / erect habitat breeding structures; i.e. nest boxes and trays within suitable structures in proximity to Raffeen quarry post construction; and
- Instate and monitor site specific landscaping measures to screen the operational road project from the cliff face habitat.

#### 3.1.2 Other Avifauna

- Avoid clearing vegetation during the bird nesting season; and
- Compensatory woodland planting to provide nesting habitat to replace woodland impacted by the proposed M28 road project.

#### 3.1.3 Pennyroyal

- Identify and translocate all pennyroyal populations within the footprint of the proposed M28 Road Project at Raffeen quarry and Shanbally;
- Prepare proposed receptor area within project Compulsory Purchase Order (CPO) line at Shanbally;
- Instate pennyroyal populations within open ground / disturbed habitat located within abandoned quarry / holding area at Shanbally; and
- Outline monitoring protocol for translocated pennyroyal populations to ensure successful establishment.

#### 3.1.4 Badgers and Otters

- Present mitigation measures for badger and otter during pre-construction, construction and operational phases of the proposed road project.



### 3.1.5 Bats

- Present mitigation measures for bats pre-construction, construction and operational phases of the proposed road project.

## 3.2 HABITATS

### 3.2.1 Semi-natural Grasslands

- Present methodology for translocation of semi-natural grasslands from the road footprint to a proposed receptor site within the project Compulsory Purchase Order (CPO) area. Translocation methodologies will include selecting and turving (removing the vegetative and root layer of the grassland habitat using a machine excavator and hand tools) from a receptor site before translocating and establishing the turves within a previously prepared receptor site.
- Outline management plan to manage receptor site over the short to medium term to provide favourable habitat characteristics such as grazing, draining, mowing, fertilisation etc.
- Cordoning off and protection of calcareous grassland within project CPO line, south of the route footprint.

### 3.2.2 Wetlands at Raffeen Quarry

- Present methodology for the creation of wetland habitat within the CPO line at Raffeen quarry,
- Provide methodology to facilitate water drawdown and plant species translocation from the wetland area under the footprint of the proposed road project to the receptor site, and
- Outline management principles to ensure wetland establishment and sustainability and to recreate the species and habitat assemblages currently present within Raffeen quarry.

### 3.2.3 Woodlands (including linear woodlands)

- Undertake woodland planting, comprising native tree and shrub species, within the proposed road project CPO to compensate for woodland loss under the proposed road project.

## 4 HABITAT CREATION AND TRANSLOCATION METHODOLOGIES

The below text provides an outline methodology to undertake habitat creation and translocation techniques for habitats and species discussed in **Chapter 3** of this HSMP.

### 4.1 METHOD STATEMENT FOR MITIGATION, MONITORING, HABITAT ENHANCEMENT AND OTHER MEASURES FOR THE PROTECTION OF PEREGRINE FALCON

Peregrine Falcon was confirmed nesting on the vertical cliff face habitat along the southern bounds of the quarried footprint at Raffeen quarry during the breeding season 2014. Peregrine breeding activity was not confirmed during site visits undertaken in February, March and May 2017, however suitable habitat exists for this species within the quarried cliff faces and associated ledges and crags created by quarrying activities in this area.



**Image 4.1: Cliff Face and Wetland Habitats on Southern Extents of Raffeen Quarry**

The proposed route is partially located within and lies in proximity to this vertical cliff face at Raffeen quarry. Therefore, it is proposed to mitigate for the loss and disturbance of suitable Peregrine Falcon habitat by facilitating ongoing usage of adjoining or nearby habitat during the project operational phase, by minimising the risk of disturbance and collision associated with the nearby road project. It is also proposed to provide suitable alternative habitat for Peregrine Falcon within the project environs by securing a nest boxes or tray onto a tall man-made structure, such as a tall building, electricity tower / pylon or similar<sup>1</sup>.

<sup>1</sup> Exact locations of Peregrine nesting habitats or proposed nest box sites are not presented in this report as these features could be vulnerable to persecution and ongoing disturbance.

Prior to the construction, nest boxes and nest trays will be secured within these sites to allow the establishment and / or usage of these sites, as food caches or plucking posts / perches by Peregrine.

In order to avoid direct and indirect disturbance of any ongoing breeding activity within the quarry, it is proposed to commence construction works in this area outside of the breeding season, March 01<sup>st</sup> to August 31<sup>st</sup> inclusive. Monitoring of suitable cliff face areas will be undertaken after August 31<sup>st</sup>, to ensure young birds have successfully fledged and left the cliff nesting site. Fledged Peregrine Falcon can remain reliant on breeding adults for 5-6 weeks and may return to the nest site for a period after fledging. Monitoring will confirm when young birds have left the nest and are not dependent on the breeding site.

In the unlikely event that avifauna, such as Peregrine Falcon, utilise the vertical cliff face as a breeding habitat during the project's construction phase, they may be subject to collision with construction machinery or ongoing disturbance associated with construction activities. Therefore, once on-site monitoring has confirmed that breeding birds and their young have successfully fledged and have left the nest site, all of the vertical cliff face of the quarried area will be secured with wire mesh / netting and will remain in-situ throughout the project's construction phase. This will ensure that the cliff face will not be utilised by nesting birds during the project's construction phase, avoiding risk of collision or ongoing disturbance to breeding activities.

The construction phase of the proposed M28 Road Project will result in the loss of suitable breeding habitat at Raffeen quarry. To mitigate for the loss of this habitat and to provide alternative breeding habitat for Peregrine, two nest boxes will be attached to suitable structures such as decommissioned pylon structures or decommissioned telecommunication masts. Nest boxes will be secured in place and will be verified as being structurally sound prior to commencement of the project's construction phase. All structural materials comprising a nest box structure will be made from treated hardwood and will comprise the following dimensions:

- 56cm deep,
- 56cm height (at back),
- 51cm height (at front),
- 86cm wide, and
- 150cm circular wooden structure along the side of the box to allow adult Peregrines and fledged birds to perch.

A sample nest box structure, displaying the above dimensions is presented in **Image 4.2** below.



**Image 4.2: Sample Peregrine Nest Box Structure<sup>2</sup>**

The base of the nest box will be secured with 10cm - 15cm of pea gravel which will be secured, with adhesive or similar, onto the base / floor of the nest box structure which will provide breeding adults with a suitable substrate to lay and incubate eggs. The base of the nest box will be drilled with 15-20 small holes to provide ventilation and drainage. The nest box will be positioned away from prevailing winds. The securing of the nest box structures will be overseen by a suitably qualified ecologist / ornithologist. These structures will be monitored throughout the project's construction phase by the site ecologist to determine if structural or positioning improvements are required in addition to determining activity and ongoing usage of these structures by Peregrine or other avifaunal species.

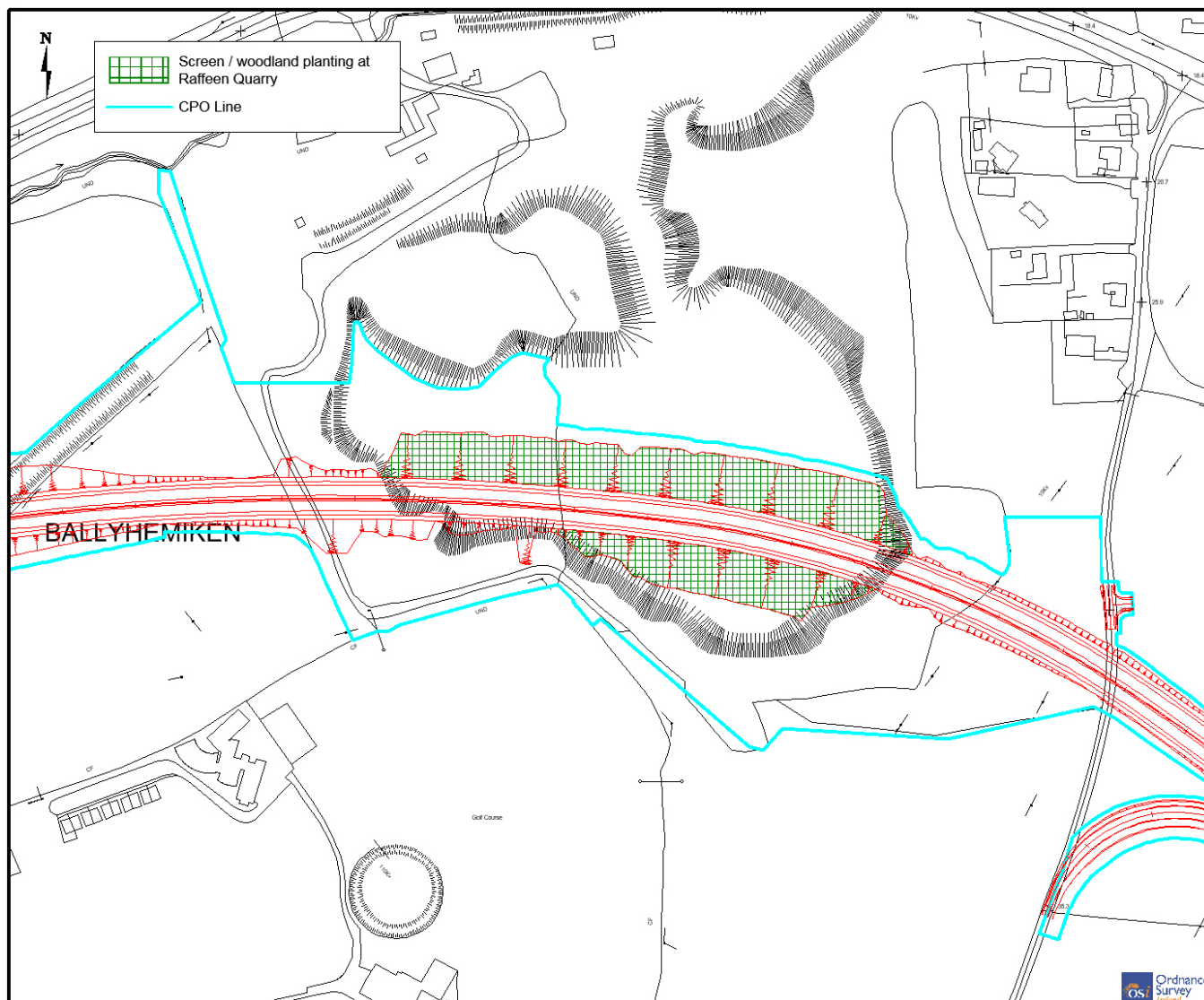
During the construction phase, screen woodland landscaping will be instated onto both embankments adjoining the motorway where it passes through Raffeen quarry (See **Figure 4.1**). On completion of the road project's construction and the successful instatement of the adjoining woodland landscaping measures, the wire mesh will be removed from the quarry cliff face to allow breeding bird activity in this area once again.

During the project's operational phase, woodland landscaping measures will screen the proposed M28 from the cliff habitat and in turn will screen breeding birds, such as Peregrine Falcon, that use the cliff face as a nesting habitat from the mainline of the proposed M28 road. Recently fledged birds using the cliff face habitat are at greatest risk from collision of nearby road traffic upon first leaving the nest site. Should Peregrine Falcon reuse the quarry cliff habitat for breeding purposes, in-situ landscaping proposals will direct Peregrine Falcon away from or over the M28 footprint and adjoining embankments, thereby reducing potential collision with vehicles using the M28 road project.

<sup>2</sup> Image sourced <https://www.raptorresource.org/build.htm>

The screen planting, particularly the semi-mature specimen trees on the higher embankment slopes, will direct the flight path of birds either (a) away from the M28 or (b) over the M28 and over the line of traffic (See **Figure 4.1**). Semi-mature standard broadleaved trees will be established on the outer margins of the embankments to facilitate adequate screen protection and to influence a flight path over the road footprint. The lower embankment slopes will be planted with native tree and shrub species as whips and feathered transplants at a standard size of 60-90cm or 90-120cm.

Figure 4.1: Footprint of Proposed Screen / Woodland Planting at Raffeen Quarry



## Monitoring

Prior to and during the project's construction phase, the following monitoring procedures for Peregrine Falcon will be undertaken by a suitably qualified ecologist / ornithologist:

- Prior to construction activities within Raffeen quarry, the quarry habitat will be monitored throughout the preceding breeding season and until all fledged birds have left the breeding site. This monitoring will confirm that there is no longer breeding activity or dependent young at the site and will inform when works will begin within the quarry footprint;
- The breeding site will be treated with wire mesh / netting and will remain in-situ throughout the project's construction phase to discourage the birds from utilising the site;
- Following erection, the nest box structures will be monitored on a monthly basis to determine structural issues, positioning, height etc.; and
- The nest boxes will be monitored on a monthly basis throughout the construction phase to determine usage by Peregrine or other avifaunal species.

The nest box structures and the cliff face habitats at Raffeen quarry will be monitored. Monitoring and determination of breeding activity (post construction and during the mitigation phase of the project) will follow the Irish Raptor Study Group's survey methodology for the 2017 Irish Peregrine Survey: Guidelines for Contributors and will take cognisance of the following Guidance documents:

- [http://www.eurapmon.net/sites/default/files/raptors\\_2nd\\_ed\\_017\\_peregrine.pdf](http://www.eurapmon.net/sites/default/files/raptors_2nd_ed_017_peregrine.pdf); and
- [https://www.bto.org/sites/default/files/shared\\_documents/peregrine\\_survey/2014-peregrine-survey-guidelines-contributors.pdf](https://www.bto.org/sites/default/files/shared_documents/peregrine_survey/2014-peregrine-survey-guidelines-contributors.pdf);

Monitoring during the breeding bird season will focus on the following areas:

- Nest box structures, and
- Cliff face habitat at Raffeen quarry.

## 4.2 METHOD STATEMENT FOR MITIGATION, MONITORING, HABITAT ENHANCEMENT AND OTHER MEASURES FOR THE PROTECTION OF OTHER AVIFAUNA

The following protective measures will be adopted as part of the proposed works:

### Site Clearance

- The contracting authority and the appointed contractor will endeavour to make all reasonable efforts to avoid tree felling and scrub clearance during the nesting season (as per the Wildlife Act 1976 as amended), thereby avoiding direct impacts to breeding birds during the proposed project's construction phase;
- Where vegetation clearance is required during this period, vegetation will be surveyed by an ecologist in advance of any construction works taking place in order to determine the presence of nests; and
- Where nests, etc., are present, then a buffer zone will be cordoned off; and, the nests, etc., will either be left in-situ until the end of the bird nesting season or dealt with in accordance the

terms of a licence sought from and issued by the Minister for Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

### Landscaping

- As part of the landscape mitigation, screen planting within targeted sections of the route (See **Figure 16.5** of the EIS and **Figure 4.4 – Figure 4.6** of this HSMP) will be established and will form an integral part of the overall project. The landscaping along the route will provide nesting and feeding habitat for a range of passerine bird species of the countryside and will partially mitigate for loss of hedgerow sections. Specific Landscape Measure (SLM04) proposes tree planting within the Mulcon Valley to compensate for the loss of trees along the footprint of the route. The establishment and maturation of the planted trees and screen planting will partially compensate for the loss of trees along the route and will provide viable bird nesting and foraging habitat in the short to medium term. As the screen planting continues to mature and establish, these areas will support viable refuge for both avifauna and mammals over the medium to long term.

## 4.3 METHOD STATEMENT FOR MITIGATION, MONITORING, HABITAT ENHANCEMENT AND OTHER MEASURES FOR THE PROTECTION OF PENNYROYAL<sup>3</sup>

Pennyroyal (*Mentha pulegium*) is a plant species protected under the Flora Protection Order (2015) and characterised as endangered in the current red data list for Irish Vascular Plants (Wyse Jackson et al., 2016). Raffeen quarry and a quarry / storage area at Shanbally support pennyroyal populations.

At Raffeen quarry, pennyroyal grows in abundance within the northern half of the site, north of the proposed road footprint, along the existing access roads, on areas of bare ground and within plateaus of unquarried and partially quarried ground toward the centre of the site and within the northern extents of the existing quarry void. The distribution of pennyroyal at Raffeen is restricted by the flood waters of the quarry's wetland area which expands and contracts during the winter and spring / summer seasons respectively. The road footprint and northern embankment of the proposed M28 Road Project crosses through localised, disparate populations of pennyroyal which have established on recolonising bare ground with localised abundances of bryophyte cover.

The area at Shanbally support similar ground conditions to that at Raffeen and has facilitated the establishment of pennyroyal. Pennyroyal populations have established within the footprint and south of the proposed road alignment / interchange at Shanbally, within and alongside areas of ephemeral shallow ponding water that support localised abundances of moss (*Calliergonella cuspidata*) cover providing a moist, humid micro habitat in this area.

Populations of pennyroyal within the road footprint at Raffeen and Shanbally will be translocated, subject to the a licence from NPWS under Section 21 of the Wildlife Act as amended, to an area of suitable habitat at Shanbally, south and south-east of the road footprint (See **Figure 4.2**). In addition, small and disparate populations of pennyroyal to the north of the project footprint, but within the CPO line at Raffeen Quarry will be translocated, under licence, to the proposed receptor site at Shanbally.

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<sup>3</sup> The proposed measures within this Method Statement are contingent on pennyroyal (*Mentha pulegium*) populations at Raffeen and Shanbally being of native origin; i.e. not a non-native / adventive variant of this plant species.



The receptor area at Shanbally supports recolonising bare ground and mixed scrub. Where required, the areas of mixed scrub will be removed, outside of the bird nesting season, as per the Wildlife Act 1976 as amended. However, if works must proceed during this season, a derogation licence will be applied for from the Wildlife Licencing Unit of the NPWS under Section 21 of the Wildlife Act 1976 as amended.

Prior to translocation works being undertaken, the proposed receptor area will be delineated and prepared to receive the translocated material, using temporary fencing as required, ensuring that there is suitable area to accommodate the aggregate and vegetative material from each of the receptor sites.

Pennyroyal translocation will be completed in autumn to facilitate new root growth of the translocation species throughout the following winter and spring. Translocation of pennyroyal plants during the autumn period will allow these plants to set seed in-situ while also allowing for the ready identification of all populations of this species at each of the receptor sites. The proposed receptor is located in proximity to an existing population of pennyroyal and also supports comparable habitat/edaphic/abiotic conditions to those present at Raffeen quarry; i.e. bare/sparsely vegetated ground that supports localised, ephemeral ponding and abundances of bryophyte growth. These conditions will be recreated at the proposed receptor site, by providing slight contours and depressions within the translocation material to provide localised, shallow ponding of water. Collection of water at the receptor area will not be permanent but will be regulated by prevailing weather conditions, ephemeral ponding and subsequent percolation through the aggregate underlying substrate and evapotranspiration.

Protection of the receptor area throughout the project construction phase will be gained by restricting entry to the area in which the pennyroyal is located. Fencing will be installed around the boundary of the proposed receptor area to prevent access by construction vehicles or other ancillary works.

#### **4.3.1 Translocation and Establishment**

Pennyroyal is a rhizomatous plant species, meaning it establishes and spreads within a habitat by a network of underground runners, known as rhizomes. Pennyroyal, where it occurs within Raffeen quarry and Shanbally is situated upon bare or partially vegetated ground which supports sparse vegetative cover. Unlike a grassland or peatland habitat, these areas do not support soil or vegetative depths that would facilitate sectioning or turving and translocating the habitat supporting this species.

**Image 4.3: Pennyroyal Growing on an Access Track near the Northern Boundary of Raffeen Quarry, North of the Proposed Road Footprint**



Given the difficulty of securing turves from the receptor sites at Raffeen and Shanbally, translocation efforts will begin by removing plants and their rhizomatous materials from each population by hand, using trowels, small spades and other hand held tools where they occur within the footprint of the proposed road project. The hand-picked material will be placed into canvas, polypropylene or hessian bags and will be transported to the receptor site by the site ecologist.

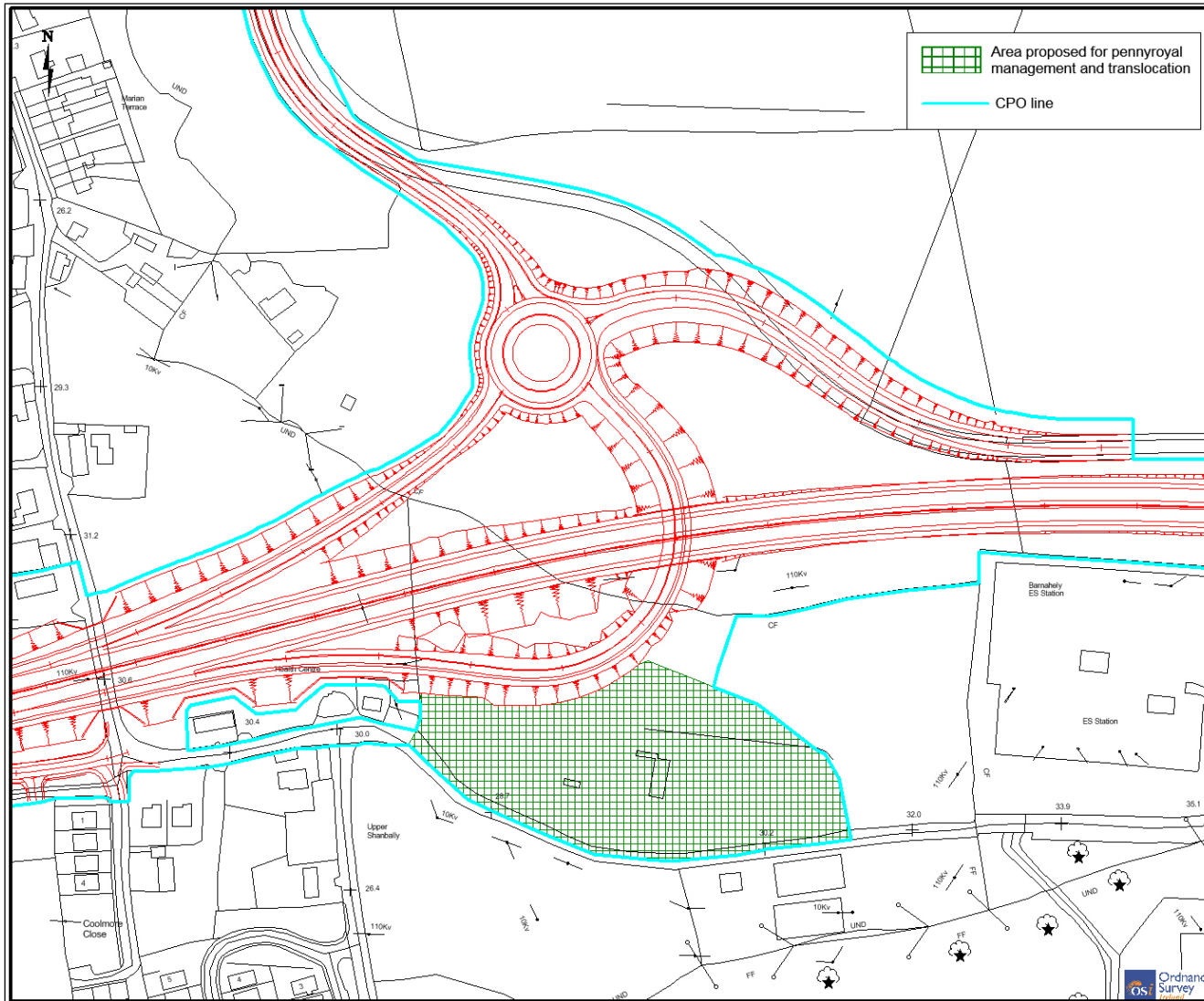
Following hand removal of the pennyroyal vegetative materials, the top 10cm of aggregate material underlying the pennyroyal will be excavated, targeting any remaining rhizome network and the plant's seed bank.

Excavation works will be completed using a wheeled excavator rather than a tracked excavator to minimise disturbance. Excavation will be carried out using a specialised bucket, facilitating shallow excavations, prioritising the rhizome network, the associated aggregate materials and seed bank.

The excavated aggregate material will be transported from the donor to the receptor area at Shanbally by dumper while transport of the excavated material from the donor areas at Raffeen quarry will be by truck. Aggregate materials filled at Raffeen Quarry will be fully sealed / covered on transit to the receptor area at Shanbally. The material excavated from Raffeen quarry will be tipped within the receptor site and regraded using a wheeled excavator. Once the aggregate materials have been successfully regraded within the site, the harvested pennyroyal plants and rhizomatous materials will be inserted / secured into this area by hand. These works will be lead and monitored by the site ecologist(s).

Part of the area proposed for pennyroyal translocation supports a localised population of Japanese knotweed an invasive plant species listed under Regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations 2011 as amended. An invasive species management plan has been prepared for this project and details control, management and eradication measures for Japanese knotweed as it occurs within the project CPO, including this area at Shanbally. Japanese knotweed at this site will be treated prior to site preparation and translocation works for pennyroyal being undertaken.

Figure 4.2: Area Proposed for Pennyroyal (*Mentha pulegium*) Translocation South of the Route at Shanbally



### 4.3.2 Monitoring

All of the proposed translocation works will be monitored will involve the participation of and will be led by a suitably qualified ecologist. An ecologist will monitor and co-ordinate all matters of the translocation works, as follows:

- Preparation of receptor site at Shanbally;
- Identification of pennyroyal populations at Raffeen and Shanbally;
- Selection and removal of pennyroyal vegetative material at Raffeen and Shanbally;
- Excavation of aggregate materials from donor sites at Raffeen quarry and Shanbally;
- Transport, tipping and re-grading of excavated aggregate material within the receptor site; and
- Ongoing monitoring during the project's construction phase to assess establishment of pennyroyal plants, drainage within the proposed translocations areas and monitor the growth rate of ruderal and shrub species within the receptor area.

### 4.3.3 Aftercare

The success of habitat creation/translocation measures for pennyroyal will be monitored periodically throughout the project's operational phase. Numbers of individual plants will be recorded along with supplementary ecological data so that the factors responsible for successful establishment and continuing growth of pennyroyal can be identified.

Any habitat creation measures to be undertaken shall follow the following recommendations:

- The establishment, growth form and spread of pennyroyal plants within the CPO at Shanbally will be monitored at years 1, 3, 5 and 10 of the project operational phase;
- The findings and recommendations following each site monitoring visit will be charted and submitted to TII and NPWS if required as part of the derogation licence for subsequent implementation as necessary; and
- The encroachment or establishment of tussocky grasses or invasive plant species will be hand-removed or strimmed to stop the encroachment of these species to the receptor area.

## 4.4 METHOD STATEMENT FOR MITIGATION, MONITORING, HABITAT ENHANCEMENT AND OTHER MEASURES FOR THE PROTECTION OF BADGERS AND OTTERS

All mitigation measures to be implemented for the protection of badgers and otters are based on the *NRA Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes (2006a)*, *NRA Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes (2006b)* and *NRA Guidelines for Crossing of Watercourses During the Construction of National Road Schemes (2005)* and refer to the current design for the proposed M28 road project.

An approach of multiuse mitigation has been employed which involves the effective use of all structures including culverts etc. for wildlife passage and protection. The mitigation measures proposed for badgers will be in place and completed before the road is open to traffic.

Mammal surveys completed in early 2014 and validated in March 2015 and 2017, yielded a total of 4 active and a number of inactive badger setts, some of which are inhabited by rabbits, within the ZOI of the proposed route alignment. Given their proximity, each of these setts will require site specific mitigation measures. The mitigation measures for each sett are separated into two stages; mitigation measures during fence-line construction or vegetation clearance, and mitigation measures prior to and during construction. This takes account of the potential for the vegetation clearance/fence-line construction to be carried out well in advance of the commencement of the construction works. No otter holts were recorded within the footprint of the route or along its immediate environs.

#### **4.4.1 Pre-Construction Mammal Surveys**

In addition to those already found, otters and badgers may also create new holts or setts in advance of road construction. To this end, if 36 months have lapsed from the time the baseline surveys were completed for this EIS and the grant of planning permission and commencement of construction, a pre-construction badger survey will be completed in accordance with the *NRA Guidelines* (2006a & 2006b).

The pre-construction surveys will check for any otter holts within or close to the alignment (at least 200m upstream and downstream of the crossing point) at all watercourse crossings. Any holts found to be present will be subject to monitoring and mitigation as set out in the *NRA Guidelines* (2006b).

#### **4.4.2 Monitoring during Site Clearance**

Where dense vegetation prevents adequate determination of the presence or absence of holts or setts, these areas will require monitoring during vegetation clearance to ensure that any setts present will be found and treated appropriately.

#### **4.4.3 Protection of Badger**

No construction machinery will be used within 30m of badger setts (extended to 50m for active setts during the breeding season, December – June inclusive). During the pre-construction survey, setts located adjacent/close to the CPO boundary (within 50m) will be clearly marked and the extent of bounds prohibited for vehicles clearly marked by fencing and signage, if deemed necessary. Such marker fencing will be sufficiently durable and robust to cover the period of construction. Neither blasting nor pile-driving will be undertaken within 150m of active setts during the breeding season.

Landscaping activities after the M28 construction phase can also affect badger setts, and care will be taken to ensure that setts safeguarded on or near the site are not interfered with at this stage and that access to foraging areas is not restricted.

Evacuation and destruction of active badger setts will be carried out under the supervision of an appropriately qualified ecologist under licence from the NPWS. Evacuation and destruction will be undertaken during the period 1<sup>st</sup> July to 30<sup>th</sup> November. All active setts will be protected from interference or disturbance by an exclusion zone of 30m (50m during the breeding season - December to June inclusive) within which no machinery or vegetation removal will take place. Sett tunnels can extend for over 20m from sett entrances and use of any vehicles, digging, or heavy

machinery can cause collapse of tunnels and cause mortality of badgers. Light work, such as hand digging or scrub clearance will not take place within 10m of sett entrances.

The setts will be clearly marked and the area from which vehicles are prohibited will be clearly marked by timber post and rail fencing (and appropriate signage) which will allow badgers to move in and out freely. To ensure that accidental damage to setts does not occur, it is important that there is a transfer of information between construction personnel at all levels. The mitigation measures and procedures required in relation to badgers will be included in the Environmental Operating Plan prepared for the proposed M28 Road Project.

Exclusion of badgers from disused or currently inactive setts is not seasonally restricted and can be conducted at any time subject to licence from the Wildlife Licencing Unit of the NPWS.

#### **4.4.4 Protection of Otter**

Otters are likely to use the lower reaches of the watercourses draining the study area especially where they form direct connectivity to larger waterbodies such as the Douglas River Estuary and Monkstown Creek. In addition, Lough Beg and its proximal complex of wetland habitats support suitable otter feeding and commuting habitat. Otters do not limit their movements to watercourses and can enter hinterlands to search for prey species, such as frogs and newts where available.

No otter holts were recorded during the site mammal surveys completed in early 2014, 2015 and 2017. If holts are found during the preconstruction surveys and are found to be inactive, exclusion of holts may be carried out during any season under licence from the NPWS. No wheeled or tracked vehicles (of any kind) will be used within 20m of active, but non-breeding, otter holts. Light work, such as digging by hand or scrub clearance will not take place within 15m of such holts, except under licence. The prohibited working area associated with otter holts will be fenced and appropriate signage erected. Where breeding females and cubs are present no evacuation procedures of any kind will be undertaken until after the otters have left the holt, as determined by a specialist. Breeding may take place at any season, so activity at a holt must be adjudged on a case by case basis, where required. Exclusion and destruction will be undertaken under licence, in accordance with the NRA *Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes* (2006b). This process involves the installation of one-way gates on the entrances to the holt and a monitoring period of 21 days to ensure the otters have left the holt prior to removal.

#### **4.4.5 Other Mitigation Measures**

The location of any depots, spoil heaps or other additional site usage during clearance and construction will avoid any disturbance to the location of active badger setts and will also avoid areas identified for the installation of mammal underpasses and mitigation.

#### **4.4.6 Mammal Ledges and Underpasses**

Badgers typically follow the same pathways between setts, feeding/foraging areas and latrines. Such pathways are identified on the basis of the presence of tracks, snuffle areas and feeding scrapes. In most cases, these pathways occur along features such as watercourses, hedgerows, treelines as well as woodland and scrub margins.

To mitigate any barrier effect on otters and to avoid mammal road casualties, mammal ledges and underpasses will be constructed adjacent to regular crossing points on the proposed M28. Mammal underpass locations were informed by mammal surveys completed for the project which confirmed current mammal activities within and surrounding the study area. Where mammal underpasses could not be secured onto existing structures such as culverts, pipes etc., this was determined by underlying engineering constraints, that included flood risk, suitability of the structure to facilitate retrofitting, health and safety issues with securing and maintaining retrofit structures and costs associated with retrofitting in-situ structures and are provided in **Table 4.1** below. The locations of proposed mammal underpasses for the proposed M28 Road Project are displayed in **Figure 4.3**.

**Table 4.1: Badger/Mammal Ledges and Underpasses for the Proposed M28 Road Project**

Mammal Underpass (MUP) No	Chainage Location	Underpass type	Target Species	Justification
MUP01	Ch. 2+550	900mm Pipe culvert	Badger	Mammal activity found throughout area and territory will be severed by new alignment. There is a requirement to provide an underpass under the old M28 alignment at this location.
MUP02	Ch. 3+150	900mm Pipe culvert	Badger and Otter	
MUP03	Ch. 4+900	Ledge	Badger and Otter	Badger activity recorded throughout woodland and scrub adjoining Glounatouig stream tributary. Provision of mammal ledge or dry pass at crossing of the Glounatouig stream tributary.
MUP04	Ch. 5+950	900mm Pipe culvert	Badger	Badger activity recorded on either side of the proposed M28 route alignment.
MUP05	Ch. 7+150	900mm Pipe culvert	Badger	Badger activity recorded along disused railway embankment. Active 2 entrance sett is directly impacted by the new alignment. An artificial sett is also proposed in this area to mitigate the loss.
MUP06	Ch. 8+675	Pipe	Badger	Historical records of badger activity recorded in the area in the woodland copse to the north. Potential severance of territory and foraging grounds
MUP07	Ch. 12+400	Pipe	Badger	Badger activity recorded in locality. Active sett directly impacted by the new alignment. Artificial sett also required at Ch 12+325 (ABS04).

Underpasses and ledges will be constructed in accordance with the NRA Guidelines (NRA, 2006a and 2006b). Additional advice on the construction and location of mammal underpasses is available in the Highways Agency document *Design Manual for Roads and Bridges* (Highways Agency, 2001a and b).



The following general guidelines for underpasses will be adhered to:-

- The exit and entrance to tunnels will be flush with mammal-proof fencing and the invert set at ground level. A concrete surround will provide a solid connection to the uprights of the fence and inhibit any efforts by badgers to dig under the pipe. Drainage will be adequate to prevent water-logging at the entrances during wet weather, and
- Specific design of underpasses will be tailored to individual locations and will be carried out at the detailed design stage.

Placement of mammal underpasses through sections of cut creates engineering difficulties. Where engineering difficulties arise, underpasses will be moved to the nearest suitable location, but not more than 250m away. Final design and placement will be advised at detailed design stage by a qualified ecologist.

Ledges are walkways that allow mammals to cross under a road at water crossings. Ledges shall be at least 500mm wide, constructed at least 150mm above the 1 in 5 year flood event, and allow at least 600mm headroom. They are usually constructed of solid concrete on one or both sides of a bridge or culvert, but may also be made of wooden or metal planks, sometimes bolted onto the structure's sides. The ledges will be installed in accordance with the NRA Guidelines (NRA, 2006).

These culverts/underpasses will also serve other wildlife movement under the road. Similarly, existing, proposed accommodation roads and railway tunnels under the proposed road project will also serve to facilitate badger passage.

Where it is not possible to install mammal underpass facilities in areas where the road will be in cut, any over-bridges along the proposed M28 Road Project will allow passage of mammals between areas cut by the road.

