



The status of Barn Owls within the study area for the N6 Galway City Transport Project



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TABLE OF CONTENTS

	PAGE
TABLE OF CONTENTS	2
LIST OF FIGURES	3
LIST OF TABLES	3
SUMMARY	4
1 Background	5
1.1 The impacts of road networks on Barn Owls	5
1.2 Mitigation measures for Barn Owls	6
2 Introduction	8
2.1 The Barn Owl survey area	8
2.2 Objectives	10
3 Methods	11
3.1 Barn Owl survey	11
4 Results	13
4.1 Barn Owl survey	13
4.2 Other raptor records	20
5 Recommendations	22
References	23

LIST OF FIGURES

FIGURE		PAGE
Fig. 1.1	<i>The survey area for the N6 Galway City Transport Project.</i>	8
Fig. 1.2	<i>All registered Barn Owl sites in the Republic of Ireland in 2013 (n = 132)</i>	9
Fig. 1.3	<i>All active Barn Owl sites in County Galway registered in 2013</i>	9
Fig. 2.1	<i>The Barn Owl survey area (areas in grey are excluded from the survey)</i>	11
Fig. 3.1	<i>The distribution of all Barn Owl sightings recorded in the survey area between 2008 and 2014</i>	13
Fig. 3.2	<i>Variation in all site types surveyed (n=74).</i>	14
Fig. 3.3	<i>The variation in suitability (categories 0 – 3) across all sites surveyed (n = 74)</i>	15
Fig 3.4	<i>The distribution and suitability of all sites surveyed (n = 74)</i>	16
Fig 3.5	<i>The distribution of all sites where signs of Barn Owl were recorded</i>	16
Fig 3.6	<i>The location and status of all Barn Owls sites within the survey area</i>	17
Fig 3.7	<i>The distribution and status of all other known raptor sites in the survey area in 2014</i>	21

LIST OF TABLES

TABLE		
Tab. 3.1	<i>The location and status of all active sites</i>	17
Tab. 3.2	<i>The site type and status of all other raptor sites within the survey area in 2014</i>	21

LIST OF IMAGES

IMAGE		
Image 3.1	<i>An example of a derelict cottage which were the most common site type within the survey area.</i>	14
Image 3.2	<i>Roscam Round Tower and Merlin Park Castle, a Category 1 and Category 3 site respectively.</i>	15
Image 3.3	<i>Ardfry house</i>	18
Image 3.4	<i>Menlough Castle</i>	18
Image 3.5	<i>Rinville House</i>	19
Image 3.6	<i>Carnmore farm house</i>	19
Image 3.7	<i>Anglingham Quarry</i>	20

SUMMARY

The Barn Owl *Tyto alba* is categorised as a *Red-listed Bird of Conservation Concern* in Ireland due to extensive population declines observed in recent decades (Colhoun and Cummins, 2013). The Breeding Birds Atlas (2007-2011) highlighted a decline of 39% in the breeding range of Barn Owls in Ireland over the 40 year period since the original Breeding Birds Atlas of Britain and Ireland (1968 – 1972) (Balmer *et al.*, 2013; Sharrock, 1976). Several studies have linked the increase in major road networks to Barn Owl population declines (Illner, 1992; De Bruin, 1994; Ramsden, 2003). Due to their hunting behaviour, low flight and poor peripheral vision Barn Owls are particularly susceptible to collision with vehicles (Boves and Belthoff, 2012; DeBruin, 1994; Illner, 1992; Massemin and Zorn, 1998; Ramsden 2003). Data from Ireland indicates that collisions with vehicles is a major cause of mortality for Barn Owls (BirdWatch Ireland, unpublished; Lusby *et al.*, 2013), however the extent to which this impacts the population is not fully understood.

The objective of the study is to establish detailed information on Barn Owl distribution and abundance within the Barn Owl survey area which is defined based on available information on Barn Owl home range ecology and which incorporates the scheme study area for the N6 Galway City Transport Project, in order to inform the most appropriate route selection to minimise negative impacts on the local population.

The Barn Owl survey area comprised approximately 225km². The field element of the Barn Owl survey was carried out between the 27th of June and the 18th of July 2014. All roads within the survey boundaries were systematically travelled and the suitability of all buildings and quarries within the study area was assessed and categorised on a scale of 0 – 3 based on their suitability for Barn Owls. A total of 76 sites were comprehensively surveyed, of which the commonest site type was derelict cottages (27), followed by stone barns (13) and castles (11). A total of 47 (63%) sites were assigned to Category 0 as they were considered to be entirely unsuitable for Barn Owls, 11 (14%) were assigned to Category 1, offering potential for roosting, though unlikely for nesting, four (6%) were assigned to Category 2, having likely roosting and/or nesting opportunities and the remaining 14 (15%) sites were Category 3, as they offered good roosting and nesting opportunities.