#### **4.4.7 Mammal Fencing**

Mammal resistant or mammal proof fencing will be required to guide badgers and other mammals to passage facilities and to prevent animals crossing the new roadway. The specification for mammal resistant fencing is given in the NRA Guidelines (NRA 2006a and 2006b). Fencing will be recessed and tied into bridge, culvert and mammal underpass locations to guide badgers and other mammals safely under the road and prevent them accessing the road carriageway. Dedicated mammal crossings will be more readily used if the approach is softened through the use of appropriate planting. Mammal resistant fencing will be incorporated at the earliest possible stage during road-construction, preferably during erection of the permanent fenceline with gaps left at locations specified for underpasses. Gaps shall be subsequently closed after underpasses have been constructed.

Gates entering onto farm access roads will require concrete sills and mammal resistant mesh attached to the gate to exclude badgers from accessing the proposed M28. The location of gates on farm access roads requiring this modification will be determined at detail design stage.

Where there is an overlap of stock-proof fencing and mammal resistant fencing at culvert/underpass locations, stock-proof fencing must be adjusted to allow for unimpeded access to the underpass. This involves modification of the lower section of the stock-proof fence. The fence will be adjusted so that the bottom rail and wire mesh are removed and chain-link is not fixed to the ground at the location of the underpass. This allows for the animals to see a break in the fence line and thus clear access to the underpass nearby. Detail of this can be seen in Figure 1 of NRA Guidelines (2006a).

#### **4.4.8 Artificial Setts**

In order to compensate for the direct loss and disturbance of badger setts within the footprint and in proximity to the project, it is proposed to create and secure 4 no. artificial setts within the LMA/CPO line. Artificial setts will be established in proximity to existing setts currently under the footprint or potential disturbed by the proposed M28 Road Project and its associated construction activities. The locations of artificial setts proposed are shown in **Figure 4.3** (See also **Figure 12.7** of **EIS Chapter 12**).

Figure 4.3: Mammal Mitigation Measures for the Proposed M28 Road Project



## 4.5 METHOD STATEMENT FOR MITIGATION, MONITORING, HABITAT ENHANCEMENT AND OTHER MEASURES FOR THE PROTECTION OF BATS

Structures with potential to support bat roosting and foraging potential that are scheduled for removal, shall be re-surveyed by a suitably qualified bat specialist immediately prior to demolition to determine if any bats are present as, due to the passage of time between survey and construction of the road, bats may move into previously inspected buildings. If a roost is discovered in a building to be removed then a sufficient number of Schwegler bat boxes or similar shall be erected adjacent to the site one month prior to works to provide alternative roost sites for the bats.

Any work on, or demolition of these structures shall preferably be undertaken between November and March, as bat numbers are then known to be fewer in buildings during this time. In addition buildings will be searched prior to demolition to reduce impact to bats present on-site.

To mitigate the loss of the roosts, three Schwegler bat boxes shall be erected in the immediate area of each roost at least one month prior to demolition of the building to provide alternative roosting sites for its bats. Any demolition shall be done carefully, in the presence of a bat specialist, and with the expectation that bats may be found. The roof of the structures shall be manually removed to protect any animals which may be beneath. If discovered, the bat specialist shall remove the animal and place it into an on-site, previously erected bat box or retain it in a secure box until dusk when it shall be released on-site.

### Removal of Deciduous Trees

Mature broadleaved trees that need to be felled under the proposed M28 footprint must first be surveyed for bat presence by a suitably experienced specialist (bat ecologist). If bats are found, an application for a derogation licence must be made to the NPWS to allow its legal removal. Such trees will be felled in the period late August to late October, or early November, in order to avoid disturbance of any roosting bats as per *NRA Guidelines* (NRA 2006a and 2006b) and also to avoid the bird breeding seasons. Tree felling will be completed by Mid-November at the latest as bats roosting in trees are very vulnerable to disturbance during their hibernation period (November - April). Trees with ivy-cover, once felled, will be left intact onsite for 24 hours prior to disposal to allow any bats beneath foliage to escape overnight.

Landowners must be advised that the timber from felled trees will remain for their use. This will prevent trees being felled prematurely.

### Retention of Trees

Several species of bats roost in trees. Treelines and mature trees that are located immediately adjacent to the realignment route or are not directly impacted shall be avoided and retained intact. Overall impacts on these sites will be reduced through modified design and sensitivity during construction. Any trees and treelines along approach roads and planned site access tracks shall be retained. Retained trees will be protected from root damage by machinery by an exclusion zone of at least 7 metres or equivalent to the tree canopy drip zone. Such protected trees will be fenced off by adequate temporary fencing prior to other works commencing.

## Landscape Planting of Woodland, Linear Woodland and Scrub Replacement for Loss of Commuting Routes

Linear features such as hedgerows and treelines serve as commuting corridors for bats (and other wildlife). Mitigation measures are set out below to compensate for the loss of these features. These measures will also compensate for habitat loss and provide continuity in the landscape.

Severed linear features such as hedgerows and treelines shall be reconnected to the specific landscape measures and ecological landscape measures using semi-mature trees under-planted with hedgerow species to compensate for the loss of treelines and hedgerows. The exact locations of such planting are outlined in the Habitat and Species Management Plan (See **Appendix B**) and the Landscape and Visual Assessment chapter. Native species will be used as they support more insect life than non-native varieties. Species to be used within proposed woodland areas include; pedunculate oak (*Quercus robur*), Scots pine (*Pinus sylvestris*), hawthorn (*Crataegus monogyna*), hazel (*Corylus avellana*), holly (*Ilex aquifolium*), Blackthorn (*Prunus spinosa*), Goat Willow (*Salix caprea*), grey willow (*Salix cinerea*), alder (*Alnus glutinosa*), rowan (*Sorbus aucuparia*) and birch (*Betula pubescens*).

Planting will preferably be completed during the pre-construction phase to provide hedgerow/tree growth prior to completion of the project. This would ensure that bats commuting in the area have prior knowledge of newly planted landscape features as well as ensuring the newly planted hedgerows/treelines are well established prior to completion of the proposed M28 road project.

Habitat replacement and landscaping will compensate for or add to the wildlife value of the area and also provide areas of aesthetic as well as wildlife interest. Further pro-active habitat restoration measures are considered below.

### Habitat Retention, Replacement and Landscaping

In general, best practice design will aim to retain the quality of the landscape and ensure its protection within the landscaping programme.

The overall design of the project includes for replacement planting of existing woodland, hedgerow, treeline and scrub habitats with native trees and shrubs. **Chapter 16: Landscape and Visual Impact** has specified for 16 landscaping measures along the project route to include screen woodland mix planting in addition to SLM 04 which comprises a large area of woodland planting to replace woodland lost due to construction in Mulcon Valley. Native species as outlined will be chosen in all landscaping schemes. Planting schemes will link in with existing wildlife corridors (hedgerows and treelines) to provide continuity of wildlife corridors.

### Bat Boxes

The loss of potential roosting features and foraging/commuting habitat coupled with the wider loss of commuting territory surrounding the projects lands will necessitate the installation of bat boxes to compensate for potential roost loss. It is recommended that bat boxes are attached to suitable trees or buildings along the route but outside the area of clearance. The principle recommended type is the Schwegler 1FF bat box. Boxes shall be erected in pairs and all boxes placed in sites that will be protected from disturbance. These boxes must be away from any felling or trimming to ensure that they are not accidentally damaged or removed. Bat boxes must be clear of scrub and away from ivy encroachment as well as lighting and traffic. These boxes must be away from any

felling or trimming to ensure that they are not accidentally damaged or removed. The appropriate number of bat boxes to compensate for loss of potential roosting features should be calculated following pre-construction Potential Roost Feature (PRF) inspection/presence absence surveys.

## Monitoring

Monitoring of bat mitigation will be completed in years 2, 5 and 10 following the implementation and establishment of these measures. The establishment and maturation of landscape features within the project CPO will be monitored. This will assess the connectivity of each landscape feature with the surrounding landscape, in particular the treeline and hedgerow networks adjoining the project CPO line.

It is essential to monitor bat boxes for their acceptance of use by bats and those boxes that remain unused two years after the date of erection will be relocated to alternative suitable locations within the project CPO. This may require siting bat boxes at different heights, aspects and locations within a linear woodland or woodland habitat. Seasonal inspection of bat boxes will be undertaken as part of the monitoring works (excluding mid-June to mid-August, the lactation period of females, where any disturbance at this time can be detrimental to survival of young) to monitor bat usage and in wintertime for general wear and tear and to remove droppings following use the previous summer. This will be undertaken by a licensed bat-handler<sup>4</sup>.

## 4.6 METHOD STATEMENT FOR MITIGATION, MONITORING, HABITAT ENHANCEMENT AND OTHER MEASURES FOR THE PROTECTION OF SEMI-NATURAL CALCAREOUS GRASSLANDS AT RAFFEEN QUARRY

The following sequencing of works will be completed to undertake translocation of semi-natural grasslands at Raffeen quarry. All works will be monitored by a site based ecologist to ensure the suitability of receptor lands, the efficacy of turving and transportation methods and the instatement of turves to receptor sites.

The proposed receptor site is located to the south of Raffeen quarry, within the project CPO line. The receptor site will be prepared in advance of translocation works, to facilitate the translocation works (See **Figure 4.4**). The proposed receptor site supports arable land that is likely to support high soil nutrient content, owing to ongoing soil fertilisation associated with past farming activities. To this end, it is proposed to regrade the topsoil within this area<sup>5</sup> and to subsequently infill this area with limestone bedrock and associated overburden, excavated from within the footprint of the proposed M28 road project. This material will be finished / levelled with <0.5m of subsoil to be sourced from the road project footprint.

Once the receptor site has been prepared, works will begin on identifying, selecting and subsequently turving areas of dry calcareous and neutral grassland within the project footprint. Turving will be completed in early to mid-Autumn, when soils remain warm and moist thereby facilitating new root growth throughout the following winter and spring.

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<sup>4</sup> National Roads Authority (2006): Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes. National Roads Authority, Dublin.

<sup>5</sup> Excess excavated topsoil will be reused for landscaping measures along the road project footprint.

Excavation works will be completed using a wheeled excavator rather than a tracked excavator to minimise disturbance. Excavation will be carried out using a specialised bucket, facilitating the excavation of turve sections. Turve sections of 1.0m x 0.5m at 300mm depth will be selected from the receptor site. Depths of 300mm will be selected as this will include all of the grassland vegetative and root material to be translocated. Where turves cannot be formed from the receptor site due to lack of soil depth, the top soil will be secured and will include roots and all vegetative material before transportation directly to the receptor site without storage.

The turved material will be transported to the receptor site by a flatbed trailer to allow the safe and careful placement and removal of the turves between donor and receptor site. The transported turves will be removed individually at the receptor site, placed furthest away from the access point to avoid excessive trampling / disturbance from the translocation works. The turves will be placed in the prepared receptor site, leaving no gaps in between. Any gaps between turves will be filled with turve off cuts of soil from the receptor site. The turves will be watered once translocation has been completed. Should the translocation works be completed during wet conditions, watering of these areas may not be needed.

Areas of bare soil within or immediately adjoining the receptor site will be seeded in late summer / early autumn with yellow rattle (*Rhinanthus minor*), an herb that parasitizes the roots of grass species. The incorporation of this species within a grassland sward will restrict the spread and consequent dominance of aggressive grass species within nascent, re-establishing grassland such as that at the proposed receptor site. The establishment of yellow rattle within this habitat will allay the potential for the grassland area to become choked with tussocky grasses followed by subsequent progression to scrub. It will also help with the long-term management of the grassland habitat, restricting the proliferation of aggressive grasses. In addition, the grassland habitats within Raffeen Quarry are grazed by rabbits, which restrict the encroachment of scrub and the spread of dense tussocky grasses.

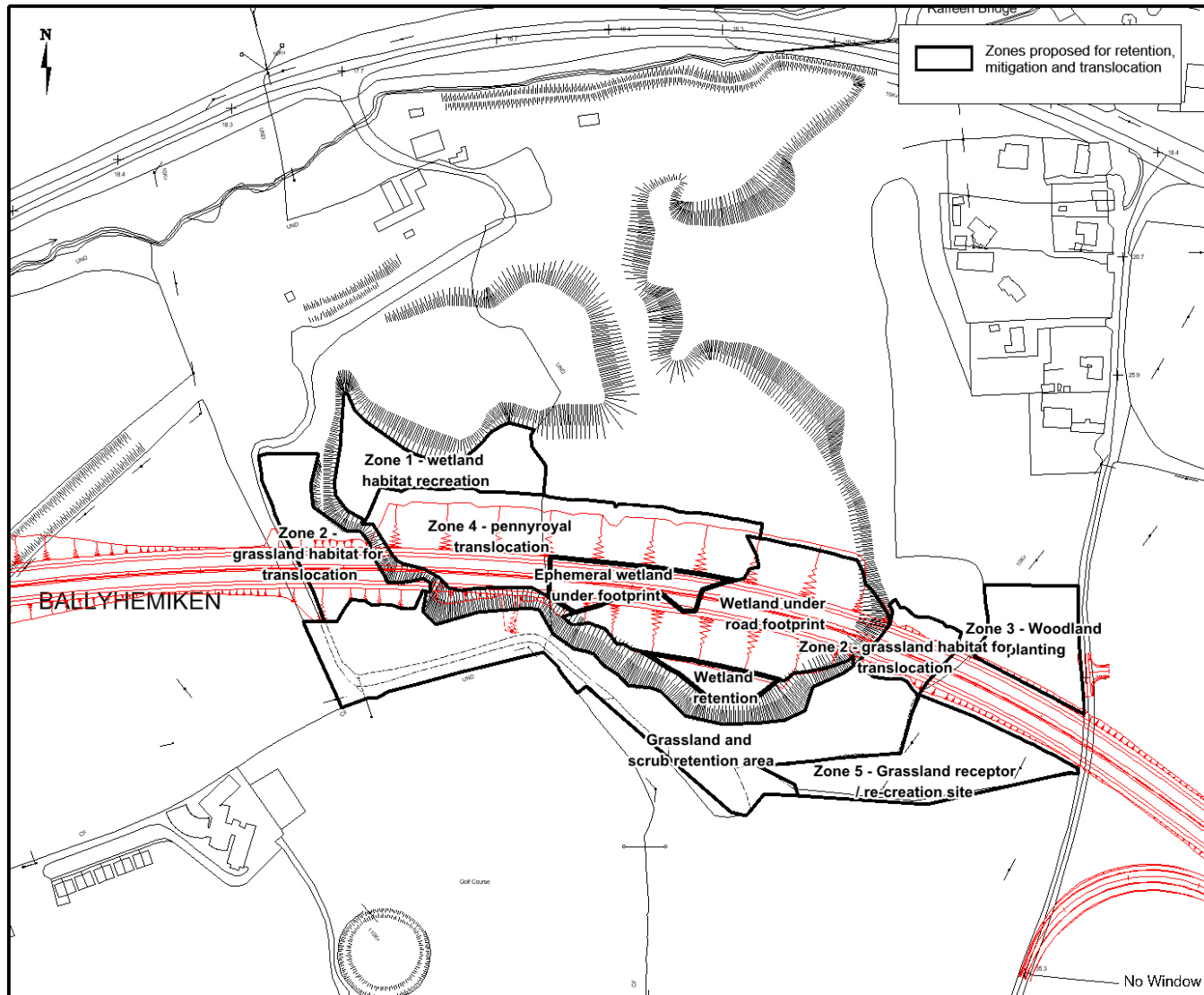
All translocation works will be monitored by a site based ecologist to ensure the suitability of receptor lands prior to translocation, the efficacy of turving and transportation methods and the instatement of turves to receptor sites.

During the project's operational phase, the translocated grasslands will be cut in late summer and again in early autumn, if required. All cut material / arising will be removed from the grassland area to avoid enrichment of the grassland and subsequent declines in plant species diversity.

#### **Retention of calcareous grassland south of the route alignment**

The area of calcareous grassland located to the south of the proposed road footprint (See **Figure 4.4**) will be fenced off to restrict access throughout the construction phase to avoid direct and indirect disturbance to this area. Access to this area by construction personnel or construction machinery will not be permitted during the construction phase.

Figure 4.4: Proposed Mitigation Measures for Habitats within Raffeen Quarry





## 4.7 METHOD STATEMENT FOR MITIGATION, MONITORING, HABITAT ENHANCEMENT AND OTHER MEASURES FOR THE RECREATION OF WETLANDS AT RAFFEEN QUARRY

The footprint of the proposed road at Raffeen quarry will intersect an in-situ wetland habitat. As part of the mitigation for the proposed road project, it is proposed to recreate this wetland habitat to the northwest of the road footprint, within the roadway CPO line. The land immediately north of the wetland supports a significant population of pennyroyal and therefore has not been selected for wetland creation. However, the site chosen for the wetland, although not contiguous to the remaining wetland habitat within the quarry, supports localised and disparate populations of pennyroyal, when compared with other sections of the quarry void. For this reason, this area was selected to recreate the wetland lost within the footprint of the proposed M28 road project. The recreated wetland habitat will reflect physical characteristics such as water depths, substrate composition and wetland vegetation abundance and composition, currently in-situ within the quarry void. This wetland will be created and functioning, prior to construction works beginning within Raffeen Quarry. To assist with vegetation establishment within this wetland area, wetland species, macrophytes and emergent species will be harvested and translocated from the existing wetland to the recreated wetland area.

A schedule for the proposed wetland creation works is presented below.

### Scheduling of the Wetland Habitat Creation

As outlined, pennyroyal within the footprint of the wetland creation area will be translocated to the proposed receptor area at Shanbally. Once all pennyroyal populations have been translocated, and completion of road construction in the area, the creation of the wetland area will be undertaken. Creation of the compensatory wetland habitat at Raffeen Quarry will comprise the following methodology and sequencing of works:

- Current topographical data for the Raffeen Quarry site shows water levels within the wetland area being at 14.7m OD. Water depths in this wetland range between 0.2 and 1.2m. Therefore, depths within this wetland area reside between 14.5m OD and 13.5m OD;
- Undertake the excavation works with the use of wheeled excavators, so that disturbance within works area is kept to a minimum;
- The excavation works will retain and set aside clean aggregate currently in-situ within proposed wetland area footprint;
- Excavation and regrading works within the proposed wetland area will be such so that they will reflect ongoing ground and surface water interactions within the existing wetland area; i.e. the proposed wetland area will not be basal variances in depths will not exceed 1.2m;
- The excavations associated with the proposed wetland area will be such that the centre will support deeper water, not exceeding 1.2m and will very gradually and gently grade to the wetland margins to support water depths of between 0.5m and 1.0m. The shallow nature of the wetland will allow for the continuing establishment of aquatic, emergent and scrub species within the wetland habitat, thereby recreating conditions similar to that under the footprint of the existing quarry. The slight variation in depths within the wetland area will influence the creation of micro-habitat assemblages across this habitat;

- Excavated material will be regraded to the wetland margins or where suitable will be reused as fill material elsewhere within the project footprint;  
A selection of small trees and shrubs within the excavation footprint and within the footprint of the road project will be selected for subsequent planting into the wetland creation area;
- Levels within the proposed excavation area will be continually checked throughout the excavation process;
- Large rocks and boulders sourced from within and adjoining the wetland habitat at Raffeen quarry will be inserted into the created wetland area to further create micro-habitats and micro-climates within the wetland area,
- Harvesting of and translocation of aquatic species, emergent plant species and small specimens of adjoining scrub species will be collected from the Raffeen Quarry habitat,
- In addition, tree and shrub species of native local provenance, predominantly grey willow (*Salix cinerea* subsp. *oleifolia*), will be planted (or replanted should suitable smaller specimens be adequately harvested from the quarry area) on the marginal / ephemeral areas of the pond, and
- Final regrading and fencing works to the wetland margins will commence following the creation of the wetland area. These works will ensure the protection of the wetland area located outside of the footprint of the proposed construction works.

## Monitoring

The construction of the wetland area at Raffeen quarry will be monitored throughout by the appointed site ecologist. The ecologists will lead and monitor all aspects of the habitat creation works including excavation methodologies, and the translocation of wetland and aquatic vegetation.

Monitoring of the wetland area will be undertaken by an ecologist throughout the project's construction phase on a monthly basis. Monitoring throughout this period will assess the progress of the wetland's creation, including the establishment of in-situ wetland species and adjoining areas of scrub.

Monitoring of the created wetland area will be continued throughout the project's operational phase. Monitoring will be undertaken twice yearly in Years 1, 3, 5 and 10 of the road project and will take place during winter and summer months to assess water levels within the created wetland habitat. Monitoring during the summer months will examine the establishment and progression of aquatic vegetation, water levels within the wetland, plant species diversity within the wetland, encroachment of scrub and occurrence of aquatic and terrestrial invasive species. This ongoing monitoring schedule will determine the management measures necessary for the wetland habitat throughout the operational phase of the project.

## 4.8 METHOD STATEMENT FOR OR MITIGATION, MONITORING, HABITAT ENHANCEMENT AND OTHER MEASURES FOR THE PROTECTION OF WOODLANDS, SCRUB AND LINEAR WOODLANDS

In addition to those areas of woodland specified for planting as part of the Landscaping and Visual assessment, it is also proposed to establish woodland as habitat compensation for areas of woodland habitat lost under the road project footprint, in addition to woodland screen planting at Raffeen Quarry to mitigate for the Peregrine Falcon habitat at this site. Areas of woodland to be planted, additional to those specified in the Landscape and Visual assessment chapter of the EIS are presented in **Figure 4.4**, **Figure 4.5** and **Figure 4.6**.

Areas of broadleaved woodland to be established within the CPO line are as follows:-

- Screen planting at Raffeen quarry;
- Woodland planting east of Raffeen quarry;
- Woodland planting west and north-west of Carr's Hill interchange; and
- Woodland planting at Chainage 4925 and Chainage 5450, west of the road alignment.

Woodlands habitats will be planted and established in these areas, corresponding to the specification detailed in the Landscape and Visual chapter of the EIS. Tree and shrub species of native local provenance will be utilised to establish these woodland areas. Species used will include pedunculate oak (*Quercus robur*), alder (*Alnus glutinosa*), hawthorn (*Crataegus monogyna*), holly (*Ilex aquifolium*), blackthorn (*Prunus spinosa*), grey willow (*Salix cinerea*) and goat willow (*Salix caprea*).

A wet woodland habitat will be created to the west of Carr's Hill interchange and will comprise sessile oak (*Quercus petraea*), alder (*Alnus glutinosa*), grey willow (*Salix cinerea*) and goat willow (*Salix caprea*). This woodland will be created to the west of the road and west of the Donnybrook stream (See **Figure 4.6**). The lands supporting the footprint of the woodland habitat will be graded to allow intermittent flooding of the ground layer by the adjoining areas of the Donnybrook Stream. The CPO line in this area includes areas of existing broadleaved woodland. The broadleaved woodland areas will be retained throughout the construction process and will not be removed, disturbed or damaged as part of construction activities in this area. Existing woodland areas adjoining the Donnybrook stream area, but outside of the CPO will be cordoned off from the all works to avoid potential disturbances, direct or indirect. In addition, tree, treeline, hedgerow and woodland areas within the project CPO line, but not within the footprint of the proposed works will be retained and protected from indirect disturbance effects, during the project's construction phase.

Further woodland habitat will be established immediately west of the road between Chainages 5450 and 4925. This woodland will provide linkages to areas of woodland and scrub located along the valley margins of the Glounatouig Stream and will provide additional cover and refuge for mammal and avifaunal species associated with this area. Native tree and shrub species will be used for this proposed planting to include pedunculated oak, hazel, holly, hawthorn and blackthorn.

Where the road intersects Raffeen quarry, woodland will be established along each embankment. As outlined in the terrestrial ecology habitat chapter, woodland will be established here to screen the road footprint from the vertical cliff face habitat located immediately south. Such planting has been designed to screen bird species, such as Peregrine Falcon, using the cliff face as a nesting habitat from the mainline of the proposed M28. Recently fledged birds using the cliff face habitat are also at risk from collision of nearby road traffic upon first leaving the nest site. The screen planting, particularly the semi-mature specimen trees on the higher embankment slopes, will direct the flight path of birds either (a) away from the M28 or (b) over the M28 and over the line of traffic (See **Figure 4.1**).

Semi-mature standard trees will be established on the higher margins of the embankments to facilitate adequate screen protection and to influence a flight path over the road footprint. The lower embankment slopes will be planted with native tree and shrub species as whips and feathered transplants at a standard size of 60-90 cm or 90-120 cm.

Woodland planting is proposed for lands located to the east of Raffeen Quarry. Native trees and shrub species will be selected for this area to include pedunculate oak (*Quercus robur*), hawthorn (*Crataegus monogyna*) and hazel (*Corylus avellana*). Woodland will be planted here to provide cover and breeding habitat for small passerine birds and mammals in the local area.

Monitoring of woodland areas will be undertaken over the first five years of the project's operational phase to ensure that trees are healthy and structurally sound and to ensure that there are no diseased or dying specimens. All unhealthy or poor growing trees will be removed and replanted with species of similar age and structure during this period. Monitoring efforts will pay particular attention to semi-mature trees, to ensure their successful establishment and their key functionality in screening the vertical cliff face from the adjoining M28 road project.

### **Tie-in of Linear Woodland Features to Specific Landscaping Measures (SLM)**

It is proposed to secure SLM along the footprint and environs of the road project to act as visual screen along the route footprint and its environs. The locations for these measures are presented in **Table 16.10** and **Figure 16.5** of the Landscape and Visual Impact Chapter of the EIS. These have been overlaid on the linear woodland (hedgerows and treelines) features located within the footprint of the proposed road project.

All woodland areas established under the SLM will be tied into and will be connected to hedgerow and treeline features that adjoin the CPO line of the M28. Connection of these woodland areas to the surrounding linear woodland network will provide commuting, foraging and sheltering routes for mammals and birds with the environs of the route and the surrounding locality.

The following SLM features will tie in to the surrounding hedgerow and treeline network:-

- SLM 07,
- SLM 08,
- SLM 10,
- SLM 11,
- SLM 12,
- SLM 14 (north of project alignment),

- SLM 16,
- Woodland planting west and north-west of Carr's Hill interchange,
- Woodland planting at Chainage 4925 and Chainage 5450, west of the road alignment, and
- Woodland planting east of Raffeen Quarry.

Figure 4.5: Compensatory Woodland Planting West and North West of Carr's Hill

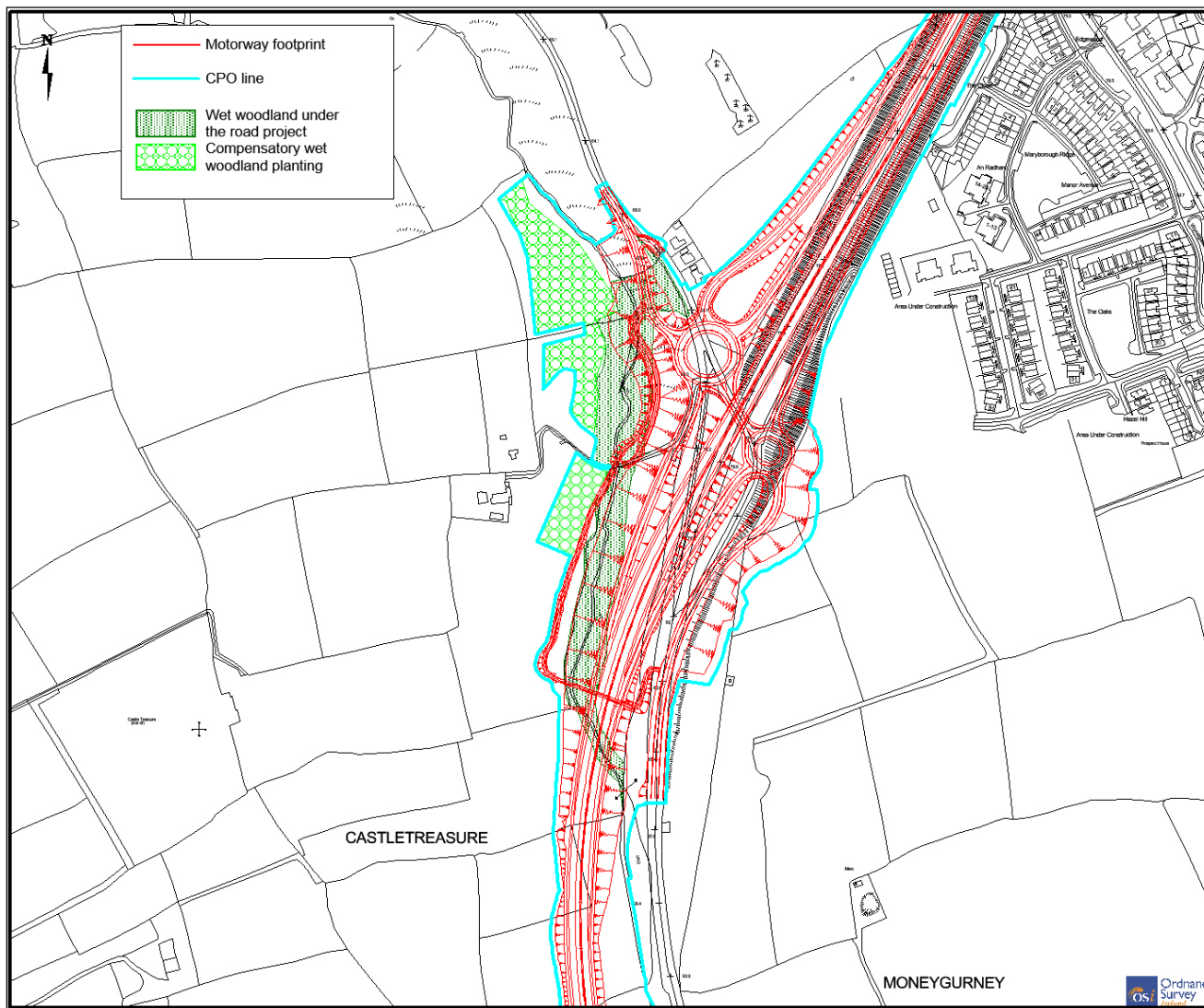
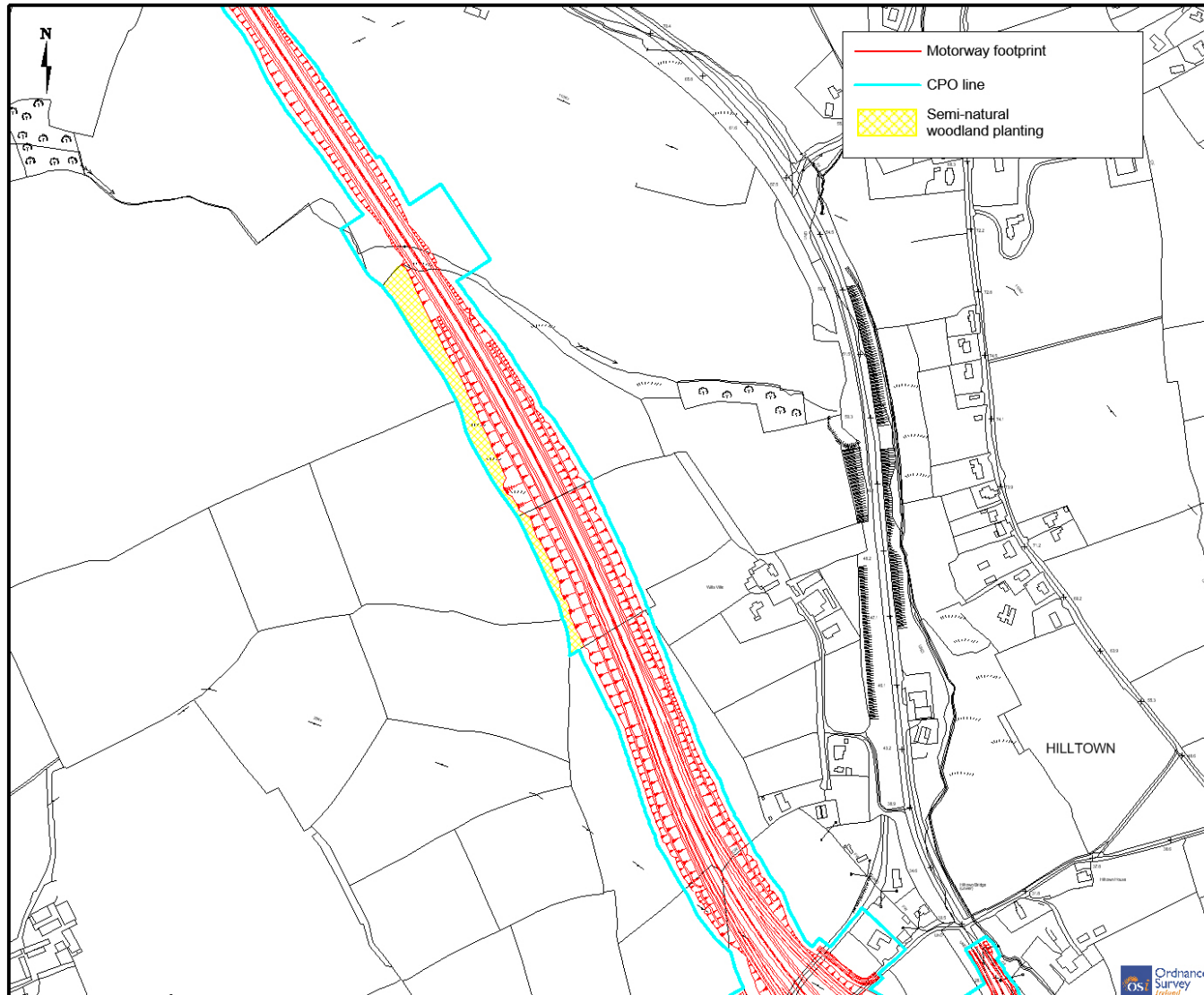


Figure 4.6: Proposed Woodland Planting West of the Road Project between Chainage 4925 and Chainage 5450



## 5 CONCLUSION

This HSMP will involve varying levels of habitat creation, mitigation and subsequent management prescriptions and monitoring during the project's construction and operational phases. Although this plan is primarily targeted at the sensitive ecological receptors associated with the road project footprint and their immediate environs, many of the prescribed measures will also benefit general site biodiversity and wildlife.





## **APPENDIX 12C: INVASIVE SPECIES MANAGEMENT PLAN**



# M28 Cork to Ringaskiddy Project

## Outline Invasive Species Management Plan

### Document Control Sheet

Client:	Cork County Council
Project Title:	M28 Cork to Ringaskiddy Project
Document Title:	Outline Invasive Species Management Plan
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# 1 INTRODUCTION

Invasive Alien Species (IAS) are animals and plants that are introduced accidentally or deliberately into a natural environment where they are not normally found, with serious negative consequences for their new environment. They represent a major threat to native plants and animals on a global scale and considered as one of the most significant drivers of ecological change.

This report presents a management plan for the control and prevention of spread of invasive alien species of plants and animals within the footprint and environs of the M28 Cork to Ringaskiddy Project. Cork County Council (CCC), under the auspices of the National Roads Authority (NRA), known for operational purposes as Transport Infrastructure Ireland (TII) propose to upgrade approximately 12.5km of the N28 National Primary Route from the N28/N40 South Ring Road Bloomfield Interchange to Ringaskiddy in County Cork.

IAS occur along the footprint and immediate environs of the proposed road project. The distribution of these plants has been mapped along the entire stretch of the road development. At a number of locations the plants are not confined to within the Compulsory Purchase Order (CPO) land take for the road project and extend into adjacent properties to varying degrees.

This management plan presents specific measures to cover the following:

- The eradication of IAS within the proposed CPO line of the road project in advance of construction commencing;
- The construction phase to avoid the risk of transporting or spreading IAS, including measures in the event that any remaining IAS should be found within the CPO line; and
- The landscaping / re-vegetation phase on completion of construction to avoid the risk of IAS re-establishing within the CPO line.

The objectives of this report are:

- To present an overview of IAS along and in the vicinity of the proposed M28 Road Project;
- To provide an effective management approach for the eradication of IAS within the proposed CPO line prior to the commencement of construction, and where feasible, adjacent to the CPO to prevent recolonisation;
- To set out a protocol for the inspection of all areas to be used for the sourcing of material and the eradication of any IAS therefrom prior to their use as a source of material;
- To provide prescriptive measures to avoid the accidental transfer of IAS during the construction of the M28 road project including the introduction of any new species. This will include specific measures to deal with any remaining IAS found within the CPO boundary during the construction phase; and
- To provide prescriptive measures to avoid the risk of re-introduction or re-establishment of IAS during the landscaping following the phased construction of the proposed road project.

## 1.1 PROJECT DESCRIPTION

The project comprises a motorway route from the interchange with the N40 (Bloomfield Interchange) to the R613 Carrigaline to Ringaskiddy road at Barnahely. From Barnahely, it comprises a single carriageway which will link to the east side of Ringaskiddy village and be a Protected Road as defined under the Roads Act which will be designated 'Clearway' as defined in the Road Traffic Act (prohibits parking and stopping) in order to meet TEN-T requirements for the Core road network. Together, the proposed M28 Road Project and the N28 single carriageway national road will form the TEN-T route to the Port of Cork complex at Ringaskiddy. A Service Area (SA) will be located within the Port of Cork lands at this eastern entrance to the Port of Cork facility.

The proposed M28 Road Project is substantially on-line between Bloomfield and Carr's Hill consisting of widening of the existing N28 road. South of Carr's Hill the route extends on the western side of the existing N28 to Shannonpark where it turns in an easterly direction and continues south of the existing road as far as the R613 at Barnahely. From, the R613 junction at Barnahely there will be two routes to Ringaskiddy, one route along the existing R613 to the existing N28 providing access to the western entrance to the Port of Cork, and a second new route comprising a new single carriageway, extending immediately to the south of Ringaskiddy Village which will turn eastwards and access to a proposed new eastern entrance to the Port of Cork facility located on the eastern side of Ringaskiddy Village.

## 1.2 METHODOLOGY

The location and distribution of IAS along the proposed M28 Road Project was mapped during the habitat mapping surveys and other multidisciplinary ecological site walkover surveys undertaken by RPS ecologists for the project Environmental Impact Statement (EIS) and Natura Impact Statement (NIS) between 2014 and 2017.

During these surveys a suite of information was recorded including the species, location and extent, associated flora and other factors that may affect its management or control such as sensitive ecological receptors, physical features, etc. In addition, the location of the site compound and areas identified for plant species translocation as part of the Habitat and Species Management Plan were examined.

The presented approach to control and management of IAS along the proposed M28 Road Project is based on national international guidance and best practice as contained within the following guidelines:

- *Guidelines on the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads* (NRA, 2010);
- *Guidelines for the Management of Waste from National Road Construction Project* (NRA, 2014 (Revision 1));
- *The Knotweed Code of Practice. Managing Japanese Knotweed on Development sites*. UK Environment Agency Environment Agency (2013). Inland Fisheries Ireland guidance regarding aquatic invasive species control (<http://www.fisheriesireland.ie/Research/invasive-species>); and
- Invasive Species Ireland guidance (<http://invasivespeciesireland.com>).

## 1.3 LEGISLATIVE BACKGROUND

The control of IAS in Ireland is regulated by the Wildlife Acts, 1976 to 2012, the European Communities (Birds and Natural Habitats) Regulations 2011-2015 and the EU Regulation (1143/2014) on the Prevention and Management of the Introduction and Spread of Invasive Alien Species. A summary of the relevant regulations are provided below.

### 1.3.1 Wildlife Acts, 1976 to 2012

Section 52(7)(c) of the Wildlife Act, 1976, as amended by Section 56 of the Wildlife (Amendment) Act, 2000, provides that *'Any person who— [...] plants or otherwise causes to grow in a wild state in any place in the State any species of flora, or the flowers, roots, seeds or spores of flora, [...] otherwise than under and in accordance with a licence granted in that behalf by the Minister shall be guilty of an offence.'* Section 52(8) of the Wildlife Act, 1976, as amended, states the following *'For the purposes of subsection (7), any reference to [...] plants, flowers, roots, seeds or spores refers only to exotic species thereof.'*

### 1.3.2 European Communities (Birds and Natural Habitats) Regulations 2011 (SI 477 of 2011)

Regulation 49 of the European Communities (Birds and Natural Habitats) Regulations 2011 (SI 477 of 2011) as amended specifically relate to the control of IAS listed in the Third Schedule (lists 59 species (including plants and animals)) which are regulated under Regulation 49 provide as follows;

#### Regulation 49

*(2) Save in accordance with a licence granted under paragraph (7), any person who plants, disperses, allows or causes to disperse, spreads or otherwise causes to grow in any place specified in relation to such plant in the third column of Part 1 of the Third Schedule, any plant which is included in Part 1 of the Third Schedule, shall be guilty of an offence.*

The Third Schedule Part 3 also deals with vector material which applies to knotweed species as follows:

*"Soil or spoil taken from places infested with Japanese knotweed, Giant knotweed or their hybrid Bohemian knotweed".*

### 1.3.3 EU Regulation (1143/2014)

EU Regulation (1143/2014) on the Prevention and Management of the Introduction and Spread of Invasive Alien Species was adopted by the European Council on 29 September 2014. The first "Union list" of 37 species consisting of 23 animals and 14 plants came into force, following the publication of the Commission Implementing Regulation (2016/1141), in the Official Journal of the Union on the 14 July, 2016. Of the 37 species on the 'Union list', 12 are already found on in Ireland including Grey squirrel, Muntjac deer, Chinese mitten crab, Red-eared terrapin/slider, Ruddy duck, Curly waterweed, American skunk cabbage, Parrot's feather, Coypu, Raccoon, Siberian Chipmuck and Uruguayan Hampshire-purslane.

#### 1.3.4 NPWS Circular

In their Circular Letter of 2/08, the National Parks and Wildlife Service bring to attention the specific requirements of Section 40 of the Wildlife Act 1976, as amended by Section 46 of the Wildlife (Amendment) Act 2000, which places restrictions on the destruction of vegetation on uncultivated land during the period from 1<sup>st</sup> March to 31<sup>st</sup> August in any year. The Circular was prompted by extensive poorly-targeted spraying of herbicide on road verges by local authorities in an effort to control noxious weeds. The Circular highlights that while control of noxious weeds (and invasive species) is permitted under legislation, it does not authorise the destruction of adjacent vegetation and extensive, untargeted spraying of road verges with herbicide is, *prima facie*, an offence under Section 40 of the Wildlife Acts.

## 2 OVERVIEW OF IAS ALONG THE PROPOSED ROAD PROJECT

IAS occur along the footprint and immediate environs of the proposed road project including Japanese knotweed (*Fallopia japonica*), cherry laurel (*Prunus laurocerasus*), three cornered garlic (*Allium triquetrum*), traveller's joy (*Clematis vitalba*) and butterfly bush (*Buddleja davidii*). **Table 2.1** below provides a list and location of IAS found within the proposed M28 Road Project and their locations are also illustrated on **Figure 2.1**.

The introduction and spread of IAS can have significant impacts on the ecological functioning on terrestrial and aquatic habitats and the ecotone between both. Within the study area species such as Japanese knotweed has been commonly found in the verges of local roads, in nearby private dwellings and can also be aggressive colonists of riverbanks or streams. River bank soil can become exposed after these invasive species create shading effects and reduce local flora cover in winter when plants die back. The soil is then eroded into rivers, altering substrate characteristics, providing favourable conditions for abundant aquatic plant growth and rendering the river substrates unsuitable for salmon and lamprey spawning (Caffrey, 1994; Lucey, 1994). Locations of Japanese knotweed within the study area are presented in **Figure 2.1** and outlined in **Table 2.1** below.

The invasive shrub species cherry laurel is present within some of the longer established woodlands at Mount Oval and Bloomfield Woods. Cherry Laurel is not listed on the Third Schedule European Communities (Birds and Natural Habitats) Regulations 2011 as amended, however it is a high risk<sup>1</sup> species subject to control measures. The species is a dense thicket forming shrub of gardens, parks and woodlands. It was first established in demesne woodlands as cover for game. The ecology of cherry laurel significantly affects the surrounding plant communities, as it forms dense monospecific stands that shades and out-competes species associated with the woodland's ground and shrub layers.

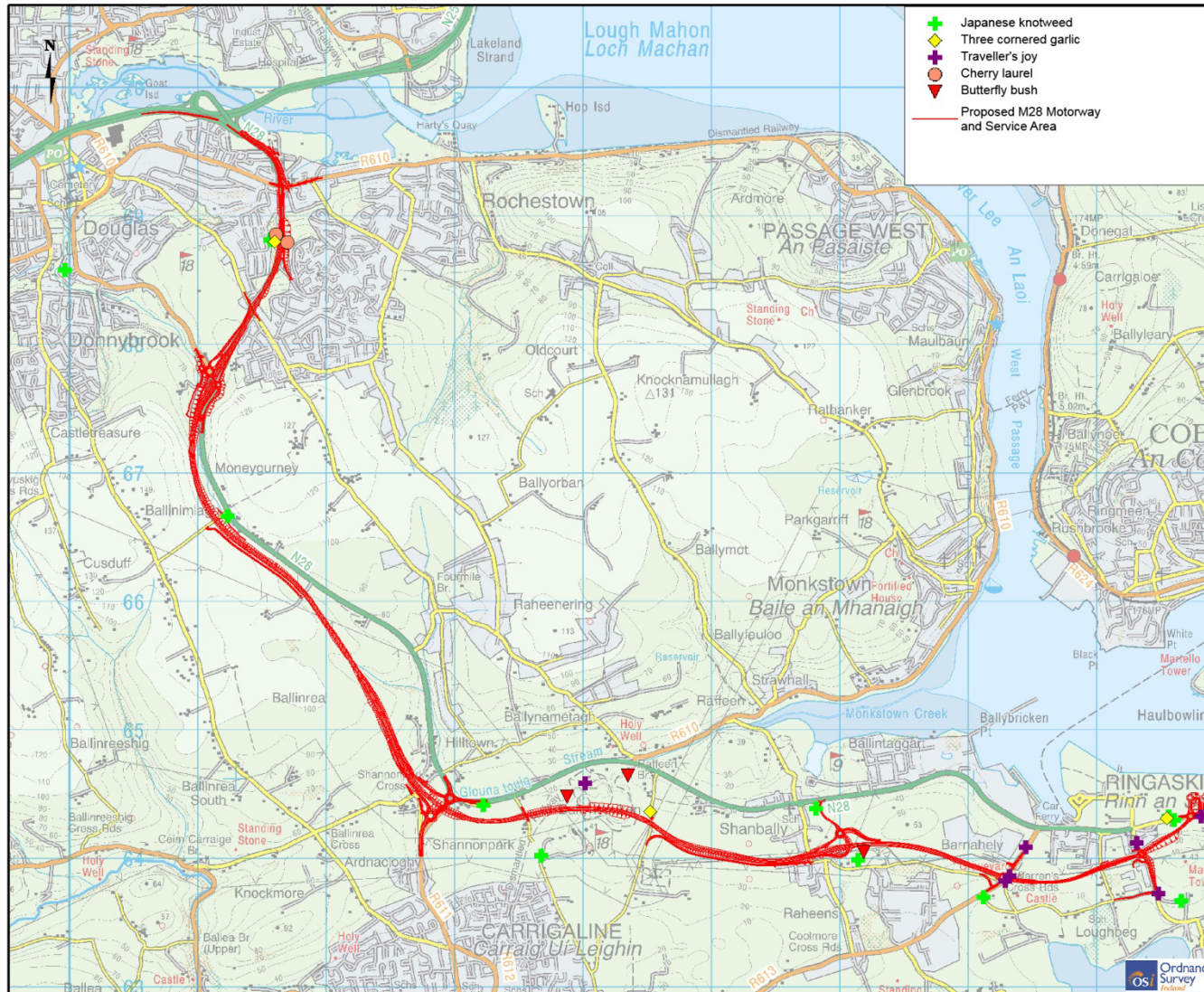
Three cornered garlic occurs within mixed broadleaved woodland at Bloomfield Woods and along N28 roadside verges at Ringaskiddy and local road verges in the Shanbally and Ballyhemiken areas. Three cornered garlic, traveller's joy and butterfly bush (are species included on the Amber list compiled by Invasive Species Ireland and are rated as medium risk due to the score of the overall assessment however, their impact on conservation goals remains uncertain due to lack of data showing impact (or lack of impact).<sup>2</sup> With the exception of three cornered garlic, these species are not listed under the Third Schedule of the 2011 Regulations, however, precautionary measures to avoid interaction and spread of this species are proposed as part of this management plan.

<sup>1</sup>[http://www.biodiversityireland.ie/wordpress/wp-content/uploads/Invasives\\_taggedlist\\_HighImpact\\_2013RA.pdf](http://www.biodiversityireland.ie/wordpress/wp-content/uploads/Invasives_taggedlist_HighImpact_2013RA.pdf)

<sup>2</sup><http://invasivespeciesireland.com/toolkit/risk-assessment/amber-list-recorded-species/>



Figure 2.1: Invasive Species locations in proximity to the proposed M28 Road Project



**Table 2.1: Invasive Species Recorded Throughout the Study Area**

Common Name	Latin Name	Location <sup>3</sup>	Commentary
Japanese Knotweed	<i>Fallopia japonica</i>	Shanbally (W76083 63977)	Line of young Japanese knotweed plants have established within holding area/compound. Growth of Japanese knotweed concentrated on mounded spoil adjoining trackway leading to the eastern half of the site.
		Shanbally (W75762 64405)	Extensive linear stand of Japanese knotweed located in boundary hedgerow/treeline east of Shanbally.
		Donnybrook stream, Donnybrook (W69907 68600)	Extensive Japanese knotweed stands established on left bank of Donnybrook Stream, downstream and outside of the proposed M28 Road Project.
		Ballinimlagh (W 71221 66689)	Located within scrub habitat immediately south of junction between local road serving Ballinimlagh and the M28 Road Project.
		Shannonpark (W 73163 644404)	Located to the south of the existing N28 beside entrance to pastoral lands.
		Ballyhemiken (W 73618 64041)	Within hedgerow across from the entrance of Fernhill Golf and Country Club.
		Bloomfield Woods (W71565 68796)	Located along western boundary of Bloomfield Woods, west of the existing and proposed M28 Road Project.
		Donnybrook Stream at Douglas (W69988 68965)	West of the proposed M28 Road Project, downstream of Carr's Hill Interchange.
		Barnahely / Castlewarren (W 77118 63692)	Stand within roadside vegetation south of Castlewarren Safety Centre.
		Ringaskiddy (W78567 64349)	Separate Japanese knotweed stands on both sides of the existing N28.
		Ringaskiddy (south of Martello Tower) (W787660 63665)	An Appropriate Assessment (Stage 2 NIS) (Atkins, 2016) completed for proposed <i>Materials Extraction and Land Re-Profiling</i> works south of the Martello Tower in Ringaskiddy identified a localised stand of Japanese knotweed to the south of the proposed project boundary. The stand is located within a hedgerow fringed to the south by disturbed ground and construction waste. The proposed extraction and re-profiling works will not be completed within or in immediate proximity to this area.
Cherry Laurel	<i>Prunus laurocerasus</i>	Bloomfield Woods, Mount Oval	Cherry Laurel identified within the woodland habitats on either side of the existing N28 at Bloomfield Woods and Mount Oval.
Traveller's joy	<i>Clematis vitalba</i>	Raffeen Quarry Disused railway line at Raffeen N28 at Ringaskiddy,	Growing within scrub at Raffeen Quarry and growing along abandoned railway line between Raffeen and Monkstown. Growing on roadside margins on N28, R613 at

<sup>3</sup> Grid Locations provided in Irish National Grid (ING).

Common Name	Latin Name	Location <sup>3</sup>	Commentary
		R613 at Ringaskiddy, Local road serving Lough Beg at Ringaskiddy	Ringaskiddy and local roads serving Lough Beg.
Butterfly bush	<i>Buddleja davidii</i>	Throughout Raffeen Quarry Shanbally Ringaskiddy	Growing throughout Raffeen Quarry and its environs. Located within area of recolonising bare ground at Shanbally. Embanked verge on margins of N28 at Ringaskiddy.
Three cornered garlic	<i>Allium triquetrum</i>	Bloomfield Woods Ringaskiddy Shanbally	Occurs occasionally within mixed broadleaved woodland understorey at Bloomfield Woods. Roadside verge on existing N28 at Ringaskiddy. Roadside verges at Shanbally.

There is likely to be a time lag between submission of the planning application, grant of planning permission and appointment of site contractor to construct the M28 road project. As a result, an invasive species survey of the route and project CPO will be undertaken prior to treatment, management and control works being undertaken for the road project. These surveys will be completed, on two occasions during the growing season April to September inclusive, to determine the further spread of species identified in **Table 2.1** and to map the occurrence of additional isolated stands of IAS that have established and spread in the interim. IAS will be treated on the M28 road project following the control measures presented below.

## 2.1 CONSTRAINTS AND THREATS TO PROPOSED PROJECT

The presence of IAS has the potential to lead to an offence under the Wildlife Acts 1976 -2012 and the European Communities (Birds and Natural Habitats) Regulations 2011, as amended. It is an offence to plant or encourage the spread of IAS listed under the Third Schedule, by moving contaminated soil from one place to another, or incorrectly handling and transporting contaminated material or plant cuttings. Persons must therefore take all reasonable steps and exercise due diligence to avoid committing an offence under the regulations.

It is acknowledged that IAS occur within and adjacent to the CPO lands for the M28 road project. However, this presents a serious issue with regard to the effective eradication of IAS from within the site boundary. Unless control is extended to include the stands of IAS outside the site boundary in its entirety, it will pose a significant risk of re-infection within the works site.

It is acknowledged that the control of IAS outside the CPO lands for the proposed road project is outside the scope of this assessment. However, there may be scope for the contractor to work with neighbouring landowners to effectively eradicate the infestation.

With regard to the suite of control measures, if the material is buried on site, the location of buried material should be accurately mapped and recorded, and future owners of the land advised. When considering excavation and containment/ disposal methods there must be regard to relevant waste legislation.

If it is a requirement to dispose of this material off site, a licence from the National Parks and Wildlife Service (NPWS) will be required in advance of any removal, in accordance with the European Communities (Birds and Natural Habitats) Regulations 2011, as amended. The waste facility must be fully licenced and capable of accepting such contaminated material. If Japanese knotweed contaminated material is removed off site, it must be by a licenced waste haulier adhering to strict biosecurity protocols. This disposal requirement applies to all IAS material including untreated and treated plant material. It also applies to soil containing the plant material, i.e. a 7m radius around the above ground stand and up to 3m deep below the stand.

If the Japanese knotweed material to be disposed of at a licenced waste facility has been treated through chemical means it will need to be classified as hazardous waste and transported and disposed to a fully licenced hazardous waste facility in accordance with relevant waste legislation.

## **2.2 AREAS OF CONCERN REGARDING SPREAD OF IAS**

### **2.2.1 Spread within the Site**

In the intervening time between the planning process and construction, infestations have the potential to spread within the study area of the proposed M28 Road Project. Preventative and remedial actions should be undertaken as soon as possible. Further details are provided in **Section 3**.

### **2.2.2 Spread from the Site onto Surrounding Land**

During construction, there is a high risk that mechanical disturbance from construction machinery could lead to uncontrolled spread on and off site.

### **2.2.3 Spread onto the Site from Infestations Outside the Site**

There are a number of infected sites recorded in the immediate vicinity of the study area. For example infestation could spread along the Donnybrook Stream. There is a high risk that mechanical disturbance from construction machinery could lead to uncontrolled spread on of IAS on and off site.

### 3 CONTROL AND MANAGEMENT OF IAS

Five non-native invasive species, traveller's joy, cherry laurel, Japanese knotweed, butterfly bush and three cornered garlic were recorded within the study area.

As part of this outline invasive species management plan, appropriate mitigation measures including the management and control measures will be implemented at all sites where invasive species are encountered for the prevention of spread of these species and any IAS recorded in future pre-construction surveys. The guidelines outlined in **Section 1.2** will be followed in relation to the management of IAS.

The control and management measures presented below will inform the options for the treatment, control and management of invasive species within the CPO lands for the proposed for the M28 Road Project. The Herbicide Advisors and Users undertaking the control and management measures will be appropriately trained and registered with the Department of Agriculture, Food and the Marine (DAFM). A suite of management and control options are presented below as outlined in the guidance documents. However, it will be at the discretion of the contractor to decide which method is most appropriate at construction stage.

#### 3.1 METHODS OF ERADICATION

The principle options available to manage and control the invasive species recorded in the environs of the proposed M28 Road Project are detailed below. All control measures require adequate follow up procedures to ensure that the plant is effectively killed. For species such as Japanese knotweed, the smallest fragment of the plants, such as the plants rhizomatous materials, are capable of regenerating so follow up treatment will be required in subsequent years to ensure that no new shoots appear.

The management options are as follows:

- Option 1: Avoidance;
- Option 2: Treatment with Herbicide;
- Option 3: Combined Treatment;
- Option 4: Soil Screening and Sieving;
- Option 5: Root Barrier Membrane;
- Option 6: Bund Method;
- Option 7: Burial Method;
- Option 8: Root Barrier Membrane Cell Method; and
- Option 9: Off-site Disposal.

This list is not exhaustive; however there are a number of recommended options available for the management of IAS on the proposed M28 Road Project. However, it is recommended that a programme to control the existing stands of IAS and potential spread new stands of IAS is initiated as soon as possible to minimise delays at the construction stage.

**Table 3.1: Treatment Options**

Option	Suitability	Recommendation
Option 1: Avoidance	<p>The stand of Japanese knotweed on the Donnybrook Stream, Donnybrook (W69988 68965) is currently located 1km downstream of the proposed M28 Road Project on the left bank of Donnybrook Stream. Therefore subject to preconstruction IAS survey this stand can be effectively avoided.</p>	<b>Recommended</b>
	<p>The stand of Japanese knotweed Ringaskiddy (south of Martello Tower) (W787660 63665) is located to the south of the proposed project boundary. Subject to preconstruction IAS survey this stand may be effectively avoided.</p>	<b>Recommended</b>
	<p>The stand of Japanese knotweed Ballyhemiken (W 73618 64041) is located within a hedgerow across from the entrance of Fernhill Golf and Country Club. Subject to preconstruction IAS survey this stand may be effectively avoided.</p>	<b>Recommended</b>
Option 2: Treatment with Herbicide	<p>It is likely that the use of herbicide will be required for at least three to five years to stop regeneration of IAS. The most effective time for herbicide treatment is from July – September (or before cold weather causes leaves to discolour and fall). Spring treatment is acceptable, but less effective. The treatment plan should aim to:</p> <ul style="list-style-type: none"> <li>▪ Ensure eradication.</li> <li>▪ Adopt high levels of biosecurity to ensure there is no spread off the site.</li> <li>▪ Compliance with relevant legislation.</li> </ul> <p>Actions must be implemented to prevent spread from the site to neighbouring properties and spread onto the site from outside. Appropriate actions include:</p> <ol style="list-style-type: none"> <li>1. Cordon off infested areas;</li> <li>2. Signage to alert operatives and the public,</li> <li>3. Thorough monitoring of adjacent land, and</li> <li>4. Liaison with adjacent landowners to eradicate infestations near to the site.</li> </ol>	
	<p><b>Japanese Knotweed</b></p> <p>The Japanese knotweed infestations at Shanbally (W76083 63977), Shanbally (W75762 64405), Ballinimlagh (W 71221 66689), Shannonpark (W 73163 644404), Bloomfield Woods (W71565 68796) and Barnahely / Castlewarren (W 77118 63692) should be dealt with on site where practicable. The use of herbicides in the treatment of IAS requires the application of the chemical treatment to the entire area of infestation. Where ecologically sensitive sites or watercourses are in close proximity to the stands, herbicides which are approved for use near watercourses must be and application should be undertaken by stem injection or weed wiper only. Consultation will be required with the NPWS where the operations are being undertaken in or in the vicinity of a site designated for nature conservation and with IFI in the vicinity of watercourses and lakes.</p>	<b>Recommended</b>

Option	Suitability	Recommendation
	<p><b>Cherry laurel</b></p> <p>Cherry laurel occurs within the understorey of the woodland habitats adjoining either side of the Mulcon Valley at Bloomfield. Cherry laurel is hard to eradicate chemically. Depending on the size of the stand, foliar spraying with herbicides is not recommended, as considerable quantities of spray will be required which can have effects beyond the target species. However, foliar spray may be an option in areas where there are either young plants or isolated stands.</p> <p>The cut-stump method involves cutting back of the aerial growth and application of herbicide directly to the cut stem or stump ideally within minutes but not later than 48 hours of cutting. A vegetable dye should be added to the herbicide to enable treated stumps to be clearly identified. Re-growth may occur following treatment which should be dealt with by a follow-up foliar spray when the growth reaches about 1m in height.</p> <p>Stem injection control involves herbicide application directly into the stems of large plants. This method enables precise application of the herbicide and uses less product and there is less risk of spray drift to non-target species. Application during March, April or October has been found to be most effective.</p>	<p><b>Recommended</b></p>
	<p><b>Traveller's joy</b></p> <p>Traveller's joy occurs in localised abundances along the north boundary of Raffeen Quarry, the disused railway line at Raffeen, the N28 at Ringaskiddy, R613 at Ringaskiddy, and the local road network serving Lough Beg at Ringaskiddy.</p> <p>Chemical treatment of traveller's joy within the road and CPO footprint should be undertaken during active growth. For mature plants, the vines should be cut back to ground level or waist height in winter or spring and the subsequent regrowth can be then foliar sprayed with an approved herbicide. This method will avoid impacting on the host plant supporting the climbing traveller's joy plant.</p> <p>For larger specimens, the plant can be cut at the base with a straight horizontal cut. Herbicide is then applied immediately to the wound with a paint brush, eye dropper or small squeeze bottle. On larger stems it is only necessary to wipe herbicide around the outer rim of the cut. The plants should be left in-situ until they are dead. Where plants are not killed in a single application, wait until re-growth before re spraying (NRA, 2010).</p>	<p><b>Recommended</b></p>
	<p><b>Butterfly bush</b></p> <p>Butterfly bush is found throughout Raffeen Quarry at a disused quarry / holding site at Shanbally and along the M28 at Ringaskiddy. The recommended practice for the application of herbicides requires cutting back of plants to a basal stump during active growth (late spring to early summer) which is then treated (brushed on) immediately with a systemic weed killer mix (Starr et al, 2003). Foliar application of herbicide may be adequate for limited infestations of younger plants, but should be followed up at 6 monthly intervals (NRA, 2010).</p>	<p><b>Recommended</b></p>

Option	Suitability	Recommendation
	<p><b>Three-cornered garlic</b> Three cornered Garlic is found on the higher embankment slopes of Bloomfield Woods, on roadside embankments along the existing N28 at Ringaskiddy and along local roads in the Ballyhemiken and Shanbally areas. Chemical treatment of three cornered garlic within the road and CPO footprint should be undertaken in early spring February / March before flowering commences.</p>	<p><b>Recommended</b></p>
<p>Option 3: Combined Treatment</p>	<p>For the Japanese knotweed infestations at Shanbally (W76083 63977), Shanbally (W75762 64405), Ballinimlagh (W 71221 66689), Shannonpark (W 73163 644404), Bloomfield Woods (W71565 68796) and Barnahely / Castlewarren (W 77118 63692) a combined treatment can be used. This involves treatment with herbicide in conjunction with excavation. The aim of the treatment is to break up the rhizome which stimulates leaf production and therefore make the plant more vulnerable to herbicide treatment. Digging can be conducted during the winter, if care is taken not to compact wet soil. Fresh regrowth can be treated during the spring and summer. This method reduces the amount of time required to chemically treat Japanese knotweed but must be carried out for greater than 18 months to be effective.</p>	<p><b>If time allows this is a recommended treatment</b></p>
<p>Option 4: Soil Screening and Sieving</p>	<p>For the Japanese knotweed infestations at Shanbally (W76083 63977), Shanbally (W75762 64405), Ballinimlagh (W 71221 66689), Shannonpark (W 73163 644404), Bloomfield Woods (W71565 68796) and Barnahely / Castlewarren (W 77118 63692) - it may be possible to use mobile plant to sieve and screen excavated within an infested area. This allows the majority of the rhizome to be extracted and destroyed by incineration or disposal to landfill. If removed off site; the remaining soil material must be disposed of to a licensed waste facility. Alternatively, the screened soil can be reused on site and monitored for regrowth. This approach could minimise the amount of infested material to be removed from the site.</p>	<p><b>Recommended</b> – however there is a requirement for ongoing monitoring and treatment over an extended period if screened soil is retained on site</p>
<p>Option 5: Root Barrier Membrane</p>	<p>Root Barrier membrane may be required if the extent of Japanese knotweed rhizome material extends beyond the project site boundary such as those infestations in Bloomfield Woods (W71565 68796), Ballinimlagh (W 71221 66689), Shannonpark (W 73163 644404), Shanbally (W75762 64405), Barnahely / Castlewarren (W 77118 63692) and Ringaskiddy (W78567 64349). In this case, root barrier membrane will be placed along the boundary to prevent horizontal spread inside the site boundary.</p>	<p>Recommended at specific locations</p>
<p>Option 6: Bund Method</p>	<p><b>All IAS sites (other than those avoided)</b> - Where deep site burial is not an option, it may be possible to create a shallow treatment bund. A bund is a shallow area of knotweed-contaminated soil, typically 1m deep. The bund can either be raised, on top of the ground, or placed within an excavation to make the surface flush with the surrounding area. The bund is to be constructed on a root barrier membrane, installed in accordance with the manufactures recommendations including a 100mm thick sand layer both above and below the root barrier to prevent puncturing. The bund area is to be cleared of any stones prior to placing the sand. The bund is to be constructed to a maximum height of 1m with 2:1 side slopes; the barrier membrane is to extend 2m beyond the toe of</p>	<p>This option is recommended where landtake is available to provide for a bundled area.</p>



Option	Suitability	Recommendation
	<p>the bund. A permanent fence is to be erected around the completed bund and offset 2m from the toe of the bund. The purpose of the bund is to move the contaminated material to an area of the site that is not in use where it can be treated over an extended period of time, 18 months - 2 years. The bund should be located away from watercourses and vegetation.</p>	
<p>Option 7: Burial Method</p>	<p>For the Japanese knotweed infestations at Shanbally (W76083 63977), Shanbally (W75762 64405), Ballinimlagh (W 71221 66689), Shannonpark (W 73163 644404), Bloomfield Woods (W71565 68796), Barnahely / Castlewarren (W 77118 63692) – This option involves the deep burial of contaminated soil on-site to a depth of five metres or greater. It is advisable to apply non-persistent herbicide to the growing plants, at least once, to prevent the potential regrowth of infested material prior to burial. The treated material should be left a sufficient amount of time to allow the herbicide to take effect on the plant prior to excavation and burial. The period time when the herbicide is active is described on the product label. It is important the containment cell is recorded to avoid future damage.</p>	<p>This option is recommended where landtake is available to provide for a deep burial.</p>
<p>Option 8: Root Barrier Membrane Cell Method</p>	<p>For the Japanese knotweed infestations at Shanbally (W76083 63977), Shanbally (W75762 64405), Ballinimlagh (W 71221 66689), Shannonpark (W 73163 644404), Bloomfield Woods (W71565 68796) and Barnahely / Castlewarren (W 77118 63692) - This option involves the construction of an underground containment cell to store infested soil permanently and securely by wrapping it in root barrier membrane and burying at a depth of over 2 metres. This is designed for sites where burial to a depth of five metres is not possible. It is important the containment cell is recorded to avoid future damage.</p>	<p>This option is recommended where landtake is available to for shallow burial.</p>
<p>Option 9: Off-site Disposal</p>	<p><b>Japanese Knotweed</b> Off-site disposal of material is only considered as a last resort when none of the other treatment options can be carried out. It can be assumed that the underground infestation extends for 7m in all directions from the nearest stem and to 3m depth. To gauge accurate volumes of infested material, site investigation can be undertaken under strict biosecurity measures and under the supervision of a suitably trained IAS professional. A licence from the NPWS in advance of any removal, in accordance with the European Communities (Birds and Natural Habitats) Regulations 2011, as amended, is also required. The contaminated material must transported off site by a licenced haulier adhering to strict biosecurity measures and disposed of to a fully licenced waste facility, capable of accepting such contaminated material.</p> <p><b>Cherry Laurel</b> Physical control options for cherry laurel includes uprooting by hand or mechanical uprooting and subsequent chainsaw cutting of root-ball, mulch-matting and bud rubbing to prevent suckering and re-establishment.</p> <p><b>Traveller's joy</b> Physical control methodologies for traveller's joy include pulling of small seedlings by hand. Larger stems have to be cut, the roots grubbed out and the material placed off the ground so it cannot take root again (NRA, 2010).</p>	<p><b>Not recommended</b></p>

Option	Suitability	Recommendation
	<p><b>Butterfly bush</b></p> <p>Excavation or hand pulling of butterfly bush infestations is applicable to minor, establishing infestations of this plant species. Hand picking of young plants will be completed to avoid soil disturbance which may result in the spread of new seedlings. Physical removal by grubbing of mature, established plants as a singular control measures is not recommended as it also may facilitate the spread and establishment of new seedlings. A combined effort of physical treatment of mature plants with targeted chemical treatment of cut stumps is recommended (NRA, 2010).</p> <p>All excavated material is to be disposed of to a licenced waste facility.</p>	

### 3.1.1 Biosecurity Measures

Regardless of the preferred method of treatment good site organisation and hygiene shall be maintained at all time on a site, particularly during construction activities. The following best practice avoidance measures will help to contain and/or prevent the introduction of an IAS infestation on a site as follows;

- Clearly demarcated the infested areas accounting for potential underground rhizome spread;
- Clearly identify and mark out areas where contaminated soil is to be stockpiled / treated on site. This should not be within 50m of any watercourse or within a flood zone;
- Create dedicated exclusion zone entry and exit points for operators on foot and for small mobile equipment. A delineated access track to be maintained free of IAS should be established through the site to minimise the spread of IAS by permitted vehicles accessing the site;
- Dedicated footwear & vehicular clean down facility should be installed in the exclusion zone.
- Vehicles leaving the site should be inspected for any plant material and cleaned down in a secure and contained area;
- Vehicles used in the transport of contaminated material will need to be visually checked and cleaned down into a contained area before being used for any other work, either on the same site or at a different site;
- Material gathered in dedicated clean down contained areas will need to be appropriately treated along with other contaminated soil on site;
- For any material entering the site, the supplier must provide an assurance that it is certified free of IAS;
- Ensure all site users are aware of the measures detailed in the outline invasive species management plan and treatment methodologies. This can be achieved through “toolbox talks “before works begin on the site; and
- Adequate site hygiene signage should be erected in relation to the management of IAS material.

### **3.1.2 Timing of IAS control, management and removal works**

Control, management and removal of IAS will be undertaken and sufficiently completed in advance of construction works for the proposed M28 Road Project. IAS stands, in particular Japanese knotweed, will be enclosed (with Harris fencing or timber fencing) and treated prior to the construction phase of the proposed road project.

## 4 CONSTRUCTION ACTIVITIES

The footprint and immediate environs of the proposed road project will be certified free of IAS prior to the commencement of construction. Where areas are still undergoing control and management measures, the infested area will be fenced off from other construction activities associated with the road project. The location(s) of these areas will be identified by the appointed site ecologist who in turn will provide toolbox talks to the appointed contractor site operatives confirming the locations of these stands and the requirement for all construction activities to avoid contact with these areas. In addition, toolbox talks will provide the following information on IAS within the road project and its environs:

- Locations of IAS;
- How to identify IAS species of concern;
- Determine how IAS species can be spread through construction and related construction activities;
- Determine biosecurity measures required where working in proximity to IAS stands;
- Outline control methods employed for IAS stands within the project; and
- Points of contact for queries on IAS, to report IAS locations or proposed activities in proximity to any IAS stands.

As outlined in **Chapter 2**, an invasive species survey of the route, the CPO line and its environs will be undertaken prior to treatment, management and control works being undertaken for the project. These surveys will be completed to determine the further spread of species identified in **Table 2.1** and to map the occurrence of additional isolated stands of IAS that have established and spread in the interim.

Once CPO lands are free of all IAS, there will be no requirement to treat any of the landtake for the project as infected material and there will be no specific requirements for soil management, or other restrictions placed on the contractor in relation to IAS other than the need to ensure that no additional IAS are introduced as part of the construction or associated activities (including ground investigations, archaeological investigations, landscaping, etc.). This will be achieved by requiring all contractors and sub-contractors to follow basic biosecurity measures as outlined for aquatic species by IFI (<http://www.fisheriesireland.ie/fisheries-research-1/73-biosecurity-protocol-for-field-survey-work-1/file>).

To avoid re-introduction of any terrestrial IAS, all machinery brought on site during construction will be certified free of IAS (especially earth moving and tracked machinery). All plants used for landscaping should be from a certified IAS free source and on completion of landscaping, monitoring and control of the landscaping and road margins for IAS will form part of the regular management operations.

## 5 MONITORING

Monitoring of treated IAS stands will be undertaken in the spring following initial treatment for a minimum of two years to check for re-growth. Any subsequent re-growth will be treated by foliar spray application using a cowled knapsack sprayer or using a weed wiper (subject to location specific environmental sensitivities) which will prevent the rhizome from re-charging over the season's growth. The stems on young material are too small and fragile to use stem injection.

Where regrowth has occurred this will be treated and further monitoring to check for new growth will be undertaken again approximately 2 months later. No disturbance of the ground within the site will take place prior to complete eradication. Certification of successful eradication will require a period of 2 years with no evidence of regrowth.

Invasive species surveys of the project CPO and its immediate environs will be completed in years 1, 3, 5 and 10 of the project's operational phase. These surveys will determine the occurrence (if any) of IAS along the footprint and environs of the road project. Should IAS be identified along the project footprint and environs, the locations of these areas will be circulated to the TII. All subsequent maintenance measures and operations, particularly tree, shrub and grassland maintenance, will be informed by and take cognisance of the findings and recommendations of these surveys.

## 6 ONGOING MAINTENANCE ACTIVITIES ALONG THE PROPOSED M28

In order to avoid accidental transfer of material during the routine maintenance of the proposed M28 Road Project prior to the implementation and completion of the IAS control the following recommendations are prescribed:

- No grass cutting or hedge trimming should be undertaken in the vicinity of any of the locations identified as supporting IAS. Small fragments of IAS during the growing season are capable of regeneration and may be unwittingly transferred in the machinery or in the tyres of tractors.



## **APPENDIX 12D: WETLAND ASSESSMENT OF RAFFEEN QUARRY**

# Report on an aquatic habitat in Raffeen Quarry Co. Cork, prepared for RPS (Galway Office).

Cilian Roden

## *Background*

RPS are carrying out ecological surveys in connection with development of the N28 Cork-Ringaskiddy road. Their survey of Raffeen quarry revealed a number of habitats including a shallow freshwater pond on limestone bedrock. Because of the presence of charophytes they requested the author to investigate the pond and determine its ecological classification using Fossitt's scheme and the EU Habitats Manual. Along with two members of RPS Mr Eamonn Delaney and Ms Paula Kearney, the site was visited on April 28th 2017 and the following report prepared. The habitat categories of Fossitt (*A guide to the habitats of Ireland*, Heritage Council, 2000) are used in the site description and shown in bold type.

## *Site description*

The pond is situated in the south east corner of the quarry at grid reference W7429 6435. Maximum depth was about 1m (although water level may be higher in periods of heavy rainfall). The pond bottom was largely flat limestone bedrock. Sediment accumulation was small with rarely more than 10 cm of soft sediment overlying the rock and frequently far less. No springs were noted but seepage through bedrock cracks may occur. The bottom profile is almost horizontal with dry rock sloping gently into the pond with a large zone of intermittent flooded ground surrounding the pond on its northern side. The remaining shores are surrounded by now derelict quarry faces up to 10-20 m high.

## *Flora*

Few species were recorded in the pond, these include;

### Algae

*Chara vulgaris*

### Moss

*Calliergonella cuspidata*

### Vascular plants

*Equisetum fluviatile*

*Littorella uniflora*

*Potamogeton natans*

*Bulboschoenus maritimus*

*Mentha aquatica*

*Typha latifolia*

*Ranunculus aquatilis*

## *Vegetation*

The pond benthic vegetation is a mosaic of species with little clear zonation. In areas deeper than 50 cm, large colonies of *P. natans* are well developed, as this species has floating leaves large parts of the water surface is blanketed with plants. In shallower areas, a mosaic of *Littorella uniflora*, *Chara vulgaris* or rock occurs. Bare rock is covered by a cyanobacterial crust (krustenstien) resembling that found in marl lakes but not so well developed. Around the pond edge colonies of *T. latifolia*, *E. fluviatile* and *B. maritimus* occur. *Ranunculus aquatilis* occurs in one location. In places where gravel or cobbles are close to the water, *Salix cinnerea* grows. The considerable area of intermittently flooded rock, appears to support a variety of annual species which could not be identified as they were little more than seedlings during the survey period.



### *Assessment*

Area: the pond area is less than 2 ha.

Ecological functioning; As the pond developed in a quarry it cannot be older than the quarry, the quarry is not shown on O.S. maps made in the 19th-early 20th century . It is probably at most 50-100 years old. The species present are widespread and some like *Chara vulgaris* are often found in temporary or artificial habitats such as garden ponds, drinking troughs or puddles. A possible exception is the cyanobacterial crust which is most abundant in unpolluted marl lakes, its presence suggests good water quality. None of the charophytes usually found in Irish marl lakes were noted (*C.vulgaris* can occur in such habitats as an adventive species). It is possible that the vegetation is determined largely by what species have reached the pond to date, with future vegetation partly dependent on the arrival of new colonist species. The presence of *Bulboschoenus maritimus* is surprising as this is normally a brackish water form; its presence may reflect the absence of completion from more likely species such as *Schoenoplectus lacustris*. Given the closeness to Cork Harbour underground seepage of saline water is conceivable but a hydrometer measurement showed no presence of salt.

Future prospects; The very shallow nature of the pond probably means that it will evolve into a fen or wet marsh in the future. Already both *Potamogeton natans* and *Littorella uniflora* have formed a scraw or turf in about half the pond, as have emergent species such as *B. maritimus*.

### *Classification*

Despite the presence of cyanobacterial crust on the bare limestone floor of the pond there is no other resemblance to marl lakes (an EU designated habitat) . Its recent origin and small flora, as well as its likely future development allow it to be classified as **FL8** (artificial water body including quarry pools) of Fossit.

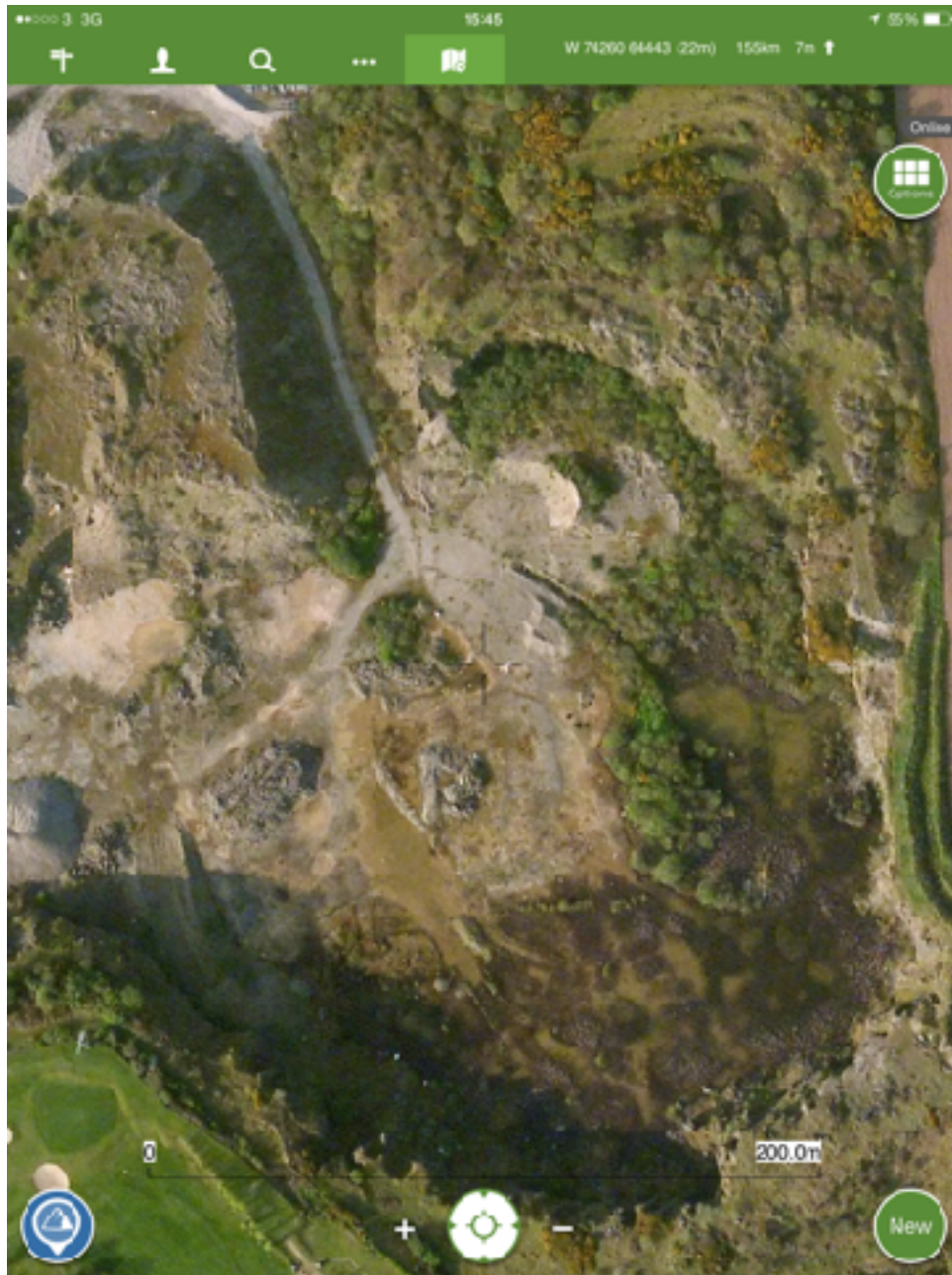


Figure 1. Bing aerial image of pool. The pool area is at the bottom of the image just above the cliff edge. Purple brown areas show patches of plants including *Potamogeton natans* and *Littorella uniflora*. Yellow brown is bare rock covered by cyanobacterial crust.



Figure 2. View of pool looking southwest to old quarry wall.



Figure 3. Northeast corner of pool showing yellow cyanobacteria crust and *Typha latifolia*.



**APPENDIX 12E: BOTANICAL SURVEY OF RAFFEEN QUARRY GRASSLAND**



# M28 Cork to Ringaskiddy Project

## Botanical Survey of Raffeen Quarry Grassland

### Document Control Sheet

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# 1 INTRODUCTION

Cork County Council (CCC), under the auspices of Transport Infrastructure Ireland (TII) (formerly National Roads Authority), are developing a project to upgrade approximately 12.5km of the N28 National Primary Route from the N28/N40 South Ring Road Bloomfield Junction to Ringaskiddy on the Ringaskiddy Peninsula in County Cork. An Environmental Impact Statement (EIS) is being prepared for the proposed M28 Cork to Ringaskiddy Project. An initial draft of the Terrestrial Ecology chapter of the EIS has identified an area of approximately 1.8ha of semi-natural dry/ calcareous grassland located within the proposed route zone of influence in Raffeen Quarry. Raffeen Quarry is located near the southern extremity of the route, east of the Shannonpark roundabout. Lack of quarrying activity at Raffeen, particularly on the higher margins of the quarry void have engendered the establishment of a species rich semi-natural grassland habitat interspersed with scattered scrub. The findings of a site walkover survey completed in July 2014 suggested that the grassland areas were maintained by rabbit grazing.

This report has been prepared in order to further inform the ecological impact assessment of the proposed M28 Cork to Ringaskiddy Project. The principle objectives of the botanical survey were as follows:-

- Complete a detailed botanical survey of the grassland along the western, south-western and southern boundary of Raffeen Quarry (See **Figure 2.1**);
- Identify any species present that are of conservation importance; and
- Identify any habitats present that are of conservation importance and the degree of correspondence of those habitats to Annex I habitats listed on the EU Habitats Directive (92/43/EEC).

## 2 METHODOLOGY

The botanical survey at Raffeen Quarry was conducted on 28<sup>th</sup> May 2015. A general list of species present in the calcareous grassland habitat identified in the EIS was made during a walkover of the habitat. Five 1m x 1m quadrats were placed within the grassland using a random sample location strategy, and the species present in each quadrat recorded. The location of the quadrats and the area of grassland within the quarry are illustrated in **Figure 2.1**. Cover in vertical projection for each species was recorded using the Domin scale (Kent and Coker, 1992) as detailed in **Table 2.1**. A synoptic table of the species recorded in each table, the frequency that they were recorded over the five quadrats and their cover was then produced.

**Table 2.1: The Domin Scale**

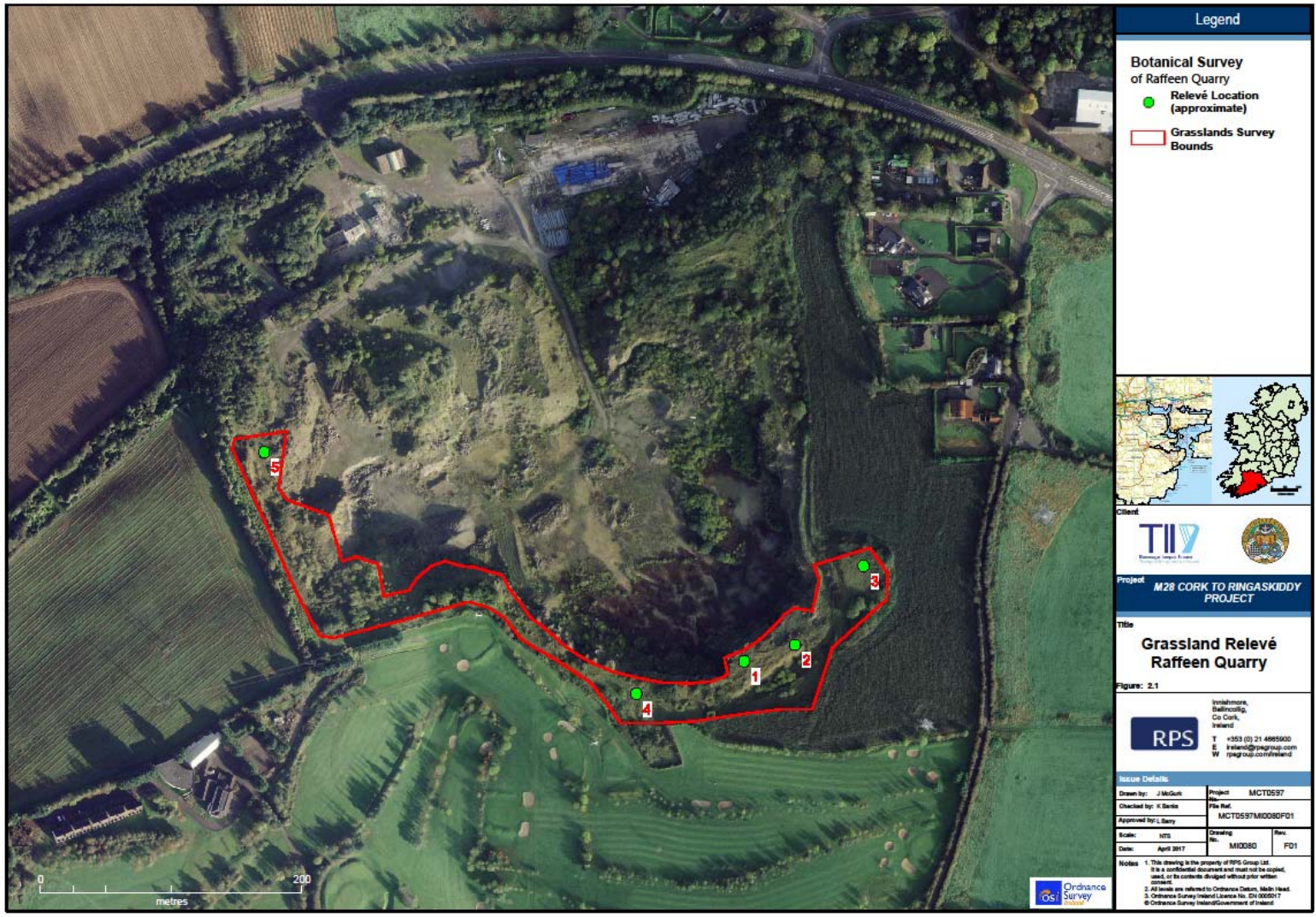
Value	Domin Scale
10	91-100%
9	76-90%
8	51-75%
7	34-50%
6	26-33%
5	11-25%
4	4-10%
3	<4%-frequent
2	<4%-occasional
1	<4%-rare
+	Insignificant: normally 1-2 individuals with no measurable cover

Habitats were classified in accordance with the guidelines set out in '*A Guide to Habitats in Ireland*' (Fossitt, 2000), which classifies habitats based on the vegetation present and management history. The classification is a standard scheme for identifying, describing and classifying wildlife habitats in Ireland. The classification is hierarchical and operates at three levels, outlining the correlation between its habitat categories and the phytosociological units (plant communities) of botanical classifications.

The *Key to the identification of semi-natural grassland communities in Ireland* (O'Neill et al., 2014) was used to classify the communities of plants present. The Irish Semi-natural Grassland Survey 2007-2012 (O'Neill et al., 2013) contains further detailed descriptions of each community: this was also used as a reference in order to further assess the degree of correlation of the semi-natural grassland at Raffeen Quarry to the assigned plant community.



Figure 2.1: Location of Grassland and Relevés at Raffeen Quarry



The grassland was also described in terms of correspondence to Annex I habitats as per the Interpretation Manual of European Union Habitats - EUR28. The Interpretation Manual is a scientific reference document published by the European Commission for the interpretation of Priority and Non-Priority Annex I habitat types of the Habitats Directive. This manual incorporates descriptive sheets for Annex I Priority and Non-Priority Habitats, which establishes clear, operational scientific definitions of habitats, using pragmatic descriptive elements (e.g. characteristic plants) and taking into consideration regional variations.

Finally, the value of the grassland was assessed according to the criteria for site evaluation outlined in the guidance document *Guidelines for Assessment of Ecological Impacts of National Roads Schemes* (NRA<sup>1</sup>, 2009). The geographic frame of reference which is used to determine value is provided in **Table 2.2**.

**Table 2.2: Ecological Site Assessment Scheme**

Ratings for Ecological Sites
<p><b>International Importance:</b></p> <p>‘European Site’ including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA) or proposed Special Area of Conservation.</p> <p>Proposed Special Protection Area (pSPA).</p> <p>Site that fulfils the criteria for designation as a ‘European Site’ (see Annex III of the Habitats Directive, as amended).</p> <p>Features essential to maintaining the coherence of the Natura 2000 Network.</p> <p>Site containing ‘best examples’ of the habitat types listed in Annex I of the Habitats Directive.</p> <p>Resident or regularly occurring populations (assessed to be important at the national level) of the following:</p> <p>Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and/or</p> <p>Species of animal and plants listed in Annex II and/or IV of the Habitats Directive.</p> <p>Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971).</p> <p>World Heritage Site (Convention for the Protection of World Cultural &amp; Natural Heritage, 1972).</p> <p>Biosphere Reserve (UNESCO Man &amp; the Biosphere Programme).</p> <p>Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979).</p> <p>Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979).</p> <p>Biogenetic Reserve under the Council of Europe.</p> <p>European Diploma Site under the Council of Europe.</p> <p>Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988).</p>
<p><b>National Importance:</b></p> <p>Site designated or proposed as a Natural Heritage Area (NHA).</p> <p>Statutory Nature Reserve.</p> <p>Refuge for Fauna and Flora protected under the Wildlife Acts.</p> <p>National Park.</p> <p>Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA); Statutory Nature Reserve; Refuge for Fauna and Flora protected under the Wildlife Act; and/or a National Park.</p> <p>Resident or regularly occurring populations (assessed to be important at the national level) of the following:</p>

<sup>1</sup> Now known as Transport Infrastructure Ireland

<b>Ratings for Ecological Sites</b>
<p>Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list. Site containing 'viable areas' of the habitat types listed in Annex I of the Habitats Directive.</p>
<p><b>County Importance:</b> Area of Special Amenity. Area subject to a Tree Preservation Order. Area of High Amenity, or equivalent, designated under the County Development Plan. Resident or regularly occurring populations (assessed to be important at the County level) of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list. Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance. County important populations of species or viable areas of semi-natural habitats or natural heritage features identified in the National or Local BAP, if this has been prepared. Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county. Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.</p>
<p><b>Local Importance (higher value):</b> Locally important populations of Priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared; Resident or regularly occurring populations (assessed to be important at the Local level) of the following: Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; Species protected under the Wildlife Acts; and/or Species listed on the relevant Red Data list. Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality; Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.</p>
<p><b>Local Importance (lower value):</b> Sites containing small areas of semi-natural habitat that are of some local importance for wildlife; Sites or features containing non-native species that are of some importance in maintaining habitat links.</p>

## 3 RESULTS

### 3.1 GENERAL HABITAT DESCRIPTION

The grassland at Raffeen Quarry occurs in a mosaic with scrub on the margins of high ground surrounding the quarry void. Species rich areas of the grassland are comprised of Sweet Vernal-grass (*Anthoxanthum odoratum*), Common Bent (*Agrostis capillaris*) and Red Fescue (*Festuca rubra*) with locally abundant glaucous sedge (*Carex flacca*) and locally frequent field-wood rush (*Luzula campestris*). Forbs present include over one hundred spikes of Common Spotted Orchid (*Dactylorhiza fuchsii*) and the notable species Yellow-wort (*Blackstonia perfoliata*) and Cowslip (*Primula veris*) occur occasionally throughout these species rich areas. Cowslip is thought to be in decline in Ireland<sup>2</sup> and there are few recent records of this species in Co. Cork<sup>3</sup> (**Figure 3.1**). Likewise, Yellow-wort is also scarcely distributed in Co. Cork, as shown in **Figure 3.2**. In addition, a habitat survey completed as part of the proposed road project in July 2014 recorded in excess of 60 Pyramidal Orchid (*Anacamptis pyramidalis*) spikes.

Other forbs present include locally abundant Mouse-ear Hawkweed (*Pilosella officinarum*) and Bird's-foot-trefoil (*Lotus corniculatus*); and occasional Black Medick (*Medicago lupulina*), Red Clover (*Trifolium pratense*), Wild Strawberry (*Fragaria vesca*), Yarrow (*Achillea millefolium*) and Fairy Flax (*Linum catharticum*). Also present in the area in lower frequency are Meadow Vetchling (*Lathyrus pratensis*), Wild Carrot (*Daucus carota*), Oxeye Daisy (*Leucanthemum vulgare*) and Hawkbit (*Leontodon spp.*).

Less species rich areas are comprised of a higher proportion of graminoids, with forbs present including occasional Cowslip, Meadow Vetchling, Ribwort Plantain (*Plantago lanceolata*), Creeping Cinquefoil (*Potentilla reptans*), Selfheal (*Prunella vulgaris*) and Common Sorrell (*Rumex acetosa*).

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<sup>2</sup> Botanical Society of Britain and Ireland (BSBI) Irish Species Project 2014-2015: Guidance on surveying sample populations

<sup>3</sup> BSBI database: <http://bsbi.org/maps> (accessed 09/06/2015)

**Table 3.1: Vascular Plant Species and Habitats present in the Grassland at Raffeen Quarry**

	
<p><b>Image 3.1: Common Spotted Orchid</b></p>	<p><b>Image 3.2: Area of grassland abundant with Mouse-ear Hawkweed and with several spikes of Common Spotted Orchid</b></p>
	
<p><b>Image 3.3: Cowslip</b></p>	<p><b>Image 3.4: Forb rich area of grassland</b></p>

Figure 3.1: Distribution of Records of Cowslip (*Primula veris*) held on the BSBI Database

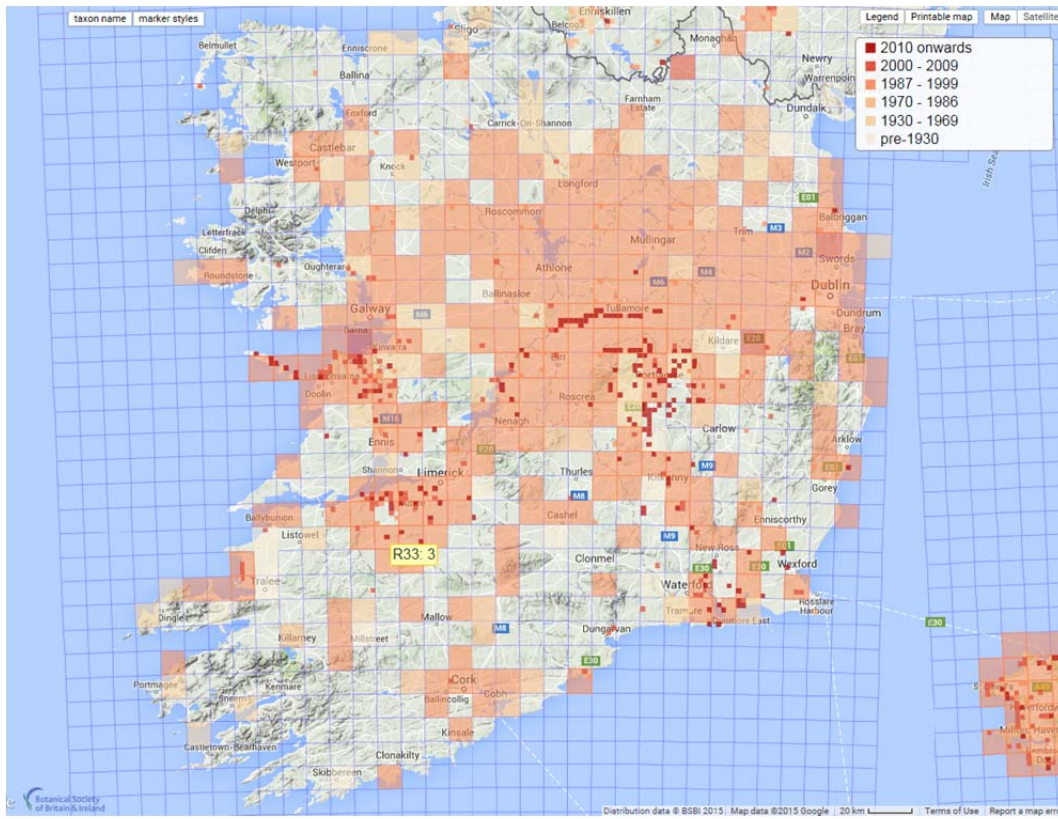
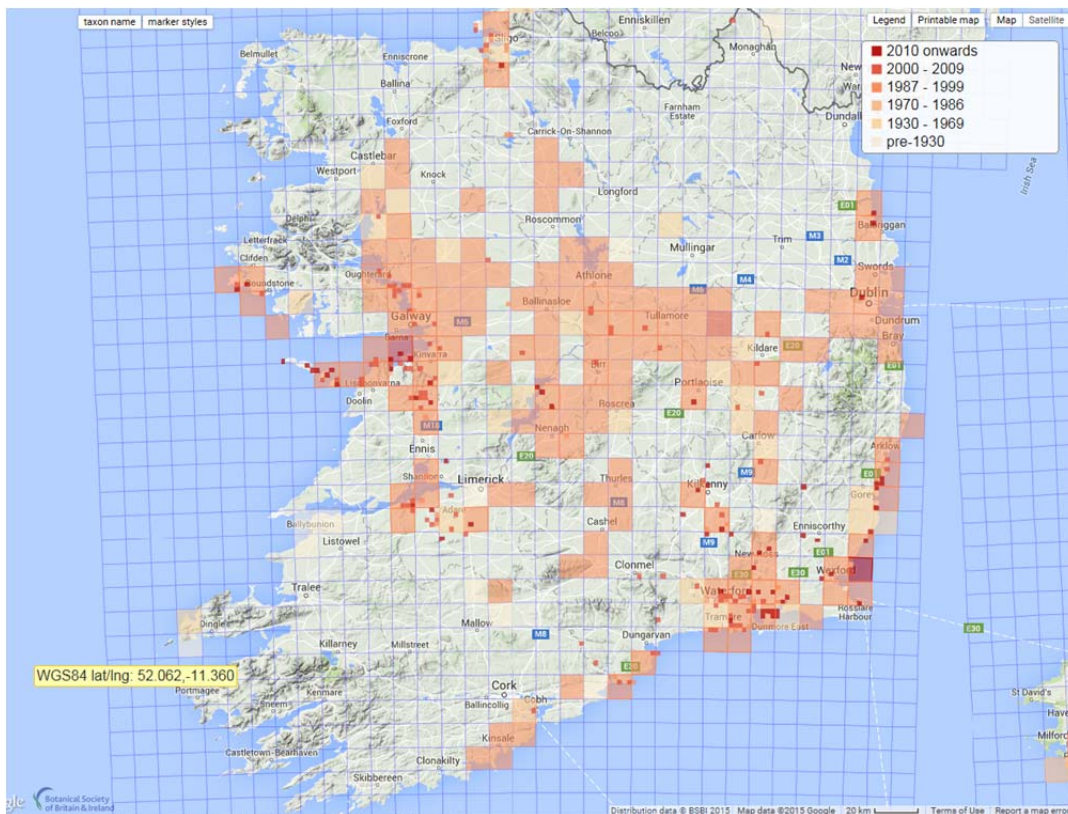


Figure 3.2: Distribution of Records of Yellow-Wort (*Blackstonia perfoliata*) held on the BSBI Database



## 3.2 QUADRAT SURVEY

The results of the relevé based survey of the grassland are detailed in **Table 3.2**. Sweet Vernal-grass, Red Fescue, Yorkshire Fog, Field Wood-rush, Mouse-ear Hawkweed and Common Bird's-foot-trefoil obtained the highest cover over the most relevés, with Yellow-wort, Common Spotted Orchid, Cowslip and Eyebright among the species recorded less frequently.

The whole area of grassland surveyed corresponds to the Fossitt habitat classification *Dry calcareous and neutral grassland* (GS1). Using the Irish Semi-natural Grassland Survey (ISGS) system of classification (O'Neill et al., 2013), the grassland corresponds most closely to community 3aiii *Briza media-Thymus polytrichus* grassland, with some elements of community 3b *Cynosurus cristatus-Trifolium repens* grassland in areas with a higher cover of graminoid species.

The criteria for Annex I habitat *Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (\*important orchid sites)* (6210) includes the following:

Important orchid sites should be interpreted as sites that are important on the basis of one or more of the following three criteria:-

- The site hosts a rich suite of orchid species;
- The site hosts an important population of at least one orchid species considered not very common on the national territory; and
- The site hosts one or several orchid species considered to be rare, very rare or exceptional on the national territory.

The grassland habitat present at Raffeen Quarry does not meet these criteria, and therefore does not correspond to the Annex I habitat *Semi-natural dry grasslands and scrubland facies on calcareous substrates*. However, using NRA (2009) criteria (**Table 2.2**) this area of grassland is considered to be of County Importance for the following reasons:-

- The habitat supports two vascular plant species (Yellow-wort and Cowslip) that are uncommon within the county; and
- Dry calcareous and neutral grassland is considered to be a habitat of special conservation importance in Co. Cork (Cork Biodiversity Action Plan 2009-2014).

**Table 3.2: Synoptic Table for Quadrat Survey, Raffeen Quarry.**

Scientific Name	Common Name	Quadrat					Frequency <sup>4</sup>	Cover <sup>5</sup>
		1	2	3	4	5		
<i>Achillea millefolium</i>	Yarrow	*	*	*			III	2-3
<i>Agrostis capillaris</i>	Common Bent			*			I	6
<i>Anthoxanthum odoratum</i>	Sweet Vernal-Grass	*	*	*	*		IV	5
<i>Bellis perennis</i>	Common Daisy		*		*	*	III	3
<i>Blackstonia perfoliata</i>	Yellow-Wort	*	*	*		*	IV	2-3
<i>Carex flacca</i>	Glaucous Sedge					*	I	7
<i>Centaurium erythraea</i>	Common Centaury			*			I	2
<i>Cerastium fontanum</i>	Common Mouse-Ear	*	*	*	*	*	V	2-3
<i>Cynosurus cristatus</i>	Crested Dog's-Tail			*		*	II	4-5
<i>Dactylis glomerata</i>	Cock's-Foot			*	*		II	4
<i>Dactylorhiza fuchsii</i>	Common Spotted Orchid	*	*				II	3
<i>Daucus carota</i>	Wild Carrot	*					I	2
<i>Euphrasia agg.</i>	Eyebright Species		*	*			II	2-3
<i>Festuca rubra</i>	Red Fescue		*		*	*	III	6-7
<i>Fragaria vesca</i>	Wild Strawberry	*	*		*	*	IV	1-4
<i>Hedera helix</i>	Ivy		*				I	1
<i>Holcus lanatus</i>	Yorkshire Fog	*	*	*	*		IV	5-6
<i>Lathyrus pratensis</i>	Meadow Vetchling			*			I	3
<i>Leontodon spp</i>	Hawkbit spp (Rough or Lesser)					*	I	1
<i>Linum catharticum</i>	Fairy Flax	*	*		*	*	IV	1-3
<i>Lotus corniculatus</i>	Common Bird's-Foot-Trefoil	*	*	*	*	*	V	4-6
<i>Luzula campestris</i>	Field Wood-Rush	*	*	*	*	*	V	4-6
<i>Medicago lupulina</i>	Black Medick		*			*	II	4
<i>Pilosella officinarum</i>	Mouse-Ear Hawkweed	*	*		*		III	5-8
<i>Plantago lanceolata</i>	Ribwort Plantain			*			I	5
<i>Potentilla reptans</i>	Creeping Cinquefoil			*			I	3
<i>Primula veris</i>	Cowslip			*	*		II	3-4
<i>Prunella vulgaris</i>	Selfheal					*	I	3
<i>Rumex acetosa</i>	Common Sorrel				*		I	1
<i>Scorzoneroides autumnalis</i>	Autumn Hawkbit		*				I	1
<i>Senecio jacobaea</i>	Ragwort			*		*	II	1-2
<i>Trifolium pratense</i>	Red Clover	*			*		II	4
<i>Ulex europaeus</i>	Common Gorse	*					I	2
<i>Veronica chamaedrys</i>	Germander Speedwell					*	I	2
<i>Veronica serpyllifolia</i>	Thyme-leaved Speedwell		*				I	1
<i>Vicia sativa</i>	Common Vetch	*		*	*		III	1

<sup>4</sup> Frequency of occurrence of species (i.e. how many quadrats out of 5 the species is present in)

<sup>5</sup> Using the DOMIN scale



## 4 DISCUSSION

The grassland present in the margins around the quarry void at Raffeen Quarry is a remnant of semi-natural limestone flora. Areas of the grassland are relatively species rich and support over one hundred spikes of Common Spotted Orchid, more than 60 spikes of Pyramidal Orchid and two species that are uncommon in a county context (Yellow-wort and Cowslip). In March 2014, Mr. Tony O'Mahony the then BSBI County Recorder for Cork reported on received correspondence that a population of Salad Burnet (*Poterium sanguisorba* subsp. *sanguisorba*) had been found at Raffeen Quarry in June 2013 (the first population for a mid Co. Cork site since the mid-1870s), in addition to a large population of Bee Orchid (*Ophrys apifera*)<sup>6</sup>.

The grassland does not correspond to Annex I habitat (*Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (\*important orchid sites)* (6210)), but is considered to be of County Importance.

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<sup>6</sup> Source – BSBI Irish Botanical News No. 24 - March 2014

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## **APPENDIX 12F: BAT SURVEYS**

# PROPOSED N28 BLOOMFIELD – RINGASKIDDY ROAD ROUTE REALIGNMENT, COUNTY CORK

## Summer-season bat fauna assessment

Prepared for

***RPS Group***

By

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5<sup>th</sup> October 2014



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## TERRESTRIAL FAUNA

### 1. RECEIVING ENVIRONMENT

#### 1.1 Introduction

*Aardwolf Wildlife Surveys* was commissioned by *RPS*, of Innishmore, Ballincollig, Co. Cork, to carry out a summer season study of bat fauna within the area of the proposed N28 Bloomfield to Ringaskiddy road route realignment in County Cork, as part of wider ecological studies for Environmental Impact Assessment of the development.

It is well known that these protected animals utilise road verges and associated treelines and hedgerows as feeding areas and commuting zones between roosts and between roosts and feeding areas. All species of Irish bat have been noted to feed along minor roads and lanes, field boundaries and woodland edge habitats.

The construction of a new road may adversely affect bats in a number of ways. For instance, construction often entails the removal of vegetation that was previously used by bats. This may impact bats through the creation of an open space barrier that bats may be unwilling to cross eventually resulting in a local population decline as bats are prevented from reaching preferred foraging areas. Vehicles using the new corridor may also kill bats. Bat roosts in trees or buildings within or immediately adjacent to the road route corridor may have to be removed. The removal of hedgerows and treelines and the loss of mature trees, draining of wet areas and provision of artificial lighting all affect the availability of invertebrate prey and feeding areas. It is essential therefore that a comprehensive study of bat activity at sites of such development be undertaken to identify any conflict zones and hence to avoid or reduce impacts through mitigation to safeguard these animals.

In 2006, an autumnal assessment of bats along the proposed route was undertaken and reported as part of a previous EIA (Keeley 2006) but, due to the passage of time, an ecological reassessment of the planned route was required and, in 2013, a second autumnal bat activity assessment of the proposed route was undertaken by *Aardwolf Wildlife Surveys* on behalf of *Halcrow Barry Limited* and reported at the time (Kelleher 2013). The 2013 bat assessment report detailed the results of bat surveys undertaken along the proposed road corridor in the autumn of 2013 and, as the approach detailed in the *National Roads Authority's (NRA) Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes* (NRA 2006a) was to be followed to comprehensively research and so understand the existing behaviour of bats along the chosen route of the proposed N28 realignment, the report recommended that further assessment of bat activity be undertaken during the summer of 2014. The NRA guidelines recommend that the potential impacts that a proposed road development may have on bats be assessed seasonally in order to take into consideration the affect the road will have on both the nightly and seasonal behaviour of these animals.

#### 1.2 Route description

The planned route for the N28 Bloomfield to Ringaskiddy road realignment begins at the Bloomfield Interchange on the existing N25 South Ring Road, east of Douglas village and southeast of Cork City and, crossing the R610 road and the Woodbrook Stream, initially follows the existing N28 road until entering lands at Castletreasure townland where it departs the existing carriageway at its junction with the R611 and crosses the Donnybrook Stream. Running to the west and parallel with the existing route, it turns southeast and continues for approximately

3



1km before turning southwards to the townland of Shannonpark where, crossing the R611, it turns due east along the Glounatouig Stream at Hilltown and runs through Ballyhemikan townland. From here, the planned route passes south of the village of Shanbally, crossing several minor roads and the R613 at Barnahely townland before finally turning due north at Loughbeg townland to end at Ringaskiddy. Several link roads are also proposed along the main corridor to tie-in with existing minor roads. Access to the proposed development areas is from local roads, tracks and across open countryside.

### **1.3 Bat assessment**

This report presents the results of bat surveys undertaken by Conor Kelleher along the planned road route in August 2014. The bat fauna occurring within the study site and the wider route area is described and the likely impacts of the development on bat species discussed. Habitats are assessed in relation to bat survey.

The general format of this report is in accordance with guidelines recommended by the EPA (2002) - *Guidelines on the Information to be contained in Environmental Impact Statements*. Recommendations and evaluation techniques utilised are in general accordance with *Guidelines for Baseline Ecological Assessment* (Institute of Environmental Assessment, UK 1995), *Wildlife Impact: the treatment of nature conservation in environmental assessment* (RSPB 1995) and *Guidelines for ecological evaluation and impact assessment* (Regini 2000).

In 2006, the NRA published guidelines for bats and these have been referred to:

- *Best practice guidelines for the conservation of bats in the planning of National Road Schemes.*
- *Guidelines for the treatment of bats during the construction of National Road Schemes.*

#### **1.3.1 Survey methodology**

The present summer surveys are a continuation of previous autumn-season assessments of the bat fauna occurring along the proposed road realignment route. The seasonal study is devised to investigate the different behaviour shown by these animals at different times of the year as follows.

##### *Autumn assessment: October*

Detector surveys: bat feeding, commuting and mating behaviour observed.  
Leisler's bat lekking areas and other bat mating sites identified.

##### *Summer assessment: August*

Detector and bat habitat surveys: bat feeding, commuting and roosting behaviour observed.  
Structure surveys: impacted buildings inspected for bats and/or their sign.  
Dawn swarming surveys: onsite and/or adjacent maternity roosts identified.

Prior to fieldwork for the present surveys, areas likely to be of interest to bats along the route and in the wider landscape were identified and selected from mapping and aerial photography and assessed on the ground. The nature and type of habitats present are indicative of the species likely to be present and these were assessed in general accordance with techniques adopted for the Badger & Habitat Survey of Ireland (Smal 1995). Habitats listed by Fossitt (2000) and by the UK Nature Conservancy Council (1990) were referred to. The habitat survey is not intended to serve as a botanical study.



The onsite habitats were assessed during daylight hours to determine their favourability for bats and, at dusk and into the hours of darkness, on-site bat activity was assessed by walking transects while listening for bat echolocation calls using *Batbox Duet* Heterodyne/Frequency Division and *American Acoustics Echo Meter EM3+* Heterodyne/Frequency Division/Time Expansion bat detectors. Bats were identified by their ultrasonic calls coupled with behavioural and flight observations.

Nocturnal bat activity is mainly bi-modal taking advantage of increased insect numbers on the wing in the periods after dusk and before dawn, with a lull in activity in the middle of the night. This is particularly true of 'hawking' species – i.e. bats which capture prey in the open air. However, 'gleaning' species remain active throughout the night as prey is available on foliage for longer periods. The prime periods for detecting bat activity, therefore, are two hours after dusk and again for a shorter period before dawn.

The field surveys were supplemented by evaluation of relevant literature and review of *Bat Conservation Ireland's* (BCIreland) National Bat Records Database.

### 1.3.2 Survey constraints

The summer assessment was undertaken in early August during the peak bat activity period when both young and adults are on the wing. The weather conditions during survey were optimal; with no rainfall, little wind and temperatures of 23° - 26° Celsius by day and 14° - 18° Celsius by night.

## 1.4 General description of the area

The area is located in a low-lying and gently undulating landscape where elevation varies from c. 10m asl up to c. 90m asl. The area at the beginning of the route is quite built-up but the corridor quickly enters amenity and then agricultural grassland and tillage, the latter being the main agricultural undertaking in the area.

## 1.5 Brief description of habitats present

The following are the main habitats found within the proposed route corridor with classifications based on Fossit 2000.

### 1.5.1 Grasslands and tillage

The onsite grasslands are mostly improved (GA1), high quality pastures, being predominantly used for grazing but also for silage. Small areas of various unimproved grasslands also occur along the route including dry calcareous and neutral grassland (GS1), dry meadows and verges (GS2) and wet grassland (GS4) and these too are grazed. Well maintained amenity grasslands (GA2) also occur. Many of the fields through which the proposed route passes are tilled (BC3).

### 1.5.2 Hedgerows and treelines

The structure of boundaries varies in the area and many are of stone walls (BL1) or earth banks (BL2) usually with associated vegetative cover. Hedgerows (WL1) are principally of hawthorn *Crataegus monogyna* with emergent willow *Salix* spp., elder *Sambucus nigra*, sycamore *Acer pseudoplatanus* and ash *Fraxinus excelsior* which form treelines (WL2) in places.

### 1.5.3 Woodlands

Several wooded areas occur along the proposed route including mixed broadleaved woodland (WD1) at Douglas (Bloomfield Wood), along the Donnybrook Stream at Castletreasure, Hilltown,





Shannon Park, Ballyhemiken, Shanbally and Ringaskiddy and immature coniferous woodlands (WD4) occur at Raheens/Loughbeg. Scattered mature trees also occur at the ruined Castle Warren in Barnahely.

#### 1.5.4 Scrub

Scrub (WS1) is widespread in the area and often occurs in association with woodland.

#### 1.5.5 Streams, drains and ponds

Streams and drainage channels (FW4) are the only watercourses along the route. These include the Woodbrook, Donnybrook and Glounatouig streams. Ponds (FW4) are present at Ballyheniken and within the Barnahely Wetland area. Some smaller ponds are also present within surrounding agricultural areas.

#### 1.5.6 Built land and roads

Apart from the existing N28 road, several minor roads and lanes are present within the area. There are also several tracks that serve as access to farms and houses. Other structures along or adjacent to the route include town buildings, one-off dwellings, derelict/disused cottages, a ruined castle, a Martello tower, farm buildings and bridges (BL3).

### 1.6 Designated sites of conservation interest

There are four designated conservation areas either on or adjacent to the proposed route; Cork Harbour Special Protection Area (SPA) and Loughbeg SPA are outside of the route but both the Douglas River Estuary proposed Natural Heritage Area (pNHA) and Loughbeg pNHA lie within it.

## 2. BAT FAUNA ASSESSMENT FINDINGS

The key locations of importance for bats for commuting and foraging within the study area are woodlands, watercourses, treelines and hedgerows. Additional favourable habitats include scrub and scattered trees. Some mature trees in the area also offer roosting opportunities for bats due to the presence of cracks from storm damage or by having hollows and crevices through decay. Some of these and indeed younger trees also have ivy *Hedera helix* cover that may be used for roosting by bats on occasion.

Many of the area's structures offer potential for roosting bats as farm buildings and disused/derelict buildings have open access for these animals through dilapidated doors and windows, holed roofing, gaps at eaves etc. and modern dwellings allow bats access beneath tiles, lead flashing and gaps between walls and soffits.

### 2.1 Desk study findings

The review of existing records (sourced from BC Ireland's National Bat Records Database) of bat species in the area of the proposed road route reveals that seven of the ten known Irish species have been observed within a 10km radius of the study area. These include common *Pipistrellus pipistrellus* and soprano *P. pygmaeus* pipistrelle, Leisler's *Nyctalus leisleri*, brown long-eared *Plecotus auritus*, Daubenton's *Myotis daubentonii*, Natterer's *M. nattereri* and whiskered *M. mystacinus* bats as shown in Table 1 below.



Table 1: Adjudged status of bat species within the study area

Common name	Scientific name	Occurrence	Source
Common pipistrelle	<i>Pipistrellus pipistrellus</i>	Present	BCIreland
Soprano pipistrelle	<i>Pipistrellus pygmaeus</i>	Present	BCIreland
Nathusius' pipistrelle	<i>Pipistrellus nathusii</i>	Potential – rare	BCIreland
Leisler's bat	<i>Nyctalus leisleri</i>	Present	BCIreland
Brown long-eared bat	<i>Plecotus auritus</i>	Present	BCIreland
Lesser horseshoe bat	<i>Rhinolophus hipposideros</i>	Potential	BCIreland
Daubenton's bat	<i>Myotis daubentonii</i>	Present	BCIreland
Natterer's bat	<i>Myotis nattereri</i>	Present	BCIreland
Whiskered bat	<i>Myotis mystacinus</i>	Present	BCIreland
Brandt's bat	<i>Myotis brandtii</i>	Potential – rare	BCIreland

Two soprano pipistrelle roosts, two Leisler's bat roosts and one brown long-eared bat roost have also been identified in the area but all are several kilometres distant to the proposed scheme.

Brandt's bat *M. brandtii* (only discovered in 2003 (Mullen 2007)), may potentially occur in the area but records of the species are few to date and, since it cannot be distinguished from the whiskered bat by detector, it is probably often misidentified or overlooked.

The lesser horseshoe bat *Rhinolophus hipposideros* is restricted to the west of Ireland and it is only known from Counties Mayo, Galway, Clare, Limerick, Kerry and Cork (Kelleher 2004). However, single specimens have recently been discovered in Lough Key, near Boyle, Co. Roscommon in 2004 (B. Keeley, pers. comm.) and in Tubbercurry, Co. Sligo in 2008 (pers. obs.), two counties where their low numbers may have caused their presence to be overlooked until now. The population of this species in Co. Cork is small and most roosts are in West Cork however small numbers are known to be present in the Ovens, Ballincollig and Blarney areas within 20km of the planned road scheme so potential exists for the species to be present within the area but there are no records to date.

The remaining Irish bat species; Nathusius' pipistrelle *P. nathusii*, may occur in the area occasionally, however, to date, its known maternity roosts are restricted to north-east Ireland but it is being recorded more often, probably as a result of climate change, with more animals of this highly migratory species arriving from the continent, and with increased use of bat detectors in Ireland. The species has yet to be recorded in the immediate area of the proposed road but potential exists for its occurrence as it has been recorded near the village of Dripsey (pers. obs.), approximately 20km to the west.

## 2.2 Field survey findings

Five bat species; common and soprano pipistrelle, Leisler's, Natterer's and Daubenton's were detected during the present surveys which were carried out during the nights of 5<sup>th</sup> and 6<sup>th</sup> of August 2014. Although not recorded during the present surveys, brown long-eared bat was recorded during the 2013 survey as it commuted along a hedgerow near the ruined Castle Warren in Barnahely on the 18<sup>th</sup> of October however this is a very quiet species which produces very weak echolocation pulses and sometimes hunts without emitting sounds. It can therefore be present without being detected.

As in the autumn 2013 survey, both common and soprano pipistrelle were ubiquitous along hedgerows, treelines and woodland edge throughout the study area on each night with the exception of Barnahely Wetland where only soprano pipistrelle was recorded. Leisler's bat, which forages over agricultural landscapes, scrub and woodland as well as urban areas, was detected commuting high overhead at Bloomfield Wood, Shannon Park, Shanbally and Ringaskiddy. This



is a high flying species and its commuting routes and foraging areas will not be impacted by the road scheme. Natterer’s bat, a woodland species, was detected hunting along the edge of Bloomfield Wood on the night of the 6<sup>th</sup> while Daubenton’s bat which hunts close to the surface of still watercourses and other bodies of water, was detected foraging over the River Lee/Ringaskiddy Port area on the night of the 5<sup>th</sup>.

No further bat roosts were identified along the proposed road route. Observations of flying bats along with location and activity noted are given in Table 2 below.

Table 2: Observations of bat species within the study area

Bat species	Location	Activity	Habitat & Code (Fossit 2000)
Common pipistrelle <i>Pipistrellus pipistrellus</i>	Bloomfield Wood Ch: 600-1500	Foraging	Mixed broadleaved woodland (WD1)
	Donnybrook Stream Ch: 2300-2800	Foraging	Mixed broadleaved woodland (WD1) and stream (FW4)
	Glounatouig Stream Ch: 5200-6100	Foraging	Mixed broadleaved woodland (WD1) and stream (FW4)
	Shannon Park Ch: 6100-6800	Foraging	Mixed broadleaved woodland (WD1)
	Barnahely Ch:10600-11000	Foraging	Ruined castle (BL3) and scattered trees
	Ringaskiddy Ch: 12600-13000	Foraging	Mixed broadleaved woodland (WD1) and scrub (WS1)
Soprano pipistrelle <i>Pipistrellus pygmaeus</i>	Bloomfield Wood Ch: 600-1500	Foraging	Mixed broadleaved woodland (WD1)
	Donnybrook Stream Ch: 2300-2800	Foraging	Mixed broadleaved woodland (WD1) and stream (FW4)
	Glounatouig Stream Ch: 5200-6100	Foraging	Mixed broadleaved woodland (WD1) and stream (FW4)
	Shannon Park Ch: 6100-6800	Foraging	Mixed broadleaved woodland (WD1)
	Barnahely Ch:10600-11000	Foraging	Ruined castle (BL3) and scattered trees
	Barnahely Wetland Ch: 11100-12000	Foraging	Pond (FW4), scrub (WS1), immature coniferous woodland (WD4) and derelict buildings (BL3)
	Ringaskiddy Ch: 12600-13000	Foraging	Mixed broadleaved woodland (WD1) and scrub (WS1)
	Leisler’s bat <i>Nyctalus leisleri</i>	Bloomfield Wood Ch: 600-1500	Commuting
Shannon Park Ch: 6100-6800		Commuting	Mixed broadleaved woodland (WD1)
Shanbally Ch: 9300		Commuting	Built-up area (BL3)
Ringaskiddy Ch: 12600-13000		Commuting	Mixed broadleaved woodland (WD1) and scrub (WS1)
Natterer’s bat <i>Myotis nattereri</i>	Bloomfield Wood Ch: 600-1500	Foraging	Mixed broadleaved woodland (WD1)
Daubenton’s bat <i>Myotis daubentonii</i>	Ringaskiddy Ch: 11200	Foraging	River Lee (FW2)/harbour



## 2.3 Assessment of scientific interest of the study area for bats

The principal areas of ecological interest in relation to bats present on or near the proposed road route include:

### 2.3.1 Agricultural areas and associated hedgerows and treelines

Most of the agricultural areas may be considered as of low or negligible interest from a bat perspective. These habitats are ecologically of low-grade and widespread. However, many of the hedgerows which bound field systems offer shelter for commuting and foraging bats and are therefore considered as being of medium local value.

### 2.3.2 Woodlands and watercourses

The woodlands on or adjacent to the proposed route, especially where associated with watercourses, all provide important foraging areas and commuting corridors for a number of bat species and are therefore considered as being of medium local value.

## 3. LEGAL STATUS - BATS

All Irish bat species are protected under the Wildlife Act (1976) and Wildlife Amendment Acts (2000 & 2010). Also, the EC Directive on The Conservation of Natural habitats and of Wild Fauna and Flora (Habitats Directive 1992), seeks to protect rare species, including bats, and their habitats and requires that appropriate monitoring of populations be undertaken. Across Europe, they are further protected under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982), which, in relation to bats, exists to conserve all species and their habitats. The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, enacted 1983) was instigated to protect migrant species across all European boundaries. The Irish government has ratified both these conventions.

All Irish bats are listed in Annex IV of the Habitats Directive and the lesser horseshoe bat is further listed under Annex II.

*NB: Destruction, alteration or evacuation of a known bat roost is a notifiable action under current legislation and a derogation licence has to be obtained from the National Parks and Wildlife Service before works can commence.*

It should be noted that any works interfering with bats and especially their roosts, including for instance, the installation of lighting in the vicinity of the latter, may only be carried out under a licence to derogate from Regulation 23 of the Habitats Regulations 1997 and Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011 (which transposed the EU Habitats Directive into Irish law) issued by NPWS. The details with regards to appropriate assessments, the strict parameters within which derogation licences may be issued and the procedures by which and the order in relation to the planning and development regulations such licences should be obtained, are set out in Circular Letter NPWS 2/07 "Guidance on Compliance with Regulation 23 of the Habitats Regulations 1997 - strict protection of certain species/applications for derogation licences" issued on behalf of the Minister of the Environment, Heritage and Local Government on the 16<sup>th</sup> of May 2007 - reproduced in Appendix 3.

Furthermore, on 21<sup>st</sup> September 2011, the Irish Government published the European Communities (Birds and Natural Habitats) Regulations 2011 which include the protection of the Irish bat fauna and further outline derogation licensing requirements re: European Protected Species.



The current status and legal protection of the known bat species occurring in Ireland is given in Table 3 below.

Table 3: Legal status and protection of the Irish bat fauna

Common and scientific name	Wildlife Act 1976 & Wildlife (Amendment) Acts 2000 & 2010	Irish Red List status	Habitats Directive	Bern & Bonn Conventions
Common pipistrelle <i>Pipistrellus pipistrellus</i>	Yes	Least Concern	Annex IV	Appendix II
Soprano pipistrelle <i>P. pygmaeus</i>	Yes	Least Concern	Annex IV	Appendix II
Nathusius' pipistrelle <i>P. nathusii</i>	Yes	Least Concern	Annex IV	Appendix II
Leisler's bat <i>Nyctalus leisleri</i>	Yes	Near Threatened	Annex IV	Appendix II
Brown long-eared bat <i>Plecotus auritus</i>	Yes	Least Concern	Annex IV	Appendix II
Lesser horseshoe bat <i>Rhinolophus hipposideros</i>	Yes	Least Concern	Annex II Annex IV	Appendix II
Daubenton's bat <i>Myotis daubentonii</i>	Yes	Least Concern	Annex IV	Appendix II
Natterer's bat <i>M. nattereri</i>	Yes	Least Concern	Annex IV	Appendix II
Whiskered bat <i>M. mystacinus</i>	Yes	Least Concern	Annex IV	Appendix II
Brandt's bat <i>M. brandtii</i>	Yes	Data Deficient	Annex IV	Appendix II

Further information on the Irish bat fauna is given in Appendix 1 and 2.

#### 4. POTENTIAL IMPACTS OF THE DEVELOPMENT ON BATS

Bat species within the area of the proposed road will be affected by both the construction phase and subsequent existence of the new route corridor across the existing landscape. Loss of foraging sites and commuting habitat may displace certain species.

Extant records of bats in the immediate area and the findings of the previous and present surveys indicate that a diverse range of bat species use the landscape surrounding the proposed road route and the key impacts on these animals arise through potential roost loss, loss of feeding areas and disruption of commuting routes.

A variety of habitats occur in the study areas which vary in their importance for bats. The loss of grassland areas within the preferred route corridor will have a negligible or minor negative impact on bats. Apart from pollution incidents, watercourses should not be significantly impacted by the proposed development and thus bats are likely to continue using them. The main impacts on bats arise through the severance and loss of hedgerows and treelines and the loss of a percentage of woodland along the chosen route all of which are widely used by these animals.

Disused or derelict buildings and large deciduous trees on or adjacent to the scheme may require removal and these may harbour bats occasionally.



## 5. MITIGATION MEASURES

Standard mitigation measures, as would apply to any large-scale development, shall be adopted in the construction of the carriageway. These include limiting season of disturbance to trees and vegetation to reduce impacts on breeding species, to provide for habitat replacement and to implement measures to avoid and/or control pollution and sedimentation into watercourses during construction and operation phases. Specific measures will be required to protect bats and these are given below.

The following mitigation measures are in line with the NRA guidelines on provisions for the conservation of bats during the planning and construction of roads (2006). Reference is made to the NRA Guidelines (*Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes*) and the *Guidelines for the Treatment of Bats during the Construction of National Road Schemes*).

### Removal of deciduous trees

Any mature broadleaved tree that is to be removed should first be surveyed for bat presence by a suitably experienced specialist. If bats are found, an application for a derogation licence should be made to the *National Parks and Wildlife Service* to allow its legal removal. Such trees should ideally be felled in the period late August to late October, or early November, in order to avoid disturbance of any roosting bats as per *National Roads Authority* guidelines (NRA 2006a and 2006b) and also to avoid the bird breeding seasons. Tree felling should be completed by Mid-November at the latest as bats roosting in trees are very vulnerable to disturbance during their hibernation period (November – April). Trees with ivy-cover, once felled, should be left intact onsite for 24 hours prior to disposal to allow any bats beneath foliage to escape overnight.

Landowners should be advised that the timber from felled trees will remain for their use. This should prevent trees being felled prematurely.

### Trees to be retained

Several species of bats roost in trees. Where possible, treelines and mature trees that are located immediately adjacent to the realignment route or are not directly impacted should be avoided and retained intact. Overall impacts on these sites should be reduced through modified design and sensitivity during construction. Any trees and treelines along approach roads and planned site access tracks should be retained where possible. Retained trees should be protected from root damage by machinery by an exclusion zone of at least 7 metres or equivalent to canopy height. Such protected trees should be fenced off by adequate temporary fencing prior to other works commencing.

### Compensation for loss of commuting routes

Linear features such as hedgerows and treelines serve as commuting corridors for bats (and other wildlife). Mitigation measures are recommended to compensate for the loss of these features. These measures will also compensate for habitat loss and provide continuity in the landscape.

Severed linear features such as hedgerows and treelines should, where possible, be reconnected using semi-mature trees under-planted with hedgerow species to compensate for the loss of treelines and hedgerows that are currently used by bats. The exact locations of such planting will be designed at detailed landscaping stage. Native species should be used as they support more insect life than non-native varieties.

All planting should preferably be completed during the pre-construction phase to provide hedgerow/tree growth prior to completion of the development. This would ensure that bats commuting in the area have prior knowledge of newly planted landscape features as well as



ensuring the newly planted hedgerows/treelines are well established prior to completion of the road.

Habitat retention, replacement and landscaping

Habitat replacement and landscaping could compensate for or add to the wildlife value of the area and also provide areas of aesthetic as well as wildlife interest. Further pro-active habitat restoration measures are considered below.

In general, best practice design should aim to retain the quality of the landscape where possible and ensure its protection within the landscaping programme. Existing hedgerows and treelines, woodland and semi-natural scrub or semi-natural grasslands should be retained where possible and incorporated into the landscaping programme.

The overall design of the project should also include habitat replacement or enhancement of existing onsite woodland, hedgerow, treeline and scrub habitats and it is recommended that the planting of native broadleaved trees is also considered. Native species should be chosen in all landscaping schemes. Planting schemes should attempt to link in with existing wildlife corridors (hedgerows and treelines) to provide continuity of wildlife corridors.

## **6. RESIDUAL IMPACT OF THE DEVELOPMENT ON BATS**

Although the loss of habitats favourable to bats is expected to displace certain species through disruption of commuting routes, due to the route initially following the existing carriageway and its shortness, the widespread nature of hedgerows and treelines in the area and implementation of recommended mitigation measures to safeguard these animals, the residual impact of the development on bats is expected to be negligible to minor negative and all bat species recorded in the area should persist.



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## 8. APPENDICES

### 8.1 APPENDIX 1: bat ecology

#### *Introduction*

The bat is the only mammal that is capable of true flight using modified hands and arms which are covered by a supple membrane of skin. This ability has allowed bats to exploit aerial insect prey and avoid predation. As the largest mammalian group after the rodents (to which they are not related), bats are very successful and have diversified into over 1,200 species worldwide, representing almost a quarter of all mammal species. Within such diversification, they have evolved a range of hunting strategies, means of reproduction, roosting behaviours and social interactions (Kunz 1982). They are found throughout the world and in every continent apart from Antarctica.

Bats are classified within the Order Chiroptera (meaning 'Hand-wing') and this is further divided into two Superfamilies: the Megachiroptera and Microchiroptera. The former are mainly fruit-eaters while the latter are predominantly insectivorous. Of these, 52 bat species are currently known in Europe.

#### *Irish bat species*

In Ireland, ten species of bat have been recorded. These are classified into two Families: the Rhinolophidae (Horseshoe bats) and the Vespertilionidae (Common bats). The lesser horseshoe bat *Rhinolophus hipposideros* is the only representative of the former Family in Ireland. All the other Irish bat species are of the latter Family and these include three pipistrelle species: common *Pipistrellus pipistrellus*, soprano *P. pygmaeus* and Nathusius' *P. nathusii*, four *Myotis*: Natterer's *Myotis nattereri*, Daubenton's *M. daubentonii*, whiskered *M. mystacinus*, Brandt's *M. brandtii*, the brown long-eared *Plecotus auritus* and Leisler's *Nyctalus leisleri* bats.

Individual species accounts with distribution maps are given in Appendix 2.

#### *Hunting with sound*

The microbats are unique as they use a type of sonar, called echolocation, by which they hunt their prey. This is a stream of sound produced at high frequencies which allows the animal to build-up a complete 'sound picture' of their surroundings. These sounds are produced well beyond the range of human hearing. Using these sounds, the bats are able to detect the clutter of nearby leaves, hear an insect, know how fast it is travelling, how fast its wings are beating, whether it is hard or soft bodied etc. before closing in for the catch. Although bats use this method to find their way around, they also use their eyes to see in low light levels.

All the European bat species feed exclusively on insects and/or spiders and a pipistrelle, weighing only 4 to 8 grams, will eat up to 3,500 insects every night. This allows the bat to increase its body weight by 50% each night but this is immediately burned off through calorie consumption while flying. Such feeding ensures a build up of fat in the form of brown adipose tissue between the shoulder blades of the bat which acts as a winter fuel store to keep the animal alive while in hibernation.

#### *Roosting behaviour*

Bats naturally roost in caves and trees but some species have recently adapted to using man-made structures for roosting. Being social animals, these roosts can reach substantial numbers in the peak period of bat activity in mid-summer and especially if the roost has been selected as a maternity site. These nursery roosts are mainly composed of breeding females but often they



include some non-breeding females and males that may be the previous season's young still with their mother. Males are more solitary and form smaller roosts apart from the females.

For summer roosts, bats seek warm temperatures but, for hibernation in winter, they require constant temperatures of only 5° or 6°C and humid surroundings to keep from dehydrating. In mild winters, bats will emerge from such sites to hunt should insects be on the wing.

*Breeding and longevity*

In autumn, male bats attract females by song flights and form harems with up to 20 females being defended by a male. After mating, the males take no further part in the rearing of the young.

Irish bats can produce one young per year but, more usually, only one young is born in spring every two years (Boyd and Stebbings 1989). There is no fixed pregnancy period and gestation is governed by ambient temperature. The slow rate of reproduction by bats inhibits repopulation in areas of rapid decline. Although bats have been known to live for twenty or more years, this is rare as most die in their first and the average lifespan, in the wild, is four years. The survival of the young is closely linked to climate and poor weather in spring and summer can result in high infant mortality.

*Threats*

All bat species are in decline as they face many threats to their highly developed and specialised lifestyles. Many bats succumb to poisons used as woodworm treatments within their roosting sites (Racey and Swift 1986). Agricultural intensification, with the loss of hedgerows, treelines, woodlands and species-rich grasslands have impacted bat species also. Habitual roosting or hibernation sites in caves, mines, trees and disused buildings are also often lost to development. Summer roosts are prone to disturbance from vandals. Agricultural pesticides accumulate in their prey, reaching lethal doses (Jefferies 1972). Chemical treatments in cattle production sterilise dung thus ensuring that no insects can breed within it to be fed upon by bats. Likewise, river pollution, from agricultural runoff, reduces the abundance of aquatic insects. Road building, with the resultant loss of foraging and roosting sites is a significant cause in the reduction of bat populations across Europe.

*Extinction*

As recently as 1992, the greater mouse-eared bat *Myotis myotis* became the first mammal to become extinct in Britain since the wolf in the 18th century.

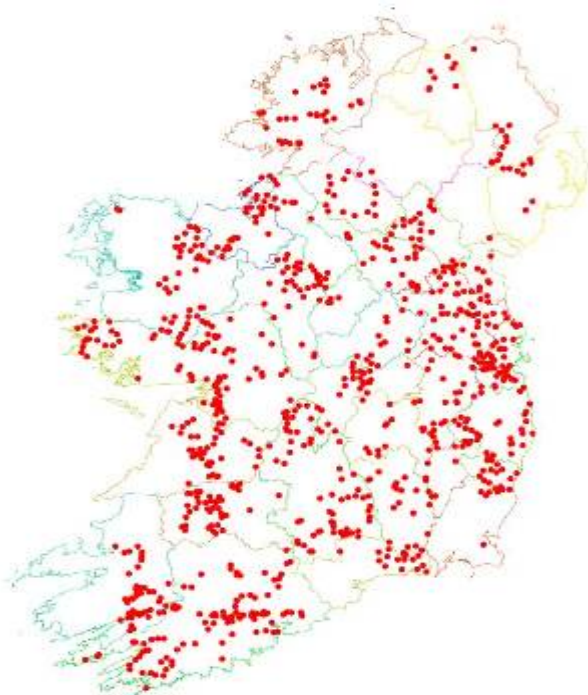
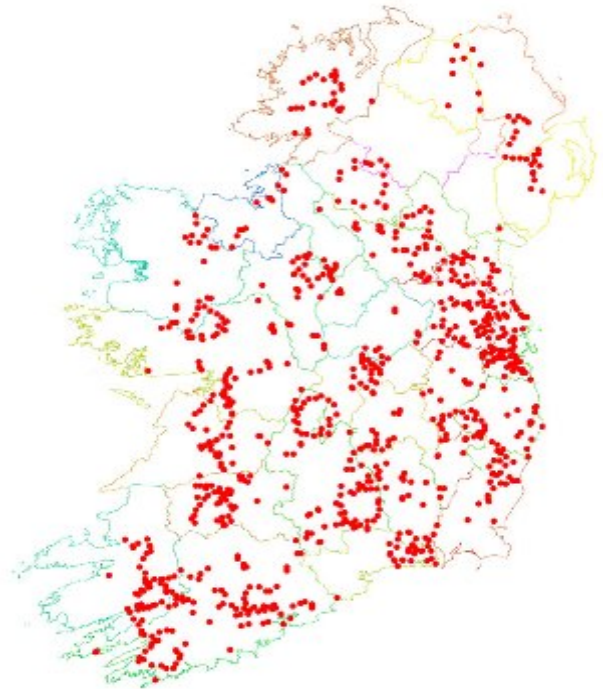


## 8.2 APPENDIX 2: description of bat species known or expected onsite

Brief species accounts and current known distribution (maps from *Bat Conservation Ireland*)

### Common pipistrelle *Pipistrellus pipistrellus*

This species was only recently separated from its sibling, the soprano or brown pipistrelle *Pipistrellus pygmaeus*, which is detailed below (Barratt *et al* 1997). The common pipistrelle's echolocation calls peak at 45 kHz. The species forages along linear landscape features such as hedgerows and treelines as well as within woodland.



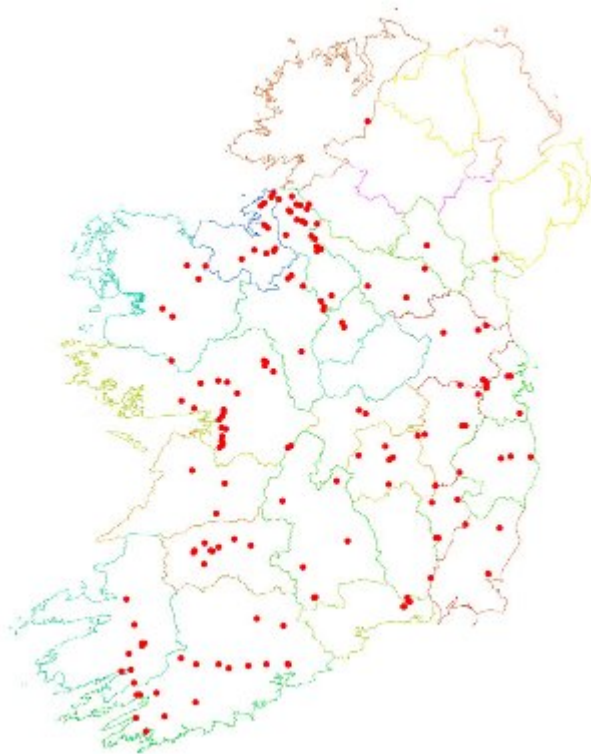
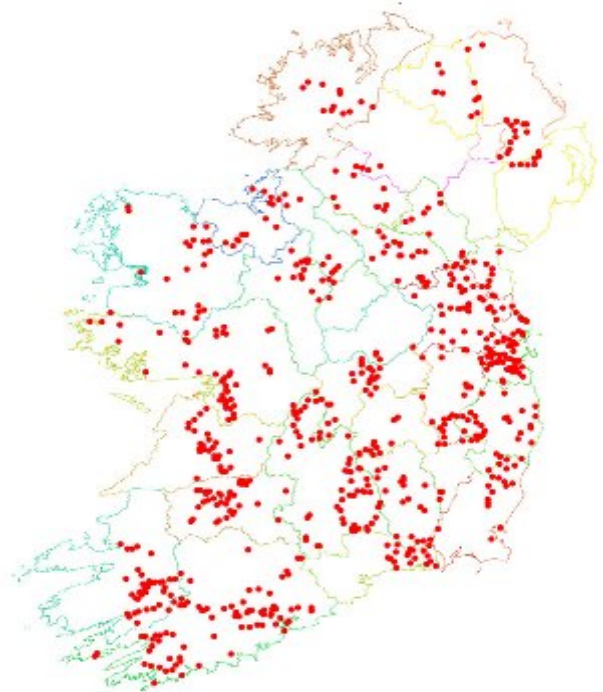
### Soprano pipistrelle *Pipistrellus pygmaeus*

The soprano pipistrelle's echolocation calls peak at 55 kHz, which distinguishes it readily from the common pipistrelle. The pipistrelles are the smallest and most often seen of our bats, flying at head height and taking small prey such as midges and small moths. Summer roost sites are usually in buildings but tree holes and heavy ivy are also used. Roost numbers can exceed 1500 animals in mid-summer.



Leisler's bat  
*Nyctalus leisleri*

This species is Ireland's largest bat, with a wingspan of up to 320mm; it is also the third most common bat, preferring to roost in buildings, although it is sometimes found in trees and bat boxes. It is the earliest bat to emerge in the evening, flying fast and high with occasional steep dives to ground level, feeding on moths, caddis-flies, and beetles. The echolocation calls are sometimes audible to the human ear being around 15 kHz at their lowest. The audible chatter from their roost on hot summer days is sometimes an aid to location. This species is uncommon in Europe and Ireland holds the largest national population. The species is considered as *Internationally Important*.



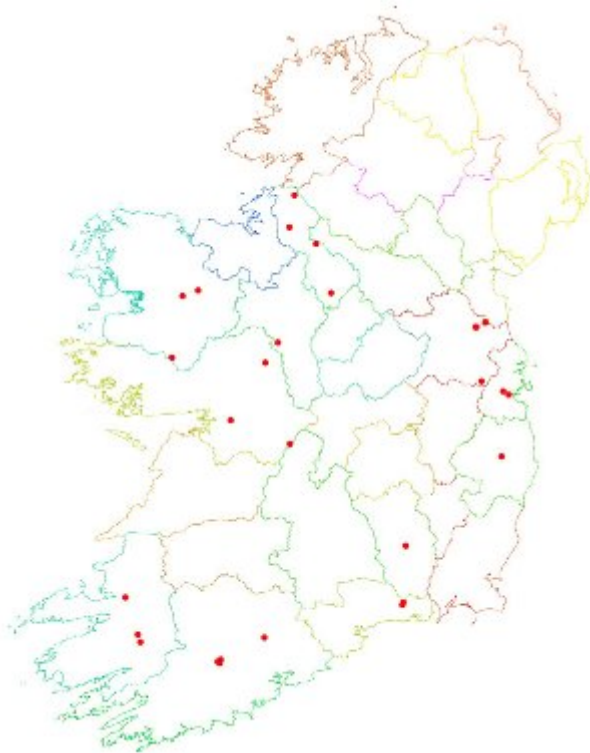
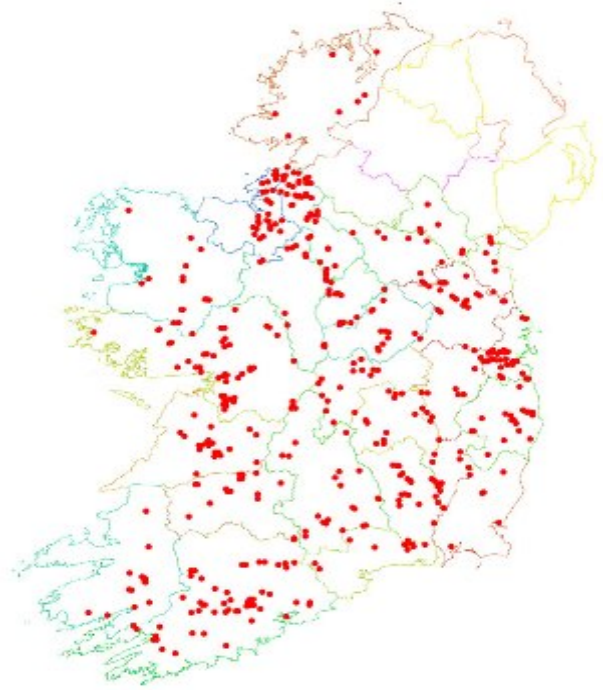
Natterer's bat  
*Myotis nattereri*

This species has a slow to medium flight, usually over trees but sometimes over water. They follow hedges and treelines to their feeding sites, consuming flies, moths and caddis-flies. Natterer's bats are frequently recorded in hibernation sites in winter but there are few records of summer roosts. Those that are known are usually in old stone buildings but they have been found in trees and bat boxes. The status of the Natterer's bat has not been determined but it is classed as *Threatened* and is listed in the *Irish Red Data Book* (Whilde 1993).



Daubenton's bat  
*Myotis daubentonii*

This bat species feeds close to the surface of water, either over rivers, canals, ponds, lakes or reservoirs, but can also be found foraging in woodlands. Flying at 15 kilometres per hour, it gaffs insects with its over-sized feet as they emerge from the surface of the water - feeding on caddis flies, moths, mosquitoes, midges etc. It is often found roosting beneath bridges or in tunnels and also makes use of hollows in trees.



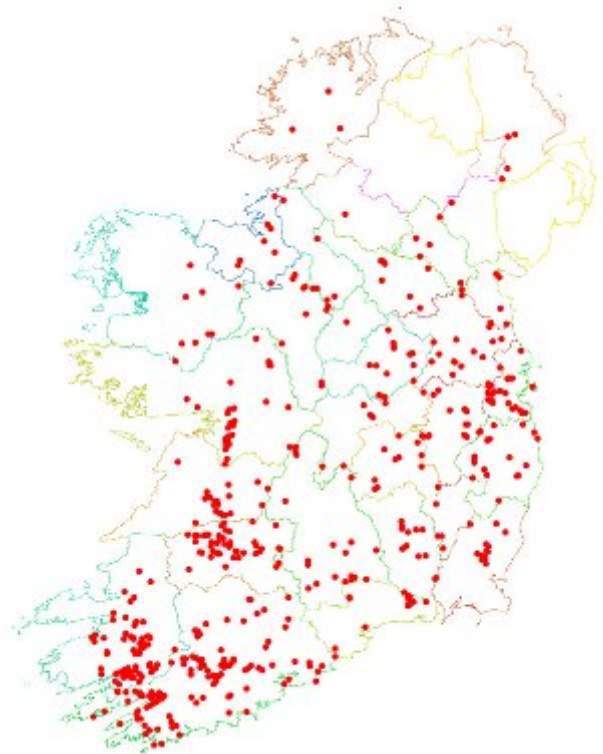
Whiskered bat  
*Myotis mystacinus*

This species, although widely distributed, has been rarely recorded in Ireland. It is often found in woodland, frequently near water. Flying high, near the canopy, it maintains a steady beat and sometimes glides as it hunts. It also gleans spiders from the foliage of trees. Whiskered bats prefer to roost in buildings, under slates, lead flashing or exposed beneath the ridge beam within attics. However, they also use cracks and holes in trees and sometimes bat boxes. The status of the species has not been determined but it is classed as *Threatened* and is listed in the *Irish Red Data Book* (Whilde 1993).



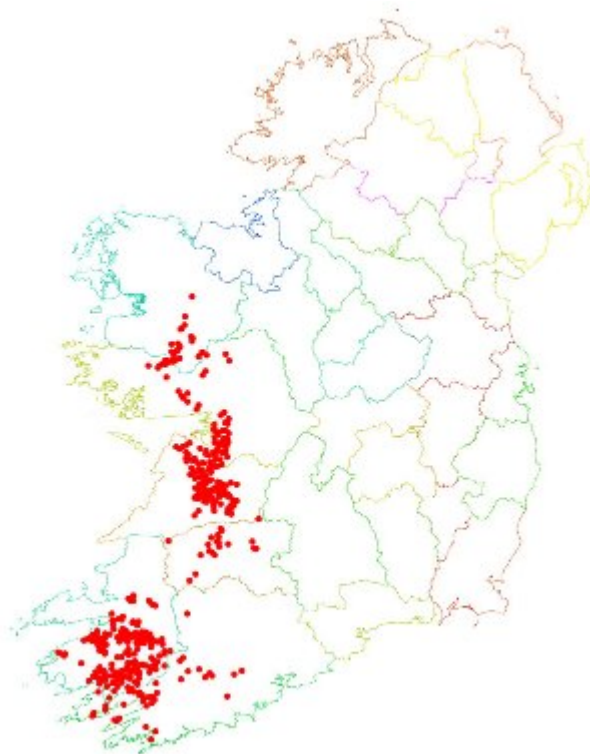
Brown long-eared bat  
*Plecotus auritus*

This species of bat is a 'gleaner', hunting amongst the foliage of trees and shrubs, and hovering briefly to pick a moth or spider off a leaf, which it then takes to a sheltered perch to consume. They often land on the ground to capture their prey. Using its nose to emit its echolocation, the long-eared bat 'whispers' its calls so that the insects, upon which it preys, cannot hear its approach (and hence, it needs oversized ears to hear the returning echoes). As this is a whispering species, it is extremely difficult to monitor in the field as it is seldom heard on a bat detector. Furthermore, keeping within the foliage, as it does, it is easily overlooked.



Lesser horseshoe bat  
*Rhinolophus hipposideros*

This species is the only representative of the Rhinolophidae family in Ireland. It differs from our other species in both habits and looks, having a unique nose leaf with which it projects its echolocation calls. It is also quite small and, at rest, wraps its wings around its body. Lesser horseshoe bats feed close to the ground, gleaning their prey from branches and stones. They often carry their prey to a perch to consume, leaving the remains beneath as an indication of their presence. The echolocation call of this species is of constant frequency and, on a bat detector, sounds like a melodious warble. Its distribution is restricted to the western Atlantic seaboard counties of Mayo, Galway, Clare, Limerick, Kerry and Cork (Kelleher 2004). However, single specimens have recently been discovered in Lough Key, near Boyle, Co. Roscommon in 2004 (B. Keeley, pers. comm.) and in Tubbercurry, Co.

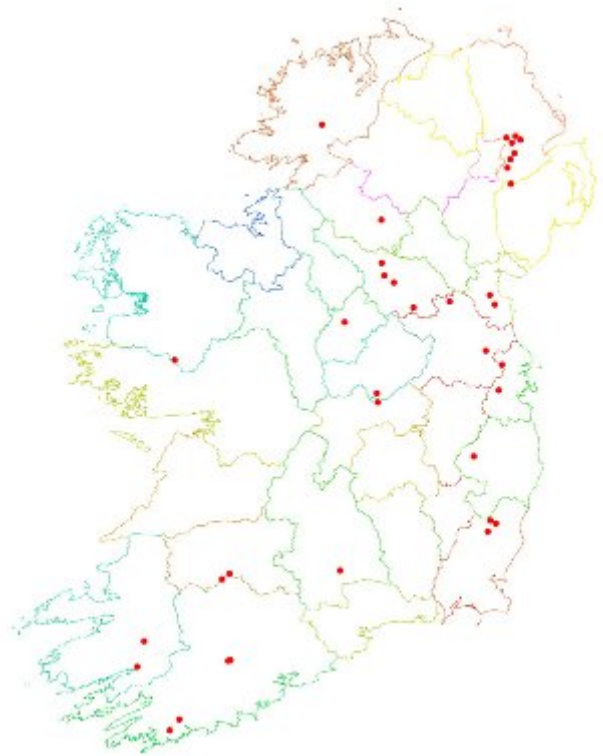


Sligo in 2008 (C. Kelleher, pers. obs.), two counties where their low numbers may have caused their presence to be overlooked in the past. This species is considered as *Internationally Important* and it is an Annex II species under the *EC Habitats Directive 1992*.



Nathusius' pipistrelle  
*Pipistrellus nathusii*

Nathusius' pipistrelle is a recent addition to the Irish fauna and, so far, has only been recorded from the north of the island in Cos. Antrim, Down and Longford (Richardson 2000) but is assumed to be spreading as the known resident population is enhanced in the autumn months by an influx of animals from Scandinavian countries. There is a likelihood, therefore, that this species may occur in the area as a vagrant especially in the autumn months. However, it was not observed during the present survey. The status of the species has not been determined.



Brandt's bat  
*Myotis brandtii*


This sibling species to the whiskered bat is known from four specimens found to date in Cos. Wicklow (Mullen 2007), Cavan, Clare (B. Keeley, pers. comm.) and Tipperary (Kelleher 2006b). A fifth specimen was identified in Killarney National Park, Co. Kerry in August 2005 (Kelleher 2005 & 2006a). No map - its status is unknown.







8.3 APPENDIX 3: NPWS Circular Letter 2/07

  
AN ROINN COMHSHAOIL, OIÐHREACHTA AGUS RIALTAIS ÁITIÚIL  
DEPARTMENT OF THE ENVIRONMENT, HERITAGE  
AND LOCAL GOVERNMENT

Circular Letter NPWS 2/07

16 May, 2007

**Guidance on Compliance with Regulation 23  
of the Habitats Regulations 1997  
– strict protection of certain species/ applications for derogation licences.**

A chara,

I am directed by the Minister for the Environment, Heritage and Local Government to refer to the EU Habitats Directive, to the Habitats Regulations 1997-2005 which transpose that directive into Irish law,<sup>1</sup> and to Ireland's obligations under that Directive.

The Directive, and the implementing Regulations, require that certain species listed in Annex IV of the Habitats Directive are strictly protected. A list of these species is appended.


These species are not necessarily associated with areas subject to a specific nature designation: in the case of bat species and otters they may be found anywhere throughout the country.

Under Regulation 23 of the Habitats Regulations 1997, any person who, in regard to the animal species listed in Annex IV of the Habitats Directive-

*"(a) deliberately captures or kills any specimen of these species in the wild,  
(b) deliberately disturbs these species particularly during the period of breeding, rearing, hibernation and migration,  
(c) deliberately takes or destroys the eggs from the wild, or  
(d) damages or destroys a breeding site or resting place of such an animal,  
shall be guilty of an offence."*

<sup>1</sup> Council Directive 92/43/EEC of 21 May 1992, on the conservation of natural habitats and of wild flora and fauna, the European Communities (Natural Habitats) Regulations, 1997 (S.I. No. 94 of 1997), the European Communities (Natural Habitats) (Amendment) Regulations, 1998, (S.I. No. 233 of 1998), and the European Communities (Natural Habitats) (Amendment) Regulations, 2005, (S.I. No. 378 of 2005),

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Regulation 21 provides corresponding protection for Annex IV plant species.

The carrying out of any work that has the potential to disturb these species, and for which a derogation licence has not been granted, may constitute an offence under Regulation 21 or 23 of the Habitats Regulations.

It should be noted that in the case of Regulation 23 (d), it is not necessary that the action should be deliberate for an offence to occur. This places an onus of due diligence on anyone proposing to carry out an action or project that might result in such damage or destruction.

A particular concern arises regarding works carried out by or on behalf of local authorities themselves, including works of maintenance or repair.

Examples of cases that are likely to require assessment are the removal of trees and other habitat during the construction of roads or other infrastructure, the modification of the courses of rivers, drainage and discharge of water, and even the re-pointing or replacement of masonry in bridges, walls and other structures where bats are likely to roost, etc.

Procedure to be followed

Local authorities must ensure that they, their staff and their agents comply fully with the requirements of the Directive and the Regulations as follows:

1. In advance of any works, an appropriate initial assessment should be carried out by a person competent to identify where a risk of damage or disturbance to an Annex IV species may exist (e.g. by an appropriately qualified ecologist). The fact that such an assessment has been carried out should be recorded and kept with the papers associated with the project.
2. Projects where a risk is identified should be subject to an appropriate scientific assessment. It will be necessary to identify alternatives or modifications that will avoid that risk.
3. Where it is not possible to identify a means of avoiding the risk completely, the question of seeking a derogation licence from the Minister under Regulation 23 of the Habitats Regulations should be considered if it is desired, notwithstanding, to proceed with the action or project.
4. The Minister is empowered, within strict parameters, to grant a license for derogation from complying with the requirements of the provisions of section 21 of the Wildlife Act 1976 and Regulations 23 and 24 of the Habitats Regulations. The scope of the Minister's powers to grant derogation licences is set out in Regulation 23, as follows:

*Where there is no satisfactory alternative and the derogation is not detrimental to the maintenance of the populations of the species to which the Habitats Directive relates at a favourable conservation status in their natural range, the Minister may, in respect of those species, grant a licence to one or more persons permitting a*



derogation from complying with the requirements of the provisions of section 21 of the Principal Act and Regulations 23 and 24 where it is—

- ( a ) in the interests of protecting wild fauna and flora and conserving natural habitats, or
- ( b ) to prevent serious damage, in particular to crops, livestock, forests, fisheries and water and other types of property, or
- ( c ) in the interests of public health and public safety, or for other imperative reasons of overriding public interest, including those of a social or economic nature and beneficial consequences of primary importance for the environment, or
- ( d ) for the purpose of research and education, of repopulating and re-introducing these species and for the breeding operations necessary for these purposes, including the artificial propagation of plants,
- ( e ) to allow, under strictly supervised conditions, on a selective basis and to a limited extent, the taking or keeping of certain specimens of the species to the extent (if any) specified therein, which are set out in the First Schedule.

6. Any application for a derogation licence (to be submitted to Mr Jamie Mulleady of this Department at: Species and Regulations Unit, National Parks and Wildlife Service, 7 Ely Place, Dublin 2 email: Jamie.mulleady@environ.ie) should address the criteria referred to in the above paragraph as well as proposed scientifically-based mitigation measures to address any potential impact on the identified Annex IV species. A decision on an application will be made on the basis of the information and proposals submitted and best scientific knowledge.

7. An application for such a derogation licence should be made in advance of seeking approval under Part 8 or 10 of the Planning and Development Regulations, 2001, as amended, or seeking planning permission for works. This will ensure that full consideration can be given to the impacts of the proposed project on the species and to avoid the possibility of delay to the proposed project or of a refusal of a derogation licence which would prevent the works being carried out as planned.

8. The obligation to obtain a derogation licence is additional to the requirement to notify the Minister of a proposed development which may have an impact on nature conservation to the Minister under article 82(3)(n) and others of the Planning and Development Regulations, 2001 (as amended). Local authorities should notify the Minister (Development Applications Unit) in any case where it appears that a proposed development may pose a risk to Annex IV species.

9. Should a problem be identified regarding Annex IV species in the course of works, this should be reported immediately to the National Parks and Wildlife Service. No further work that might impact on such species should take place unless a derogation licence has been obtained.



Applications for planning permission

Issues concerning damage or disturbance to Annex IV species also arise in the context of applications for planning permission for proposed development, e.g. proposals to renovate older houses. The responsibility of avoiding disturbance or damage to Annex IV species, or of obtaining an appropriate derogation licence, rests with the developer.

However, planning authorities should note that in any case where it appears that a proposal may pose a risk to Annex IV species, the planning application should be referred to the Minister under article 27(1)(n) of the Planning and Development Regulations 2001 (as amended). This referral should be done in the appropriate manner for applications having impacts on nature conservation sites. Planning authorities could also take the opportunity afforded by any pre-application discussions to alert prospective applicants to the requirements in relation to Annex IV species.

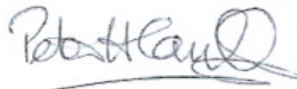
Further information

Species Action Plans, which set out specific measures for the monitoring and protection of these species, have been or are being prepared. They are published on [www.npsw.ie](http://www.npsw.ie) or can be obtained from Species Unit (Tel: 01 888 3212). Guidelines in regard to bats are available at [www.npsw.ie](http://www.npsw.ie).

General questions in relation to the protection of Annex IV species or require any further information on an application for a derogation licence should be referred to Species Unit (01 8883214). Specific queries regarding a proposed project, location or species should be referred to the appropriate National Parks and Wildlife Service Divisional Ecologist or to the Regional Manager (contact details <http://www.npws.ie/media/Media.4976.en.pdf>).

If you have any questions in relation to the referral of a planning application, please contact Development Applications Unit (Tel: 01 8883181)

Is mise le meas,



Peter Carvill,  
Assistant Principal Officer.

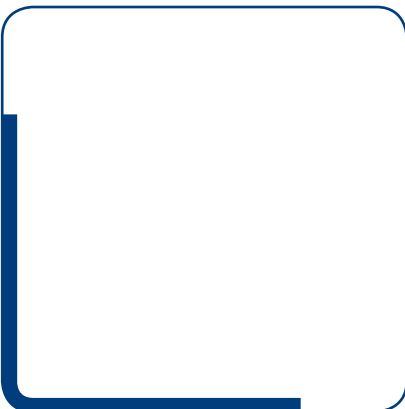
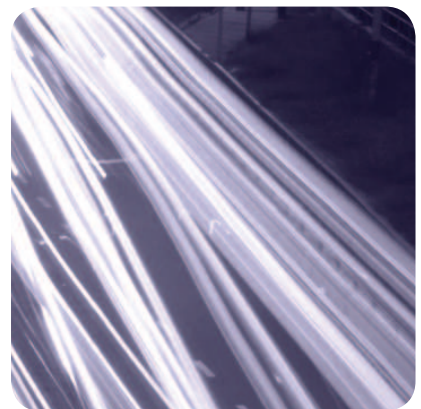
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RPS

# M28 Cork to Ringaskiddy Motorway Scheme

## Bat Assessment - Carr's Hill





# M28 Cork to Ringaskiddy Motorway Scheme

## Bat Assessment - Carr's Hill

### Document Control Sheet

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# 1 INTRODUCTION

Cork County Council (CCC), under the auspices of Transport Infrastructure Ireland (TII, formerly NRA), are developing a project to upgrade approximately 12.5km of the N28 National Primary Route from the N28/N40 South Ring Road Bloomfield Junction to Ringaskiddy on the Ringaskiddy Peninsula in County Cork. An Environmental Impact Statement (EIS) is being prepared for the proposed M28 Cork to Ringaskiddy Motorway Scheme. A bat assessment of the proposed route has been completed by bat specialist Mr. Conor Kelleher (2014). Since the completion of the bat assessment, a proposed amendment to the route has been made, to include an interchange at Carr's Hill.

This report provides an assessment of the potential value of the Carr's Hill area to bats.

The aims and objectives of the survey were to:

- Establish the location of any potential bat roosts;
- Establish the value of the study area to bats for foraging and commuting;
- Assess the results of the survey and determine the potential impact of the proposed development on any bats that might use the site;
- Provide recommendations for working methodologies in light of the survey results; and
- Provide recommendations for mitigation following the survey.

This report presents the results of bat survey work carried out between July and September 2015.

## 2 METHODOLOGY

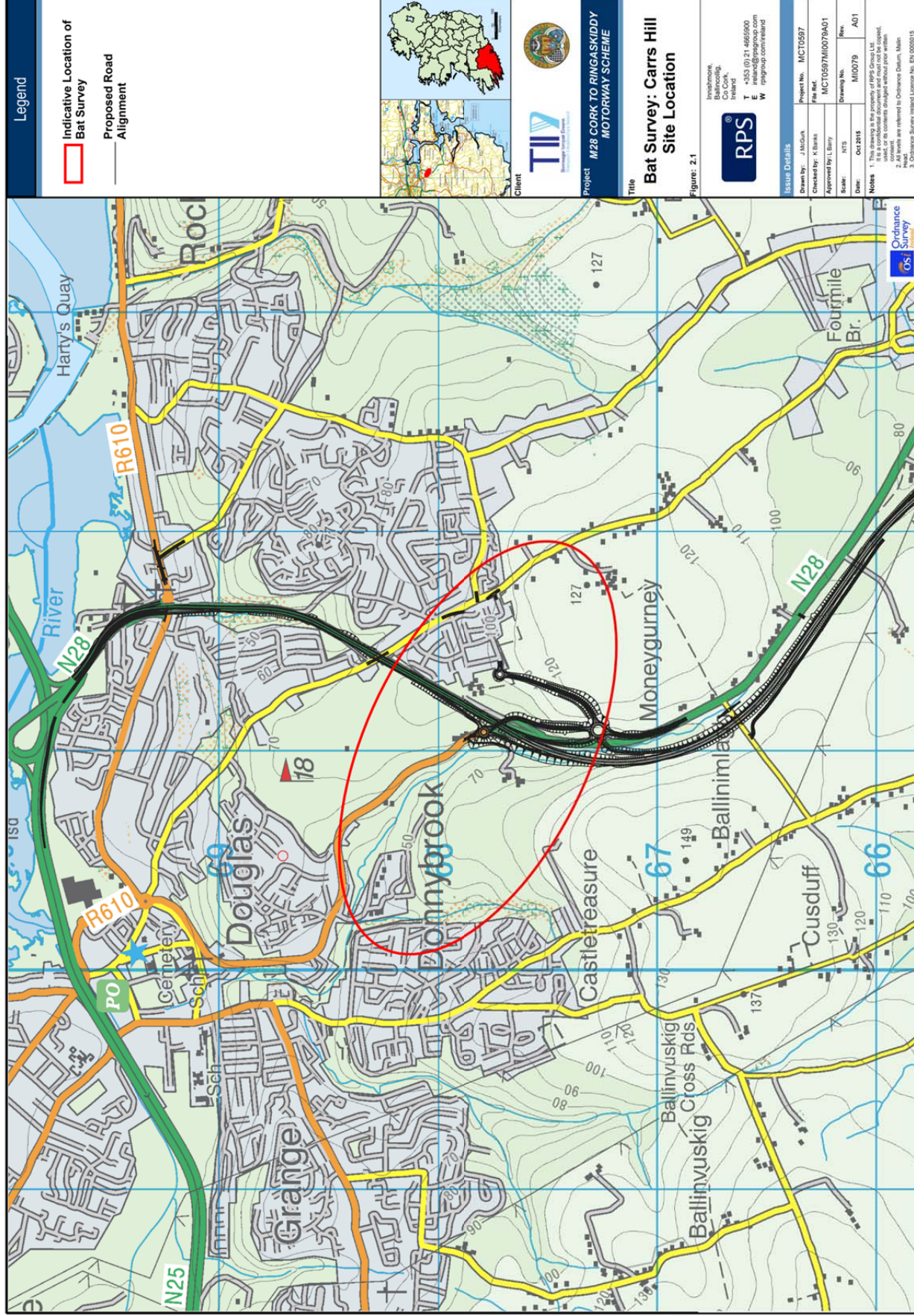
This bat assessment was undertaken by an experienced and licenced bat surveyor (licence no. DER/BAT 2015-04) and examined the Donnybrook Stream and the route crossed by the proposed Carr's Hill interchange. The location of the surveyed areas is illustrated in **Figure 2.1**.

### 2.1 DESKTOP STUDY

A full desktop study, including a review of bat records within a 10km radius of the study area, including the Carr's Hill area, is included in the bat assessment report for the proposed M28 scheme (Kelleher, C. (2014)). The desktop study for this assessment therefore did not repeat the review of bat records, but consisted of the following elements:

- A review of the previous bat survey for the proposed M28 upgrade (Kelleher, C (2014)); and
- An assessment of habitat survey maps to determine any potential roosting sites and suitable foraging and commuting areas for bats within the Carr's Hill and Donnybrook Stream area.

Figure 2-1-1- Location of the Proposed Carr's Hill Interchange



**Legend**

- Indicative Location of Bat Survey
- Proposed Road Alignment

**Client**  
  
 T I I V  
 Transport Infrastructure Ireland

**Project**  
 M28 CORK TO RINGASKIDDY MOTORWAY SCHEME

**Title**  
 Bat Survey: Carrs Hill Site Location

**Figure: 2.1**

**RPS**  
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## 2.2 FIELD SURVEY

Bat surveys were conducted in the summer and autumn seasons 2015 (July to September) in order to determine bat activity in the vicinity of the proposed Carr's Hill interchange. Survey was conducted on the 17<sup>th</sup> July, the 5<sup>th</sup> and 6<sup>th</sup> August and the 22<sup>nd</sup> September 2015.

A Passive Monitoring System of bat detection was deployed for this survey scheme (i.e. a bat detector is left in the field, there is no observer present and bats which pass near enough to the monitoring unit are recorded and their calls are stored for later analysis). The bat detector is effectively used as a bat activity data logger. This results in a far greater sampling effort over a shorter period of time. Passive monitoring was completed using the Songmeter SM2+ bat monitor. Bats are identified by their ultrasonic calls. This detector system records bat ultrasonic calls on a continuous basis and stores the information onto an internal SD card. Each time a bat is detected, an individual time-stamped (date and time to the second) file is recorded.

One SM2+ monitor was deployed for the surveys and was located alongside sections of hedgerow that may be removed as part of the proposals (see [Figure 3.1](#)). The detector was set to record from dusk for a period of 3 hours. Data was then downloaded and bat echolocation calls were later analysed by BatSound spectrogram sound analysis software Version 4.1. Each time-stamped file was analysed and the species of bat recorded was noted as a bat pass. Some files may have recorded more than one species. In this instance, a bat pass is noted for each species (e.g. two species identified in a time-stamped file which corresponded to one soprano pipistrelle bat pass and one common pipistrelle bat pass). However, in the light of two individuals of the same species being recorded in the same time-stamped file, only one bat pass was noted for this time-stamped file.

To support the Passive Monitoring Programme, dusk surveys were also completed by one surveyor on four occasions using a Batbox Duet detector. No dawn surveys were conducted as part of this assessment. Calls were recorded directly on to a Zoom H1 recorder. Post-emergence activity surveys (from approximately 30 minutes before sunset, for a minimum of 2 hours) were conducted. These surveys enable a determination of the approximate numbers and species of bats present within the site, areas used for foraging and commuting routes to and from roosts. The approximate flying height and direction taken by bats were estimated and detailed where possible.

## 2.3 BAT ASSESSMENT

The assessment was carried out in accordance with the following guidelines:

- EPA (2002), *'Guidelines on the information to be contained in Environmental Impact Statements'*, Environmental Protection Agency;
- EPA (2003), *'Advice Notes on current practice in the preparation of Environmental Impact Statements'*, Environmental Protection Agency;
- Hundt L (2012) *'Bat Surveys: Good Practice Guidelines, 2nd edition'*, Bat Conservation Trust;
- IEEM (2006), *'Guidelines for Ecological Impact Assessment in the United Kingdom'*, Institute of Ecology and Environmental Management;
- NRA (2008) *'Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes'*, National Roads Authority; and

- NRA (2009) 'Guidelines for the Assessment of Ecological Impacts of National Road Schemes Rev. 2', National Roads Authority.

## 2.4 SURVEY CONSTRAINTS

There were no survey constraints. Weather conditions for survey were good on each night, with temperatures between 11°C and 17°C, clear skies and light to no wind.

## 3 RECEIVING ENVIRONMENT

### 3.1 GENERAL DESCRIPTION OF AREA

The following are the main habitats found within the proposed route corridor, classified according to *A Guide to Habitats in Ireland* (Fossitt, 2000)<sup>1</sup>:

**Grasslands:** The grassland at Carr's Hill is agriculturally improved (GA1) grassland used for cattle grazing. Grassland alongside the Donnybrook Stream is also improved, but with two fields alongside the stream that do not appear to have been grazed in recent years.

**Hedgerows and Treelines:** The fields throughout the Carr's Hill area are bound by hedgerows (WL1) and treelines (WL2) (which are in effect overgrown treelines) which typically comprise abundant Ash (*Fraxinus excelsior*) with occasional English Elm (*Ulmus procera*), Sycamore (*Acer pseudoplatanus*) and Beech (*Fagus sylvatica*).

**Woodland:** The Donnybrook Stream at Donnybrook supports a linear area of oak-ash-hazel woodland (WN2). The woodland is situated along sloping stream and river valley margins and are characterised by Ash (*Fraxinus excelsior*) in the canopy layer in addition to occasional Pedunculate Oak (*Quercus robur*) and frequent Hazel (*Corylus avellana*) in the shrub layer.

**Scrub:** Mixed scrub fringes the valley margins of the Donnybrook Stream, and is comprised of Willows (*Salix spp.*), Gorse (*Ulex europaeus*), Bramble (*Rubus fruticosus agg.*), Hawthorn (*Crataegus monogyna*) and Blackthorn (*Prunus spinosa*).

**Streams:** The Donnybrook Stream (FW2) runs to the west of the existing N28.

**Built land and roads:** Roads present in the study area include the N28 and the R610. Other structures along or adjacent to the route include dwellings and farm buildings.

### 3.2 DESK STUDY RESULTS

In summary, the review of existing records of bat species in the area of the entire proposed M28 road route (Conor Kelleher (2014)<sup>2</sup>) reveals that seven of the ten known Irish species have been observed within a 10km radius of the study area. These include Common (*Pipistrellus pipistrellus*) and Soprano (*P. pygmaeus*) Pipistrelle, Leisler's bat (*Nyctalus leisleri*), Brown Long-eared bat (*Plecotus auritus*), Daubenton's bat (*Myotis daubentonii*), Natterer's bat (*M. nattereri*) and Whiskered bat (*M. mystacinus*).

<sup>1</sup> Fossitt, J.A, (2000) *A Guide to Habitats in Ireland*, The Heritage Council

<sup>2</sup> Kelleher, C. (2014). Proposed N28 Bloomfield – Ringaskiddy Road Route Realignment, County Cork: Summer Season Bat Fauna Assessment. Aardwolf Wildlife Surveys.

Two Soprano Pipistrelle roosts, two Leisler's bat roosts and one Brown Long-eared bat roost have also been identified in the area but all are several kilometres from the proposed scheme.

### 3.3 FIELD SURVEY RESULTS

#### Potential Roosts

The woodland alongside the Donnybrook Stream contains mature trees with features that are of potential use by bats, such as cracks and crevices in the trunk or limbs, or heavy ivy cover. The location of trees with medium to high potential for roosting or resting places for bats is marked on **Figure 3.1**.

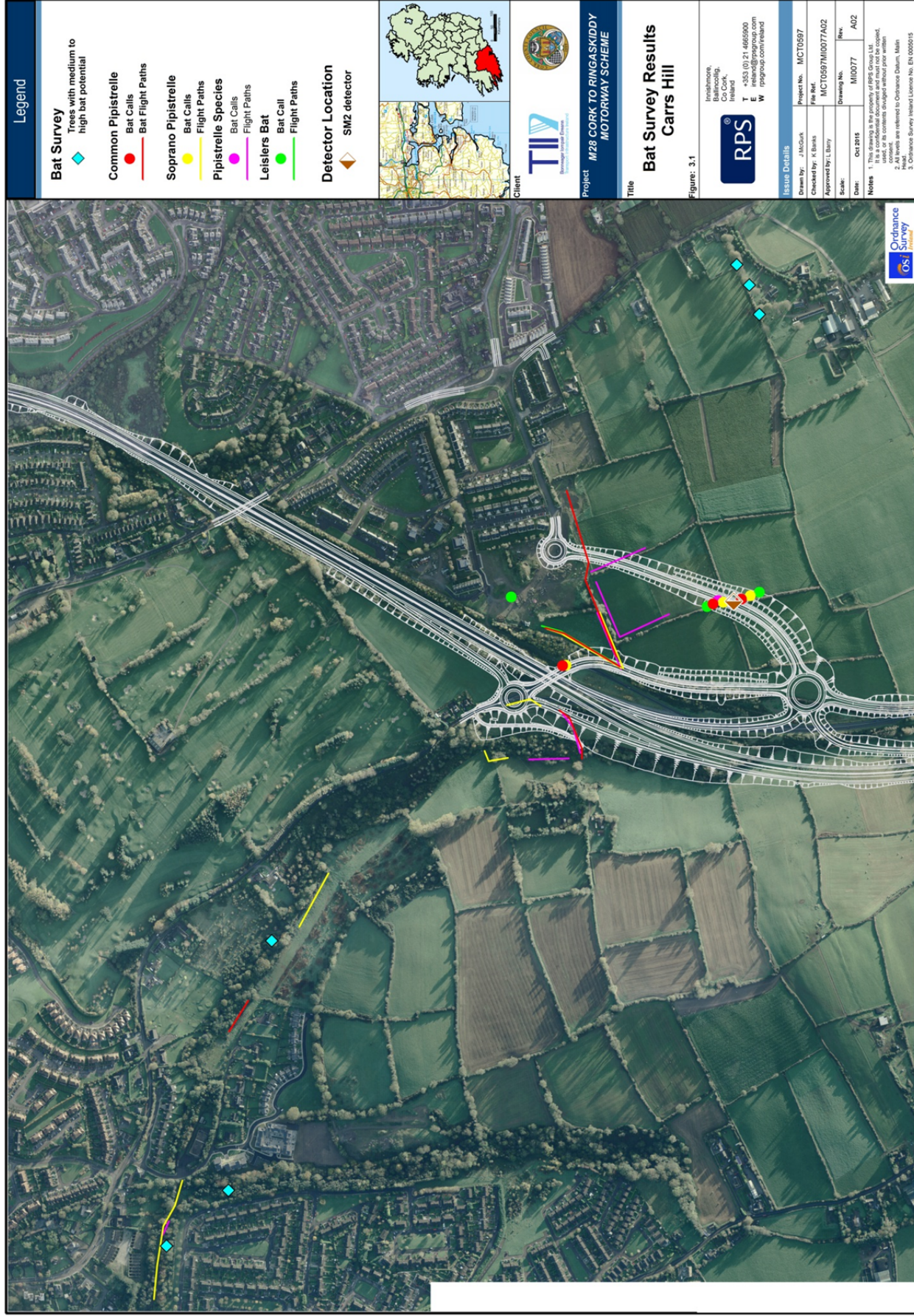
The area to the south of the woodland that would be subject to habitat loss as part of the road layout provides foraging habitat for bats, however the trees in this area provide limited roosting potential.

In the Moneygurney area, to the east of the existing N28, there are some semi-mature and mature trees in the hedgerows, which are of low to medium potential for bats. A line of Ash and Beech with medium potential for bats form the boundary of a farm yard to the east of the interchange, but no evidence of use by bats was found during the activity surveys.

#### Activity Survey

The four detector surveys undertaken within the active season in summer and autumn 2015 recorded the presence of three bat species within the study area. The results of the survey are presented in **Table 3.1** along with the location and type of activity.

Figure 3-1-1 - Bat Survey Results Map



**Table 3-1- Activity Survey Observations and Recordings of Bat Species within the Study Area**

Bat Species	Location	Activity	Habitat
Common Pipistrelle	Moneygurney	Foraging	Hedgerow
	Adjacent to Donnybrook Stream	Foraging	Woodland and scrub, grassland
Soprano Pipistrelle	Moneygurney	Foraging	Hedgerow
	R610 junction	Foraging/ commuting	Scrub
	Adjacent to Donnybrook Stream	Foraging	Woodland and scrub, grassland
Pipistrelle species	Moneygurney	Foraging	Hedgerow
	R610 junction	Foraging/ commuting	Scrub
Leisler's Bat	Moneygurney	Foraging/commuting	Hedgerow/ treeline

Soprano Pipistrelle was the most frequently recorded species, and was observed foraging or commuting along the hedgerows, woodland and scrub throughout the study area. Common Pipistrelle was also recorded foraging throughout the study area, as were a number of Pipistrelle species that were unidentifiable to species level.

Leisler's Bat was recorded foraging or commuting overhead at Moneygurney, but was not recorded during the survey along the Donnybrook Stream.

Brown Long-eared bat was not detected during the surveys, however it is a quiet bat which has weak echolocation and sometimes hunts without sound, and so can be missed by bat detectors. As noted by Conor Kelleher (2014), Brown Long-eared bats have been recorded in the area and are widespread throughout Ireland and so would be expected to be present within the study area.

The location of bat recordings and flight paths are illustrated in **Figure 3.1**.

## 3.4 EVALUATION OF SCIENTIFIC INTEREST OF AREA FOR BATS

### 3.4.1 Principle Areas of Interest for Bats in the Study Area

The principal areas of ecological interest in relation to bats present on or near the proposed road route include:

- **Hedgerows and treelines.** The improved grassland in the study area is of low conservation interest, and is of low interest to bats. However, many of the hedgerows which bound field systems offer connectivity in the landscape and shelter for commuting and foraging bats, and are therefore considered as being of **Local Importance (Higher Value)**.
- **Woodlands and watercourses.** The woodland along the Donnybrook Stream provides important foraging areas and commuting corridors for a number of bat species, particularly as the woodland is associated with a watercourse; and potential roosting opportunities in mature trees, and is therefore considered as being of **Local Importance (Higher Value)**.



### 3.5 LEGISLATION

The following bats have been recorded during this survey: Common Pipistrelle, Soprano Pipistrelle, and Leisler's bat. It is also considered likely that Brown Long-eared bat is present in the study area.

All Irish bats are protected under the Wildlife Act (1976) and Wildlife Amendment Act (2000). Also, the EC Directive on The Conservation of Natural Habitats and of Wild Fauna and Flora (Habitats Directive 1992), seeks to protect rare species, including bats, and their habitats, and requires that appropriate monitoring of populations be undertaken. Across Europe they are further protected under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982), which, in relation to bats, exists to conserve all species and their habitats. The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, enacted 1983) was instigated to protect migrant species across all European boundaries. The Irish government has ratified both these conventions<sup>3</sup>.

All bats are listed in Annex IV of the EU Habitats Directive (92/43/EC) and the Lesser Horseshoe bat is further listed under Annex II of the same Directive.

Local Planning Authorities are required to give consideration to nature conservation interests under the guidance of the SEA Directive 2001/42/EC. This Directive states that the protected status afforded to bats means that planning authorities must consider their presence in order to reduce the impact of developments through mitigation measures.

Destruction, alteration or evacuation of a known bat roost is a notifiable action under current legislation and a derogation licence has to be obtained from the National Parks and Wildlife Service (NPWS) before works can commence.

In addition, it should be noted that any works interfering with bats and especially their roosts, may only be carried out under a licence to derogate from Regulation 23 of the Habitats Regulations 1997, (which transposed the EU Habitats Directive into Irish law) issued by the NPWS. The details with regards to appropriate assessments, the strict parameters within which derogation licences may be issued and the procedures by which and the order in relation to the planning and development regulations such licences should be obtained, are set out in Circular Letter NPWS 2/07 "*Guidance on Compliance with Regulation 23 of the Habitats Regulations 1997 - strict protection of certain species/applications for derogation licences*" issued on behalf of the Minister of the Environment, Heritage and Local Government on the 16<sup>th</sup> of May 2007.

## 4 POTENTIAL IMPACTS

The results of the survey indicate that the study area supports at least three species of bat. Furthermore, existing records of bats in the immediate area and the findings of both the previous and present surveys indicate that a diverse range of bat species use the landscape surrounding the route of the proposed road. Due to their use of wide areas of landscape and their low birth rate, bats are vulnerable to potential impacts from linear developments such as road developments.

---

<sup>3</sup> Aughney, T., Kelleher, C., & Mullen, D. (2008): Bat Survey Guidelines, Traditional Farm Buildings Scheme. Heritage Council, Kilkenny

The principle potential impacts of the proposed Carr's Hill Interchange are as follows:

1. Loss of treelines and hedgerows or other linear features during construction will impact on commuting and foraging bats.

In the absence of mitigation, it is considered near certain that the removal of foraging and commuting habitat would have a direct, significant negative impact on bats at the local level. In the absence of mitigation this impact would be permanent and irreversible.

2. Loss or fragmentation of foraging habitats (such as hedgerows, treelines and woodlands) may reduce the available insect prey species and also reduce feeding area for bats in some locations.

In the absence of mitigation, it is considered near certain that the reduction of foraging habitat would have an indirect, significant negative impact on bats at the local level. In the absence of mitigation this impact would be permanent and irreversible.

3. Loss of mature trees may reduce potential roosting sites for individual bats.

Mature broadleaved trees in the vicinity of the proposed route may be used occasionally as roosting or resting places by bats. However, there are limited opportunities for roosting bats in the trees present in the study area; therefore, it is considered unlikely that there will be significant direct negative impacts to bats as a result of tree removal.

4. Disturbance of bats due to lighting during the construction phase.

In the absence of mitigation, it is probable that this would have an indirect, significant negative impact at the local level. The impact would be temporary, and would persist for the duration of construction.

The main impacts on bats arise through the severance and loss of hedgerows and treelines and the loss of a small area of woodland along the proposed route, all of which are widely used by bats.

## 5 MITIGATION

The most ideal way to mitigate impacts is through avoidance. The following measures would avoid or lessen the impacts of the scheme.

### 5.1 MITIGATION BY AVOIDANCE

1. Avoid removal of hedgerows and treelines wherever possible.
2. Habitats identified as being important foraging areas should be protected from damage.
3. Mature trees adjacent to the proposed road corridor should remain in place wherever feasible.

## 5.2 MITIGATION BY REDUCTION

### 5.2.1 Removal of linear habitats

Removal of hedgerows, treelines or strips of woodland shall be restricted to the minimum area required to construct the proposed road. Where there is no alternative to removal, planting schemes shall be provided to close gaps in the linear feature caused by the development. Small trees and shrubs from removed sections of hedgerows and lines of trees can be replanted, or otherwise trees and shrubs of native stock used. The exact locations of such planting should be designed at detailed landscaping stage; however suggestions for suitable mitigation design are included in **Figure 5.1**. The suggested mitigation comprises the following:

- Planting alongside the road alignment in order to steer the bats away from the road corridor; and
- Planting a “fly-over” to guide bats over the top of the road corridor. This can be achieved through carefully positioned planting schemes on both sides of the dissection to encourage bats to fly high over the road corridor to avoid traffic collisions. An example of “fly-over” planting is included in **Appendix A**.

All planting shall be completed during the pre-construction phase to provide hedgerow/tree growth prior to completion of the road construction. This would ensure that bats commuting in the area have prior knowledge of newly planted landscape features as well as ensuring the newly planted hedgerows/treelines are well established and tall enough prior to completion of road construction.

### 5.2.2 Protection of habitats

Any semi natural habitats adjacent to the proposed route, link roads and access routes shall be fenced off to prevent unnecessary damage or degradation.

In general, best practice design shall aim to retain the quality of the landscape where possible and ensure its protection within the landscaping programme. Existing semi-natural scrub, semi-natural woodland or semi-natural grasslands shall be retained where possible and incorporated into the landscaping programme.

### 5.2.3 Trees

Where possible, treelines, woodland and mature trees that are located immediately adjacent to the line of the proposed route or are not directly impacted shall be avoided and retained intact. Overall impacts on these sites shall be reduced through modified design and sensitivity during construction. Any existing mature trees adjacent to the corridor or construction sites to be retained shall be protected from root damage by machinery by an exclusion zone of at least 7 metres or equivalent to canopy height. Such protected trees shall be fenced off by adequate temporary fencing prior to other works commencing.

Should removal of mature trees be unavoidable, these trees shall ideally be felled in the period late August to late October, or early November, in order to avoid the disturbance of any roosting bats as

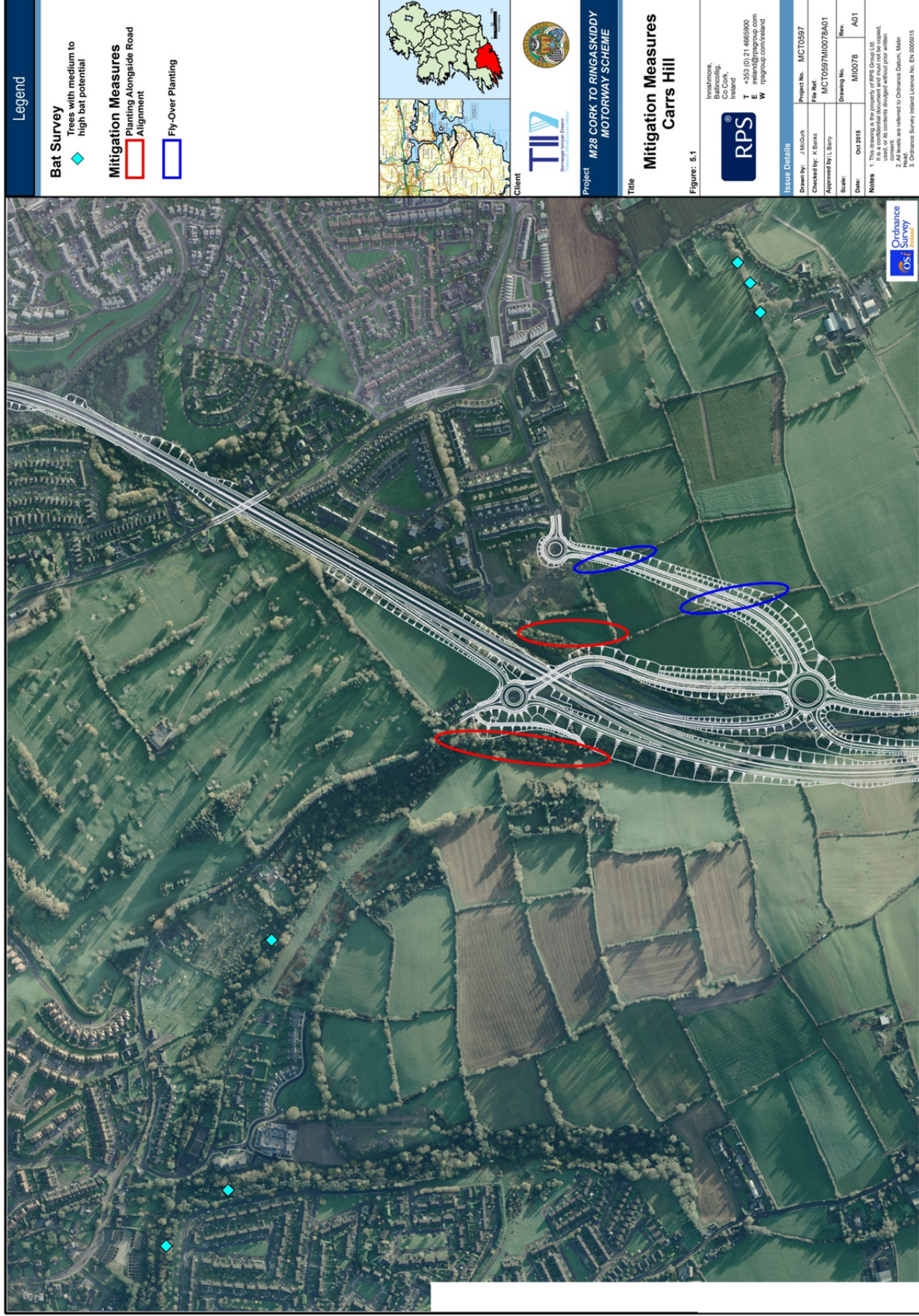
per NRA guidelines<sup>4</sup>. Tree felling shall be completed by Mid-November at the latest because bats roosting in trees are very vulnerable to disturbance during their hibernation period (November – April). Ivy- covered trees, once felled, shall be left intact on-site for 24 hours prior to disposal to allow any bats beneath the foliage to escape overnight.

Landowners shall be advised that the timber from felled trees will remain for their use. This should prevent trees being felled prematurely.

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<sup>4</sup> National Roads Authority (2005): Guidelines for the Treatments of Bats Prior to the Construction of National Road Schemes. National Roads Authority, Dublin.

Figure 5-1- Mitigation Measures Map



### 5.2.4 Lighting

In general, artificial light creates a barrier to commuting bats so lighting shall be minimised along the proposed route especially at areas of interest for bat species. Where lighting is required, directional lighting (i.e. lighting which only shines on the proposed upgrade scheme and not nearby countryside) shall be used to prevent overspill. This shall be achieved by the design of the luminaire and by using accessories such as hoods, cowls, louvres and shields to direct the light to the intended area only.

## 5.3 RESIDUAL IMPACT

If best practice is followed during the construction and operation of the proposed interchange at Carr's Hill, with the recommendations given in this report followed, including the suggested mitigation measures, the residual impact of the development in terms of impacts on bats may be considered as negligible.

## 6 CONCLUSION

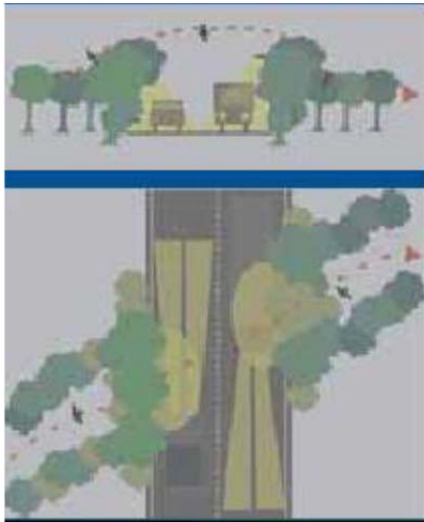
The results of the bat survey for the proposed Carr's Hill Interchange indicate that the study area supports at least three species of bat, all of which use the hedgerows, scrub and woodland present in the area for foraging and commuting. The main potential impacts on bats as a result of the proposed interchange arise through the severance and loss of hedgerows and treelines and the loss of a small area of woodland along the proposed route. However, provided that best practice is followed during the construction and operation of the proposed interchange at Carr's Hill, and the recommendations given in this report, including the suggested mitigation measures, are followed then the residual impact of the development in terms of impacts on bats is considered to be negligible.

## **APPENDIX A**

### **EXAMPLE PLANTING FOR A BAT FLY-OVER**

The following diagrams and text are from Halcrow Group (2006): *Highways Agency Best practice in enhancement of highway design for bats, Literature review*. Halcrow Group Ltd, Exeter.

This cross section and plan view illustrates how bats can be encouraged to fly above the danger zone by planting schemes. The plan view illustrates how trees planted along the road on both sides can provide lift and also prevent light shining directly on the bats' commuting route, thereby minimising disturbance:



(copyright Herman Limpens)

Crossing points should be well connected with the existing landscape, i.e. linked with continuous linear elements, such as hedgerows, that are traditionally used by bats for commuting. On either side of the intersection there should be minimal vegetation and lighting so that the intersection point is the darkest area in the landscape:



(copyright Peter Twisk)



# M28 Cork to Ringaskiddy Project

## Potential Bat Roost Survey and Assessment, Winter 2017

Draft Report, prepared for RPS, Cork

By Karen Banks MCIEEM

21<sup>st</sup> February, 2017



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## 1. Introduction

The N28 is a national primary road that links Cork South Ring Road to Ringaskiddy. The N28 runs southward from the N40 Cork South Ring Road, passing between the suburban areas of Douglas and Rochestown. At Shannonpark, immediately north of the market town and commuter settlement of Carrigaline, the road turns eastward, forming the major access to the Ringaskiddy peninsula.

There are a number of major industries located in the Ringaskiddy area, together with a deep-water port for Cork and the headquarters of the Irish Naval Services.

The N28 is approximately 12km long and is a single carriageway except for a dualled section of road at the approach to the Bloomfield Interchange (the junction with the Cork South Ring Road, N40).

The description and background of the proposed road project and a location map illustrating the proposed M28 corridor are provided in Chapter 1 and Chapter 3 of the main volume of the EIS.

### 1.1 Bat Surveys for the Proposed M28 Road Project

An initial autumn bat survey and assessment of the proposed project was completed by bat specialist Mr. Brian Keeley in 2006. This survey was updated by an autumn survey completed by bat specialist Mr. Conor Kelleher (Aardwolf Wildlife Surveys) in 2013, who also completed a summer survey in 2014. This report provides a winter bat survey and assessment of the M28 project area.

The aims and objectives of this survey were to:

- Establish the location of any potential bat roosts;
- Assess the results of the survey and determine the potential impact of the proposed road project on any bats that might use the site;
- Provide recommendations for further survey requirements and working methodologies in light of the survey results; and
- Provide recommendations for mitigation following the survey.

This report presents the results of bat survey work carried out in February 2017.

## 2. Methodology

This bat assessment was undertaken by experienced and licenced bat surveyor Karen Banks in February 2017 and examined the route crossed by the proposed road project.

### 2.1 General

This bat survey and assessment was undertaken in accordance with the following guidelines:-

- Andrews, H. (2013). *Bat Tree Habitat Key*. Available from: [www.arcol.co.uk](http://www.arcol.co.uk);
- Bat Conservation Ireland, (2010). *Guidance notes for Planners, Engineers, Architects, and Developers*;
- Collins, J. (ed.) (2016). *Bat Surveys for Professional ecologists: Good Practice Guidelines* (3<sup>rd</sup> ed.). The Bat Conservation Trust, London;
- Kelleher, C. & Marnell, F. (2006). *Bat Mitigation Guidelines for Ireland*; and
- NRA (2006). *Guidelines for the Treatment of Bats During the Construction of National Road Schemes*.

### 2.2 Desktop Study

A pre-survey data search was undertaken for this assessment in order to collate existing information from the footprint of the proposed M28 Road Project and its surrounding area on bat activity, roosts and landscape features that may be used by bats. The data search comprised the following information sources:

- Previous bat surveys completed for the proposed road project:
  - The Bat Fauna of the Route Corridor of the N28 Bloomfield to Ringaskiddy (Keeley, 2006);
  - Proposed N28 Bloomfield to Ringaskiddy Road Re-alignment, County Cork. Bat Fauna Assessment: Autumn Season (Kelleher, 2013); and
  - Proposed N28 Bloomfield to Ringaskiddy Road Re-alignment, County Cork. Bat Fauna Assessment: Summer Season (Kelleher, 2014).
- Ecological desktop and survey data gathered for the proposed road project to identify suitable foraging, roosting and commuting areas for bats (see Chapter 12: Terrestrial Ecology of the EIS); and
- Review of Ordnance Survey mapping and aerial photography of the proposed road project area and its environs.

A full desktop study, including a review of bat records within a 10km radius of the study area is included in the bat fauna assessment report for the proposed M28 Road Project (summer season)<sup>1</sup>.

### 2.3 Field Survey

#### 2.3.1 Preliminary Roost Assessment of Trees

A preliminary ground level roost assessment of trees along the proposed M28 route was undertaken in February 2017. The route of the proposed road was walked and a detailed inspection of the exterior of trees was undertaken to look for features that bats could use for roosting (Potential Roost Features, or PRFs) from ground level. The aim of the survey was to determine the actual or potential presence of bats and the need for further survey and/or mitigation.

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<sup>1</sup> Kelleher, C. (2014) Proposed N28 Bloomfield to Ringaskiddy Road Re-alignment, County Cork. Bat Fauna Assessment: Summer Season.

A detailed inspection of each tree within the alignment, and to approximately 10m either side of the proposed area of earthworks was undertaken. The inspection was carried out in daylight hours from ground level, and information was compiled about the tree, PRFs and evidence of bats. All trees, or groups of trees, surveyed were numbered and marked on a map and a description of each PRF observed was recorded. PRFs that may be used by bats include:

- Rot holes;
- Hazard beams;
- Other horizontal or vertical cracks or splits (e.g. frost cracks) in stems or branches;
- Lifting bark;
- Knotholes arising from naturally shed branches or branches previously pruned back to the branch collar;
- Man-made holes (e.g. flush cuts) or cavities created by branches tearing out from parent stems;
- Cankers in which cavities have developed;
- Other hollows or cavities;
- Double leaders forming compression forks with included bark and potential cavities;
- Gaps between overlapping stems or branches;
- Partially detached ivy with stem diameters in excess of 50mm; and
- Bat or bird boxes.

Signs of a bat roost (excluding the actual presence of bats), include:

- Bat droppings in, around or below a PRF;
- Odour emanating from a PRF;
- Audible squeaking at dusk or in warm weather; and
- Staining below the PRF.

It should be noted that bats or bat droppings are the only conclusive evidence of a roost and many roosts have no external signs. Therefore, this survey and evaluation was relatively basic as only those PRFs at ground level could be inspected closely to ascertain their true potential to support roosting bats. Trees were categorised according to the highest suitability PRF present. The criteria for categorisation of suitability for bats is described further in Table 2.1, Section 2.3.3.

### 2.3.2 Preliminary Roost Assessment of Structures

The exterior of any buildings that may potentially be impacted by the proposed road project was inspected to identify actual or potential bat access or roosting points and to locate any evidence of bats, such as urine stains or droppings. The search included features such as windowsills, peeling paint or lifted rendering, hanging tiles, eaves, soffit boxes, fascias, lead flashing, under tiles/ slates and any gaps in brick or stonework (non-exhaustive list). Access was not gained to the interior of any buildings for the purposes of this survey.

Bridges along the proposed alignment were inspected to identify actual or potential bat access or roosting points and to locate any evidence of bats. Bats roost within old and new bridges and may potentially make use of features including holes, cracks or crevices leading to voids; in expansion joints, gaps at the corner of buttresses, cracks and crevices between stone and brickwork where mortar is missing, drainage pipes and ducts and in internal voids in box girder bridges.

The quarry face at Raffeen Quarry was also inspected to identify actual or potential bat access or roosting points and to locate any evidence of bats. Bats may potentially gain access to voids in the stonework via openings in the quarry face.

### 2.3.3 Suitability of Habitats for Bats

The value of habitat features for bats was defined in accordance with *Bat Surveys for Professional Ecologists: Good Practice Guidelines* publication<sup>2</sup>, as shown in Table 2.1.

Table 2.1: Potential Suitability of Habitats for Bats

Suitability	Description	
	Roosting Habitats	Commuting and Foraging Habitats
Negligible	Negligible habitat features on site likely to be used by roosting bats.	Negligible habitat features on site likely to be used by commuting or foraging bats.
Low	<p>A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation).</p> <p>A tree of sufficient size and age to contain PRFs but with none seen from the ground or features seen with only very limited roosting potential.</p>	<p>Habitat that could be used by small numbers of commuting bats such as gappy hedgerow or un-vegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitat.</p> <p>Suitable, but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.</p>
Moderate	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only- the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).	<p>Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens.</p> <p>Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.</p>
High	A structure or tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.	<p>Continuous, high quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge.</p> <p>High quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree-lined watercourses and grazed parkland.</p> <p>Site is close to and connected to known roosts.</p>

<sup>2</sup> Collins, J. (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3<sup>rd</sup> edn). The Bat Conservation Trust, London.

## 3. Existing Environment

### 3.1 Existing Bat Data

In summary, the review of existing records of bat species in the area of the entire proposed M28 Road Project<sup>3</sup> reveals that seven of the ten known Irish species have been observed within a 10km radius of the study area. These include common (*Pipistrellus pipistrellus*) and soprano (*P. pygmaeus*) pipistrelle, Leisler's bat (*Nyctalus leisleri*), brown long-eared bat (*Plecotus auritus*), Daubenton's bat (*Myotis daubentonii*), natterer's bat (*M. nattereri*) and whiskered bat (*M. mystacinus*).

The bat survey and assessment conducted in 2014 was informed by and built upon those bat surveys completed for earlier alignments of the project/scheme in 2006<sup>4</sup> and 2013<sup>5</sup>. Five bat species including common and soprano pipistrelle, Leisler's, Natterer's and Daubenton's were detected during surveys carried out during the nights of 5<sup>th</sup> and 6<sup>th</sup> of August 2014. Although not recorded during these surveys, brown long-eared bat was recorded during the 2013 survey as it commuted along a hedgerow near the ruined Castlewarren in Barnahely on the 18<sup>th</sup> of October. This is a very quiet species which produces very weak echolocation pulses and sometimes hunts without emitting sounds and can therefore be present without being detected.

As in the autumn 2013 survey, the summer 2014 survey identified ubiquitous common and soprano pipistrelle along hedgerows, treelines and woodland edge throughout the study area on each night with the exception of Barnahely wetland where only soprano pipistrelle was recorded. Leisler's bat, which forages over agricultural landscapes, scrub and woodland as well as urban areas, was detected commuting high overhead at Bloomfield Wood, Shannon Park, Shanbally and Ringaskiddy. Natterer's bat, a woodland species, was detected hunting along the edge of Bloomfield Wood on the night of August 6<sup>th</sup> 2014 while Daubenton's bat which hunts close to the surface of still watercourses and other bodies of water, was detected foraging over the River Lee/Ringaskiddy Port area on the night of August 5<sup>th</sup> 2014.

Survey conducted by Brian Keeley in 2006 recorded Leisler's bats calling from trees close to Raffeen Quarry. Leisler's bat activity in this area was also noted over the trees to the west of the road alignment. Despite a thorough examination of Raffeen Quarry, only one bat pass was noted here in 2006 (too brief for identification) and no bat emergence occurred from the quarry.

Keeley (2006) also found that there were a very small number of brown long-eared bat droppings and butterfly and moth remains in the castle ruins at Barnahely. This was also determined during a bat detector assessment to be a mating roost for a common pipistrelle. The surrounding habitat includes a large improved grassland field followed by scrub.

Surveys by this author of the Martello Tower undertaken in July 2016 recorded six Leisler's bat and two common pipistrelle emerging from the north side of the Tower. The Leisler's bats flew in a south-westerly direction, while the common pipistrelle foraged along the hedgerows and treelines south of the Martello Tower.

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<sup>3</sup> *Ibid* 1

<sup>4</sup> Keeley, B. (2006) The Bat Fauna of the Route Corridor of the N28 Bloomfield to Ringaskiddy

<sup>5</sup> Kelleher, C. (2013) Proposed N28 Bloomfield to Ringaskiddy Road Re-alignment, County Cork. Bat Fauna Assessment: Autumn Season



## 3.2 Field Survey Results

### 3.2.1 Preliminary Roost Assessment of Trees

No trees within the study area were confirmed as roost sites. A total of thirty six trees or clusters of trees were categorised as being of moderate suitability for roosting bats (as defined in Table 2.1) as they contained one or more potential roost features, but none were obviously suitable for use by larger numbers of bats on a regular basis. Examples of PRFs of moderate suitability recorded along the proposed M28 alignment are provided in Figure 3.1. The location of the trees with moderate suitability for roosting bats is illustrated in Figure 3.3 to Figure 3.7.

### 3.2.2 Preliminary Roost Assessment of Structures

One building at Maryborough is due to be demolished as part of the construction works. The structure is a two storey domestic dwelling. There are potential access points for bats to the building via the soffit boxes and the roof tiles. A single story domestic dwelling at Shanbally may potentially require demolition as part of the works. The building was not accessed at close quarters, but there appears to be potential access points for bats to the building via the roof tiles. Both of these dwellings are classified as being of moderate suitability.

There are a number of derelict buildings adjacent to the proposed route in the Barnahely area. These buildings support no, or very low potential for roosting bats. There are also a number of stone walls in the Barnahely area that provide a linear habitat that may be used by commuting and foraging bats. The stone walls also provide crevices that may be used in the spring, summer and autumn months by individual bats, but are not suitable for use as maternity roosts or hibernation roosts. These walls are categorised as being of low suitability.

Works are proposed at one bridge along the proposed route; namely the Maryborough bridge. This bridge is a concrete overbridge that crosses the existing N28. No PRFs were observed within this bridge and it is therefore classified as being of negligible potential for bats.

Raffeen Quarry face contains several cracks and crevices that are of potential use by bats, and is classified as being of moderate suitability.

Structures included in the survey are illustrated in Figure 3.2.

Figure 3.1: Examples of PRFs in Trees Recorded in the Proposed M28 Road Project Corridor







	
<p>Hazard beam in Oak (PBR 5) at Maryborough/ Mount Oval area.</p>	<p>Knot-holes in beech (PBR6) at Maryborough/ Mount Oval area.</p>
	
<p>Willow (PBR 19) with cracks and knotholes adjacent to the Donnybrook Stream at Carr's Hill.</p>	<p>Elm (PBR 36) with several cracks in the limbs and stem at Barnahely.</p>

Figure 3.2: Structures Surveyed for PRFs in the Proposed M28 Road Project Corridor

	
<p>N28 overbridge at Maryborough (PBR 10) with negligible bat potential.</p>	<p>Two storey dwelling at Maryborough (PBR 14) with moderate suitability for bats.</p>
	
<p>Single storey dwelling at Shanbally (PBR 31) with moderate suitability for bats.</p>	<p>Raffeen Quarry (PBR 32) with moderate suitability for bats in the quarry face and good foraging habitat (open water and scrub).</p>
	
<p>Raffeen Quarry face (PBR 32).</p>	<p>Large mature beech and stonewall at Barnahely (PBR 33).</p>

The location of trees and structures recorded during the survey undertaken in February 2017 is illustrated in Figure 3.3 to Figure 3.7 and detailed in Table 3.1.

Table 3.1: Potential Roost Features Recorded

PBR Number	PBR Feature	BCT Suitability Category	PRFs
1	Tree	Moderate	Oak with knot holes and flush cuts
2	Trees	Moderate	3-4 mature oak and beech scattered in wood with knotholes, thick ivy and broken limbs
3	Trees	Moderate	Ash and beech with thick ivy cover
4	Trees	Moderate	Ash and beech with damaged limbs
5	Trees	Moderate	c.7 mature oak with knotholes, hazard beam and broken limbs
6	Trees	Moderate	2 mature beech with knotholes, broken limbs & double leader
7	Trees	Moderate	Beech with knotholes and limb damage
8	Tree	Moderate	Scot's Pine with broken limbs and flush cut
9	Trees	Moderate	4 Scot's Pine with broken limbs and lifting bark
10	Bridge	Negligible	Concrete overbridge with no potential
11	Trees	Moderate	Not accessed well but there are c.4 mature beech
12	Trees	Moderate	Sycamore and ash with knot holes and limb damage
13	Trees	Moderate	1 oak & 1 ash with thick ivy growth
14	Building	Moderate	Potential access for bats via roof tiles and soffits
15	Trees	Moderate	Group of willow and alder with splits in stems
16	Tree	Moderate	Alder with damaged limbs
17	Tree	Low- moderate	Large mature beech
18	Tree	Moderate	Sycamore with lifting bark and frost crack
19	Tree	Moderate	Several willows along stream with cracks and knotholes
20	Tree	Moderate	Mature willow and hawthorn with thick ivy growth
21	Tree	Moderate	Beech with knotholes and damaged limbs
22	Trees	Moderate	2 willow and 1 ash with ivy cover, some limb damage
23	Trees	Moderate	4 ash in hedge with ivy cover, knotholes, limb damage
24	Tree	Moderate	Group of 3 mature ash with knotholes, frost cracks and ivy growth
25	Tree	Moderate	Tree with lifting bark (tree species not identified)
26	Tree	Moderate	Ash with ivy cover and limb damage
27	Tree	Moderate	3 ash in hedge with knotholes and limb damage
28	Trees	Moderate	C. 6 ash in hedge with damaged limbs
29	Trees	Moderate	6 ash in hedge with thick ivy growth, some limb damage
30	Trees	Moderate	C. 2-3 ash along railway line with knotholes
31	Quarry face	Moderate	Cracks and crevices in quarry face
32	Building	Moderate	Not accessed closely but appears to be potential access via roof

<b>PBR Number</b>	<b>PBR Feature</b>	<b>BCT Suitability Category</b>	<b>PRFs</b>
			tiles
33	Stonewall	Low	Cracks and crevices with potential for individual bats
34	Stonewall	Low	Cracks and crevices with potential for individual bats
35	Trees	Moderate	3 elm trees with knotholes and limb damage
36	Tree	Moderate	Elm with knotholes, limb damage
37	Tree	Moderate	Large mature beech with knotholes and damaged limbs
38	Tree	Moderate	Cracks in trunks and limbs (tree species not identified)
39	Trees	Moderate	C.8 Ash in hedge ivy covered, knotholes, damaged limbs
40	Trees	Moderate	Mature ash with knotholes and damaged limbs
41	Trees	Moderate	Scrub with ash and sycamore, some ivy covered trees and limb damage
42	Tree	Moderate	Ash with thick ivy growth

Figure 3.3: Potential Bat Roosts and Confirmed Roosts in the Proposed M28 Study Area: Douglas to Carr's Hill

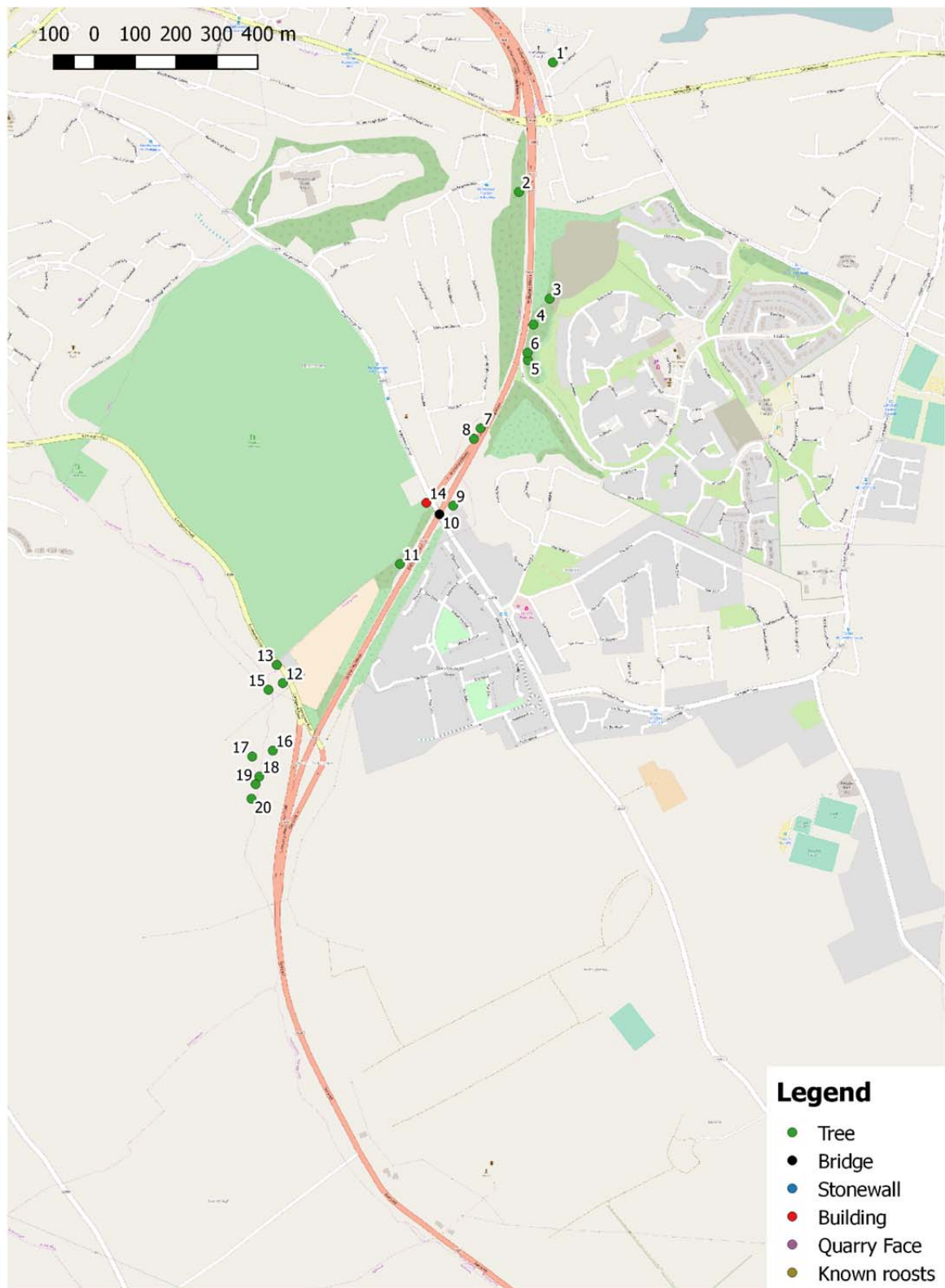


Figure 3.4: Potential Bat Roosts and Confirmed Roosts in the Proposed M28 Study Area: Carr's Hill to Hilltown

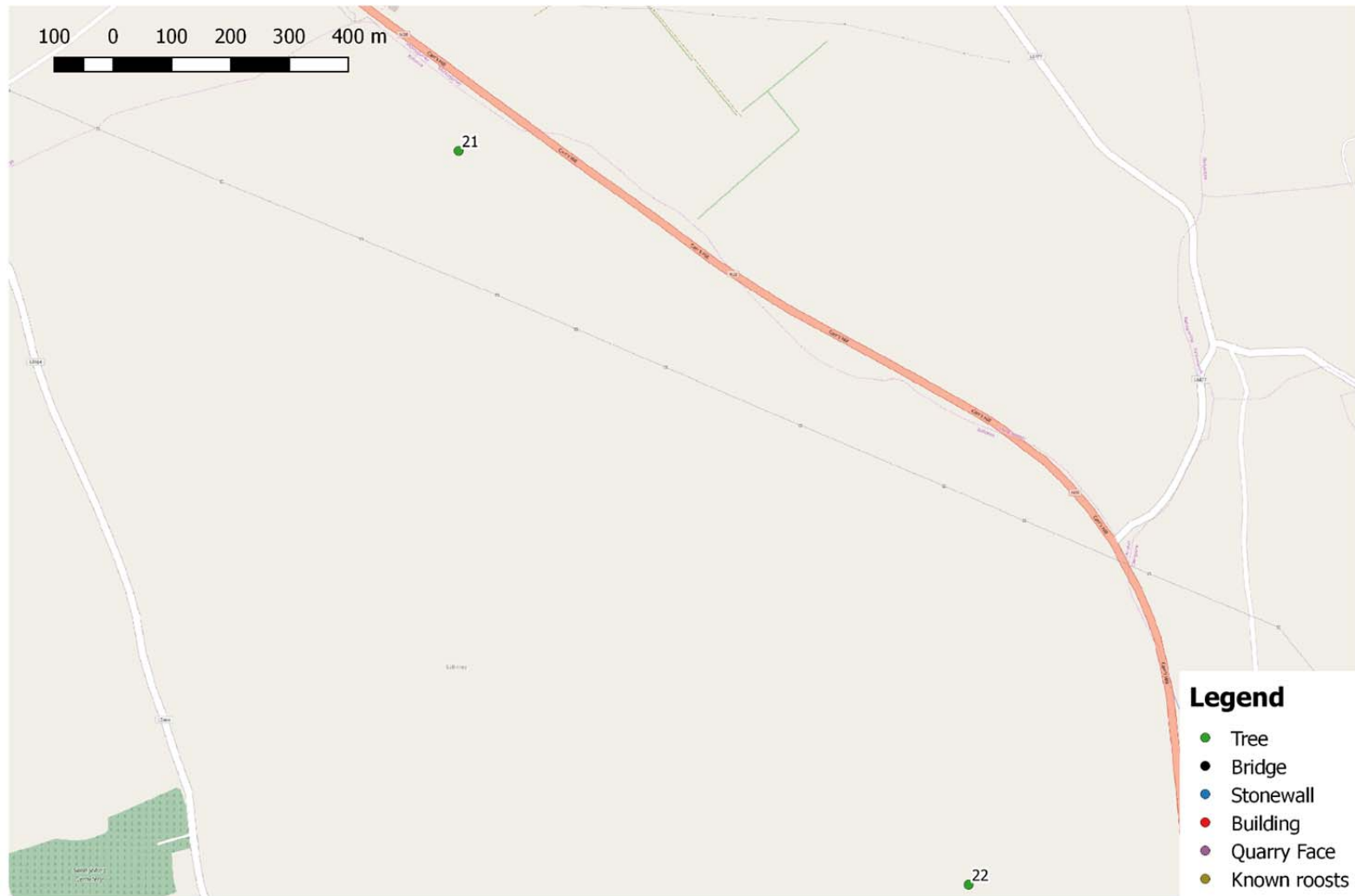


Figure 3.5: Potential Bat Roosts and Confirmed Roosts in the Proposed M28 Study Area: Hilltown to Ballyhemiken

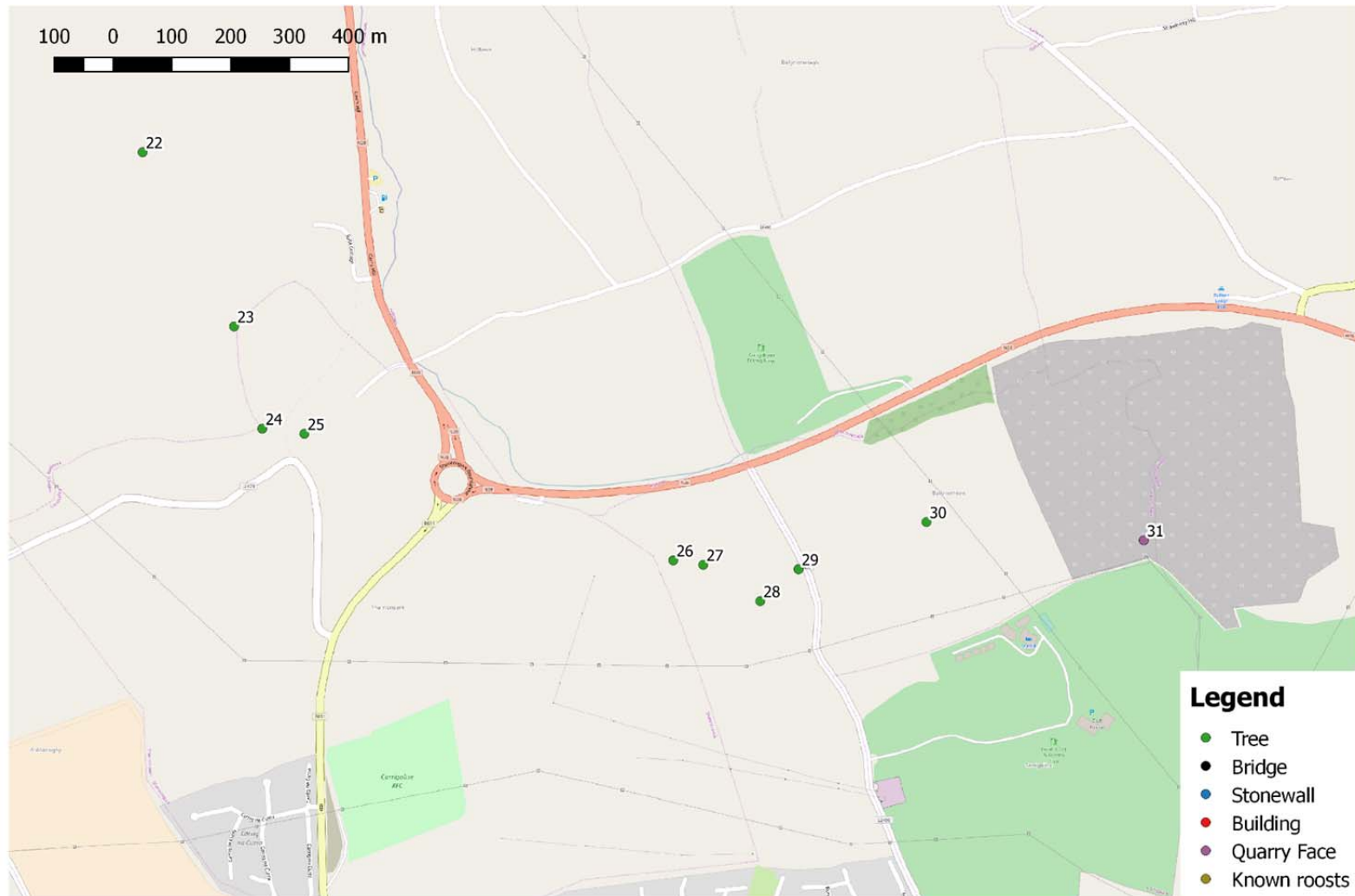




Figure 3.6: Potential Bat Roosts and Confirmed Roosts in the Proposed M28 Study Area: Ballyhemiken to Shanbally

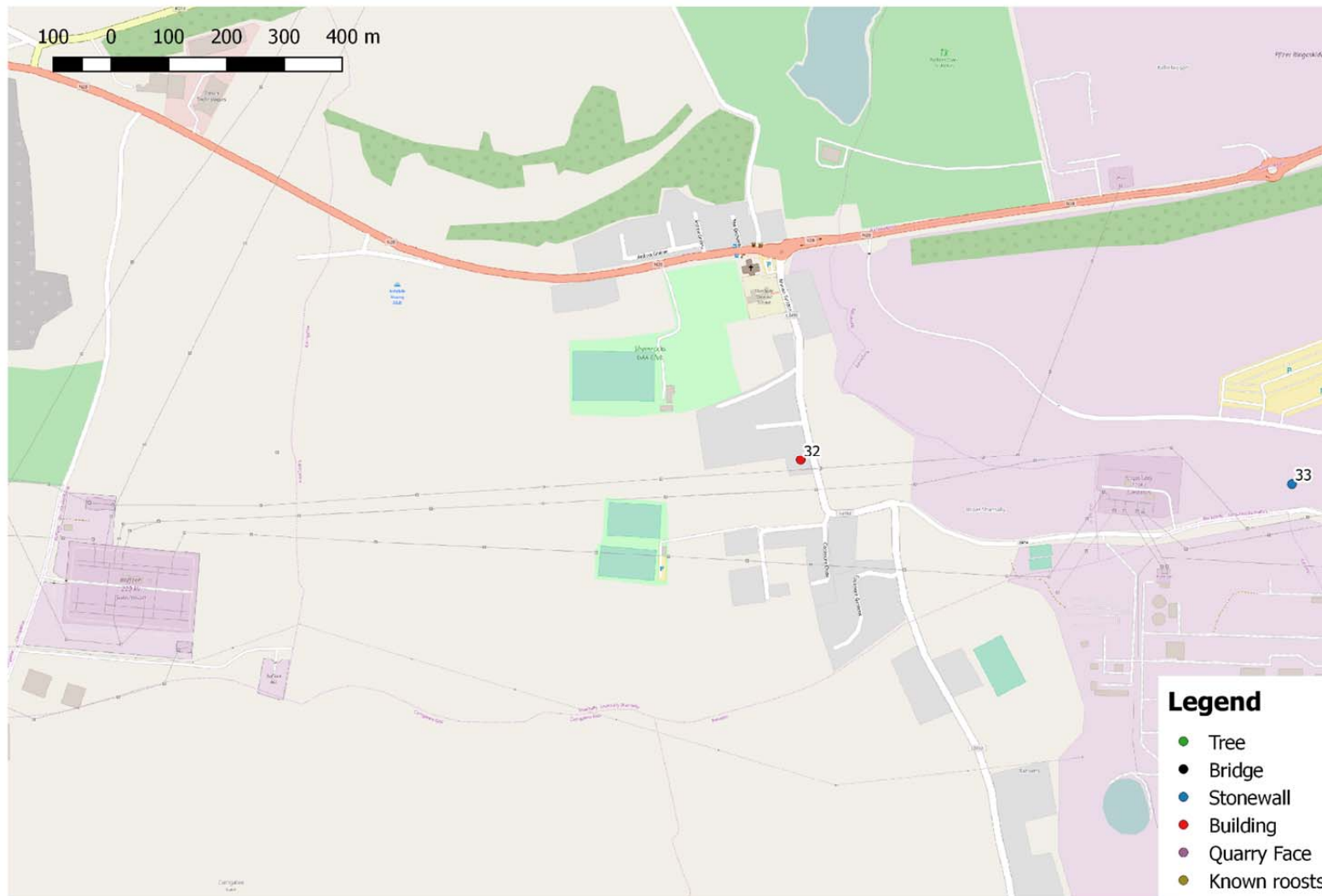
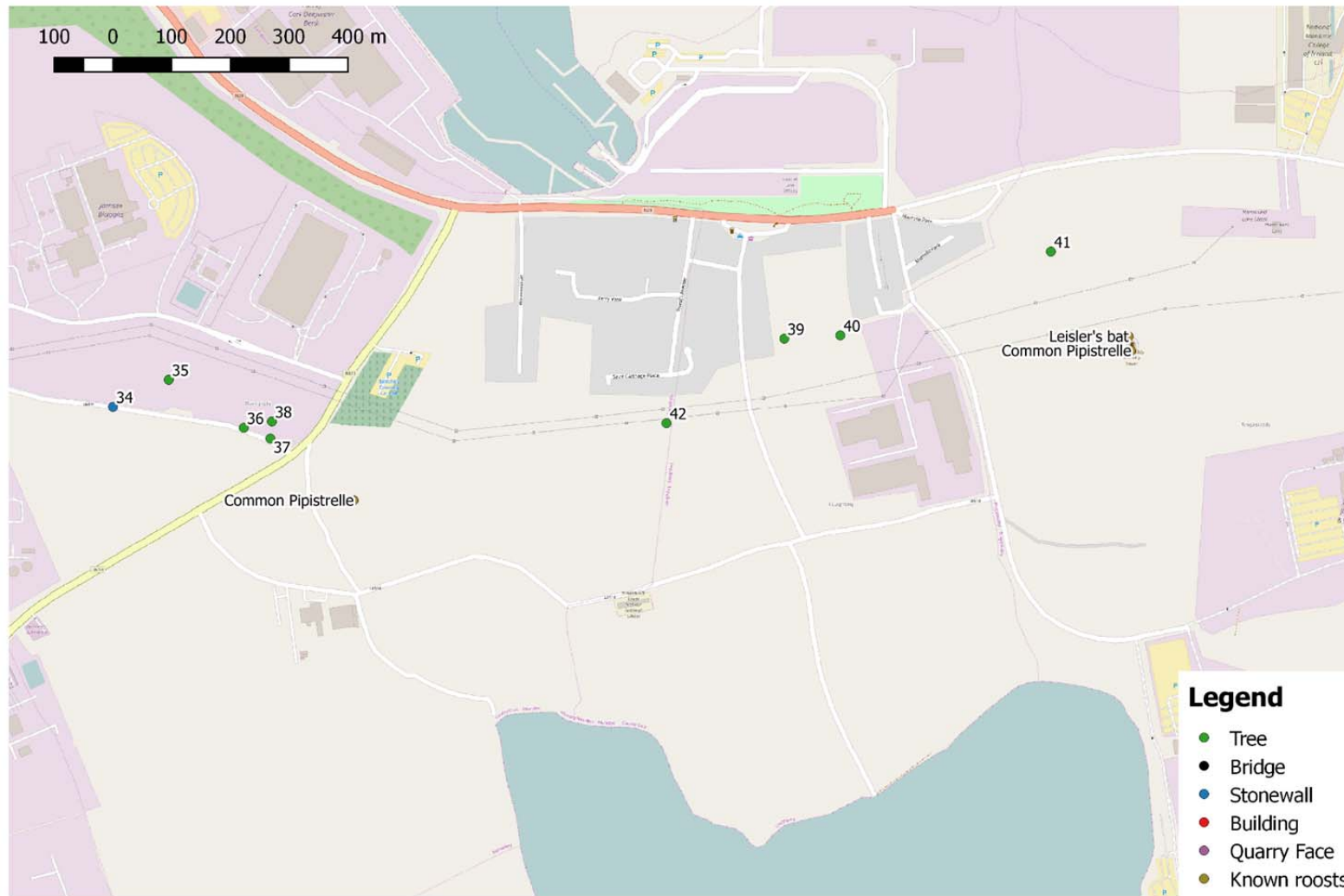


Figure 3.7: Potential Bat Roosts and Confirmed Roosts in the Proposed M28 Study Area: Ringaskiddy



### 3.3 Evaluation

#### 3.3.1 Analysis and interpretation of results

This section provides a summary of the principal areas of ecological interest in relation to bats present on or near the proposed M28 Road Project corridor. Those features identified as Ecological Receptors in Chapter 12: Terrestrial Ecology of the EIS have been included for reference. The principle areas of interest for bats include:

- Hedgerows and treelines. The improved grassland and arable land covering the majority of the study area is of low conservation interest, and is of low interest to bats. However, the hedgerows which bound field systems (ER22) offer connectivity in the landscape and shelter for commuting and foraging bats. Some of the older trees within hedgerows offer some potential roosting opportunities, most likely for individual/ small numbers of bats.
- Streams. Donnybrook Stream and its riparian corridor (ER7) supports scrub vegetation and willow-alder-ash woodland. This area forms a valuable wildlife corridor and bats have been recorded foraging in this area. Several PRFs were identified in the trees fringing the Donnybrook Stream. The proposed route intersects a tributary of the Glounatouig (ER9), which provides good foraging habitat for bats. No PRFs were observed within the proposed corridor at this location.
- Woodlands. Bloomfield woods and the associated Woodbrook Stream (ER5) supports mixed broadleaved woodland, with wet woodland in depressions. This woodland provides an important foraging area and commuting corridor for bats, particularly as the woodland is associated with a watercourse, and there are potential roosting opportunities in mature trees. There are several mature trees with a number of PRFs in a small area of woodland opposite Bloomfield woods, on the eastern side of the N28 towards the Mount Oval area (ER6). The abandoned railway line at Ballyhemiken (ER11) supports a small area of woodland and a pond to the east. This area provides potential foraging area for bats and a small number of trees with PRFs. An area of scrub and woodland at Ringaskiddy (ER15) provides a foraging area for bats and also supports ash with PRFs.
- Quarry. Raffeen Quarry (ER12) supports areas of scrub and wetland which provide potential foraging habitat for bats. Further, there are PRFs in the quarry face.
- Structures. The castle ruins and associated mature trees (ER13) at Barnahely provide PRFs for bats. Two domestic buildings that may be demolished during the construction phase have been identified as Potential Bat Roosts (PBRs).

#### 3.3.2 Bat Roosting Preferences

The following information on bat roosting preferences has been adapted from *Irish Bats in the 21<sup>st</sup> Century*<sup>6</sup> and *Bat Surveys for Professional Ecologists*<sup>7</sup>. The roosting preferences of bat species that have either been confirmed as present, or are likely to be present, in the study area are described.

Common Pipistrelle maternity colonies are mainly found in buildings, usually roosting out of sight in crevices. This species has been observed using a range of building types from flat roofed-sheds to churches, however, using Irish roost preference modelling this species was found to select buildings of stone construction. Males roost singly or in small groups in the summer, in buildings or trees. Bat boxes are used by both males and females, but generally only males use them during the summer. Common Pipistrelle has also been recorded in bridges in Ireland. This species has not been recorded using underground sites for hibernation in Ireland but is sometimes found in cracks and crevices of buildings and bat boxes in winter.

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<sup>6</sup> Roche *et al.* (2014) *Irish Bats in the 21<sup>st</sup> Century*. Bat Conservation Ireland.

<sup>7</sup> Collins, J. (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3<sup>rd</sup> edn). The Bat Conservation Trust, London.

Soprano Pipistrelle maternity colonies are mainly found in buildings, and as for Common Pipistrelle, usually roost out of sight in crevices. Soprano Pipistrelle has been recorded using a range of building types from toilet blocks to churches, however, Irish roost preference modelling showed that buildings of brick construction were the only selected maternity roost feature. Males roost singly or in small groups in the summer, in buildings or trees. Bat boxes are used by both males and females, but generally only males use them during the summer. Soprano Pipistrelle has also been recorded in bridges in Ireland. This species has not been recorded using underground sites for hibernation in Ireland but is sometimes found in cracks and crevices of buildings and bat boxes in winter.

The majority of Leisler's Bat roosts in Ireland are found in buildings, and roosts have also been recorded in bat boxes and trees. This species has not been found roosting in underground structures in Ireland or Europe. While Leisler's have been found in a range of building types, modelling of Irish roost records indicates that it favours buildings of stone construction with a felt lining in the roof.

Brown Long-eared bat maternity roosts are found in trees, in voids of large old buildings and bat boxes in woodland, and rarely in caves. Confirmed hibernacula for the species are extremely rare in Ireland, but in the UK have been recorded in underground sites, trees and buildings. Brown Long-eared bats have been found in a range of building types, from old mills to bungalows; this species is known to favour roosting in buildings with large attic spaces. Modelling of Irish roost records indicates that this bat generally favours roosting in churches.

Daubenton's bat roosts are found in hollow trees, bridges and sometimes buildings and caves. The majority of roost records in Ireland are from stone bridges. Confirmed hibernacula records for this species are rare in Ireland; in the UK hibernation sites are mainly underground, in caves, mines and tunnels.

Natterer's bat roosts are found in buildings, bridges, trees, underground sites and bat boxes. Maternity roosts have been recorded in the roof space of buildings, in churches and other old buildings.

As noted in Section 3.2.1.1., no evidence of bats roosts in trees was found during the course of the bat survey conducted of the proposed M28. A number of mature trees were identified along the proposed pipeline corridor that are of moderate potential for use by bats as roosting or resting places. These trees may be used by individuals or small numbers of bat species but it appears, from a ground level inspection, unlikely that large numbers of bats roost in trees along the proposed M28 corridor.

As noted in Section 3.2.1.2., Barnahely Castle ruins has been identified in previous surveys as a common pipistrelle mating roost, and the Martello Tower has been identified as a summer roost for small numbers of Leisler's bat and common pipistrelle. The location of these bat roosts is indicated on Figure 3.3.

### 3.3.3 Legislation

The following bats have been recorded during surveys undertaken for the proposed project: common pipistrelle, soprano pipistrelle, Leisler's bat, Natterer's, Daubenton's and brown long-eared bat.

All Irish bats are protected under the Wildlife Act (1976) and Wildlife Amendment Act (2000). Also, the EC Directive on The Conservation of Natural Habitats and of Wild Fauna and Flora (Habitats Directive 1992), seeks to protect rare species, including bats, and their habitats, and requires that appropriate monitoring of populations be undertaken. Across Europe they are further protected

under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982), which, in relation to bats, exists to conserve all species and their habitats. The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, enacted 1983) was instigated to protect migrant species across all European boundaries. The Irish government has ratified both these conventions<sup>8</sup>.

All bats are listed in Annex IV of the EU Habitats Directive (92/43/EC) and the Lesser Horseshoe bat is further listed under Annex II of the same Directive.

Local Planning Authorities are required to give consideration to nature conservation interests under the guidance of the SEA Directive 2001/42/EC. This Directive states that the protected status afforded to bats means that planning authorities must consider their presence in order to reduce the impact of developments through mitigation measures.

Destruction, alteration or evacuation of a known bat roost is a notifiable action under current legislation and a derogation licence has to be obtained from the National Parks and Wildlife Service (NPWS) before works can commence.

In addition, it should be noted that any works interfering with bats and especially their roosts, may only be carried out under a licence to derogate from Regulation 23 of the Habitats Regulations 1997, (which transposed the EU Habitats Directive into Irish law) issued by the NPWS. The details with regards to appropriate assessments, the strict parameters within which derogation licences may be issued and the procedures by which and the order in relation to the planning and development regulations such licences should be obtained, are set out in Circular Letter NPWS 2/07 "*Guidance on Compliance with Regulation 23 of the Habitats Regulations 1997 - strict protection of certain species/applications for derogation licences*" issued on behalf of the Minister of the Environment, Heritage and Local Government on the 16<sup>th</sup> of May 2007.

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<sup>8</sup> Aughney, T., Kelleher, C., & Mullen, D. (2008): Bat Survey Guidelines, Traditional Farm Buildings Scheme. Heritage Council, Kilkenny

## 4. Impact Assessment

### 4.1 Impact of the Proposed Project- Construction

The results of activity surveys undertaken for the proposed road project indicate that the study area supports at least six species of bat. Furthermore, there are existing records of seven bat species from the 10k Grid Squares the proposed M28 Road Project corridor is situated in<sup>9</sup>. Due to their use of wide areas of landscape and their low birth rate, bats are vulnerable to potential impacts from linear developments such as road developments.

Several PRFs have been identified in the study area within mature trees, domestic buildings and a quarry face. Therefore, in the absence of mitigation, there is potential that the proposed M28 Road Project may result in the loss of potential or actual roosting sites for bats in mature trees, domestic buildings and Raffeen Quarry face. From a ground level inspection of the PRFs, it is considered unlikely that large numbers of bats are using the PRFs in mature trees, therefore it is probable that removal of potential bat roosts would have an indirect significant negative impact on bats at a local level. Should an active bat roost be destroyed there would be a direct significant negative impact on bats at a local level.

There is also potential for disturbance of bats due to lighting during the construction phase. When bats emerge from roosts they tend not to echolocate but rely on eyesight to fly from the roost to adjoining treelines or hedgerows. Various studies have shown that bats' eyesight works best in dim light conditions; where there is too much luminance bats' vision can be reduced resulting in disorientation. Too much luminance at bat roosts may cause bats to desert a roost. Light falling on a roost exit point can delay bats from emerging and miss peak levels of insect activity at dusk: any delays of emergence can reduce feeding periods.

In the absence of mitigation, it is probable that disturbance of bats due to lighting would have an indirect, significant negative impact at the local level. The impact would be temporary, and would persist for the duration of construction.

This assessment of potential impacts has been undertaken in relation to the PRFs identified during the winter survey undertaken in February 2017, and is not intended to provide an exhaustive list of the potential impacts of the proposed road project on bats. For a full description of potential impacts of the proposed M28 Road Project on bats, please refer to Kelleher (2014) and Chapter 12: Terrestrial Ecology of the main EIS.

### 4.2 Impact of the Proposed Project- Operation

As detailed in Section 4.1, bats' eyesight works best in dim light conditions; where there is too much luminance bats' vision can be reduced resulting in disorientation. The lighting proposed for the road project will increase light levels within the proposed project area. There will also be an increase in levels of light during the operational phase of the project as a result of car headlights. Increased lighting may reduce the availability of feeding and roosting sites for bats and would be a long-term to permanent, irreversible significant negative impact to bats. This would be significant on the local, but not national level.

As noted previously, this assessment has been undertaken in relation to the PRFs identified during the winter survey undertaken in February 2017. For a full description of potential impacts of the

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<sup>9</sup> *Ibid* 1

proposed M28 Road Project on bats, please refer to Kelleher (2014) and Chapter 12: Terrestrial Ecology of the main EIS.

## 5. Mitigation Measures

The most ideal way to mitigate impacts is through avoidance. The following measures would avoid or lessen the impacts of the proposed road project.

### 5.1 Mitigation by avoidance

1. Avoid removal of hedgerows and treelines wherever possible.
2. Mature trees adjacent to the proposed pipeline route should remain in place wherever feasible.

### 5.2 Mitigation by Reduction

#### 5.2.1 Pre-construction assessments of trees within the land-take for roost potential

Impacts have been predicted on trees and structures categorised as being of moderate suitability for bats along the proposed M28 Road Project corridor during the ground level surveys. Consequently, further surveys such as PRF inspection surveys or presence/ absence surveys are required before construction commences. All trees with moderate roost potential shall be examined by a suitably qualified ecologist prior to felling.

Survey options include the following:

- A PRF inspection survey, which involves the use of tree climbing or access equipment such as cherry pickers to gain access to PRFs to assess in more detail their likely suitability for bats and to look for evidence of bats. The aim of this survey is to reclassify PRFs and determine the presence/ absence of bats at the time of survey and the need for further survey and/ or mitigation.
- Presence/ absence surveys, which include dusk and/or dawn visits to watch, listen for and record bats exiting or entering bat roosts.

#### 5.2.2 Pre-construction assessment of structures within the land-take for roost potential

The demolition of houses within the land take of the proposed M28 Road Project poses a potential risk to bats. Buildings are highly important as roosting sites for bats and all Irish bat species use buildings for all roost types. Most significant in terms of roosts in houses are maternity roosts, but cellars and even attics may serve as hibernation sites for bats. Prior to demolition, buildings scheduled to be demolished that were identified as having the potential for bats shall be re-examined. Methodologies for survey of buildings include an examination of the exterior and interior of the building for signs of use by bats, and a dusk/ dawn activity survey as required.

An activity survey of Raffeen Quarry was undertaken by Brian Keeley in 2006, but was not included in the autumn and summer surveys undertaken for the proposed project in 2013 and 2014. Due to the passage of time it is recommended that an emergence survey of the quarry face coupled with a bat activity survey of the quarry is undertaken between April and September in order to inform a robust assessment of potential impacts on bats.

#### 5.2.3 Mitigation for Trees

Where possible, treelines, woodland and mature trees that are located immediately adjacent to the line of the proposed pipeline corridor and construction areas or are not directly impacted shall be avoided and retained intact. Overall impacts on these sites shall be reduced through modified design and sensitivity during construction. Any existing mature trees adjacent to the corridor or construction areas are to be retained and shall be protected from root damage by machinery by an



exclusion zone of at least 7 metres or equivalent to canopy height. Such protected trees shall be fenced off by adequate temporary fencing prior to other works commencing.

Should removal of mature trees be unavoidable, these trees shall be felled in the period late August to late October, or early November, in order to avoid the disturbance of any roosting bats as per NRA guidelines<sup>10</sup>. Tree felling shall be completed by Mid-November at the latest because bats roosting in trees are very vulnerable to disturbance during their hibernation period (November – April). Once felled, trees that have potential bat roost features shall be left intact on-site for 24 hours prior to disposal to allow bats to escape overnight.

Landowners shall be advised that the timber from felled trees will remain for their use. This should prevent trees being felled prematurely.

#### 5.2.4 Derogation Licence

Where bats are identified within a tree during pre-construction survey, it will be necessary to seek derogation from the National Parks and Wildlife Services (NPWS) to exclude the bats and fell. The roost must not be altered or affected in any way prior to the time and using the measures stipulated in the licence for the exclusion of bats and felling must be carried out under the supervision of a bat specialist named on the licence.

#### 5.2.5 Bat Boxes

The loss of potential roosting features and foraging/commuting habitat coupled with the wider loss of commuting territory surrounding the projects lands will necessitate the installation of bat boxes to compensate for potential roost loss. It is recommended that bat boxes are attached to suitable trees or buildings along the route but outside the area of clearance. The principle recommended type along the pipeline corridor is the Schwegler 1FF bat box. Boxes shall be erected in pairs and all boxes placed in sites that will be protected from disturbance. These boxes must be away from any felling or trimming to ensure that they are not accidentally damaged or removed. Bat boxes must be clear of scrub and away from ivy encroachment as well as lighting and traffic. These boxes must be away from any felling or trimming to ensure that they are not accidentally damaged or removed. The appropriate number of bat boxes to compensate for loss of potential roosting features should be calculated following pre-construction PRF inspection/ presence absence surveys.

#### 5.2.6 Structures

Should bat roosts be confirmed in any buildings scheduled for demolition or in the quarry face, then a derogation licence must be sought from the NPWS in order to demolish the roost and building/quarry face. This will be discussed and agreed with the NPWS during the licence application process.

#### 5.2.7 Lighting

In general, artificial light creates a barrier to commuting bats so lighting shall be minimised along the proposed route especially at areas of interest for bat species, i.e. adjacent to hedgerows, treelines and woodland. Where lighting is required, directional lighting (i.e. lighting which only shines on the proposed works and not nearby countryside) shall be used to prevent overspill. This shall be achieved by the design of the luminaire and by using accessories such as hoods, cowls, louvres and shields to direct the light to the intended area only.

There shall be no direct illumination of known bat roosts. Lights shall be positioned to avoid sensitive areas and restricted so that there are dark areas. When works are conducted adjacent to known or

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<sup>10</sup> National Roads Authority (2005): Guidelines for the Treatments of Bats Prior to the Construction of National Road Schemes. National Roads Authority, Dublin.

potential bat roosts (as identified in Figure 3.3 to Figure 3.7), the timing of lights shall be restricted to avoid bat activity (i.e. from dusk until dawn).

#### 5.2.8 Monitoring

It is essential to monitor boxes for their acceptance of use by bats and those boxes that remain unused two years after the date of erection should be relocated. Seasonal inspection of bat boxes should be undertaken (excluding mid-June to mid-August, the lactation period of females, where any disturbance at this time can be detrimental to survival of young) to monitor bat usage and in wintertime for general wear and tear and to remove droppings following use the previous summer. This should be undertaken by a licensed bat-handler<sup>11</sup>.

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<sup>11</sup> National Roads Authority (2006): Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes. National Roads Authority, Dublin.

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