The presence of Barn Owls was confirmed at five sites within the survey area. Two sites in castles were confirmed as nest sites, a ruined mansion was classed as a regular roost, which is likely to be associated with one of the confirmed nesting pairs. An independent occasional roost site in a derelict farm house was also recorded, and the status of the remaining site within a quarry was not possible to determine. Monitoring revealed that both confirmed nesting sites failed to breed in 2014.

A total of 17 other raptor sites were confirmed over the course of the Barn Owl survey, which included eight Kestrel sites (three nests and five roosts), six Peregrine sites (three nests and three roosts), two Sparrowhawk sites (one nest and one displaying pair) and a single Long-eared Owl nest.

The grid reference locations and status of all sites are provided within the document and recommendations for future monitoring and the development and implementation of appropriate mitigation is also outlined.

1. BACKGROUND

1.1 *The impacts of road networks on Barn Owls*

Extensive declines in the distribution and abundance of the Barn Owl *Tyto alba* population in Ireland have been recorded in recent decades. The Breeding Birds Atlas (2007-2011) highlighted a decline of 39% in the breeding range of Barn Owls in Ireland over the 40 year period since the original Breeding Birds Atlas of Britain and Ireland (1968 – 1972) (Balmer *et al.*, 2013; Sharrock, 1976). The 2007-2011 atlas coincided with increased monitoring efforts for Barn Owl coordinated by BirdWatch Ireland, indicating that the extent of the long-term declines are likely to be even more substantial than predicted through the atlas surveys. As such the Barn Owl is categorised as a Red-listed *Bird of Conservation Concern in Ireland* as the population is considered to have suffered losses of over 50% in the last 25 years (Colhoun and Cummins, 2013). The specific factors which influence the status and trends of Barn Owls in Ireland, and which have brought about these widespread declines are not fully understood. The population in Ireland is not limited by the availability of suitable nest sites to the same extent as has been recorded in Britain and in other parts of its range (Petty *et al.*, 1994; Taylor, 1994; Newton, 2004; Lusby *et al.*, 2009, 2010 & 2011). The intensification of agriculture, particularly the reduction of prey rich foraging habitat, and the increased use of second generation anticoagulant rodenticides are known to affect Barn Owl populations elsewhere in their range (Shawyer, 1998) and have been widely implicated as the most influential drivers of the decline in Ireland. In addition several studies have linked the increase in major road networks to Barn Owl population declines (Boves and Belthoff, 2012; De Bruin, 1994; Illner, 1992; Ramsden, 2003). Barn Owls have been routinely recorded as road casualty victims in Ireland (BirdWatch Ireland, unpublished; Lusby *et al.*, 2013), and alongside the significant expansion to the road infrastructure over the past 20 years, concern over this aspect as a contributing factor in the Barn Owl decline has also increased.

The increases in traffic, vehicle speeds and expansions to road infrastructures which have occurred throughout the world have coincided with the continued escalation in the number of wildlife casualties on roads (Newton *et al.*, 1997; Seiler *et al.*, 2004). Due to their hunting behaviour, low flight and poor peripheral vision Barn Owls are particularly susceptible to collision with vehicles (Boves and Belthoff, 2012; DeBruin, 1994; Illner, 1992; Massemin and Zorn, 1998; Ramsden, 2003). Several studies to assess avian mortality on roads have recorded Barn Owls as the most frequently affected species. However there are numerous constraints when assessing the relative importance of road traffic accidents as a cause of mortality and determining the impact of road networks on Barn Owls at the population level. The potential to overestimate vehicle collisions as a cause of death due to methodological bias in recording different causes of mortality must be taken into consideration. The probability of finding a road casualty is likely to be greater compared with a bird which died of natural causes, and therefore the ratios of recorded causes of death may not be representative. Deaths caused by man, and especially road deaths are over estimated in bird mortality studies (Hodson and Snow, 1965, Glue, 1971, Newton, 1979, Weir, 1971).

Illner (1992) assessed the overall effect of road casualties on population trends and estimated that collision with vehicles accounted for approximately 10 – 15% of adult Barn Owl deaths in Germany, and suggested that these losses were likely to have a significant impact on the population. An intensive study over an eighteen year period in Liemers in the Netherlands, also attributed long term Barn Owl population declines in the region to increases in major road networks (De Bruin, 1994). Newton *et al.*, (1997) showed that recorded Barn Owl road fatalities had increased dramatically in the UK since the early part of the last century, from 6% in 1910 – 54, to 15% in 1955 – 69, to 35% in 1963 – 70 and 50% in 1991- 96. Ramsden (2003) studied the effects of road developments on Barn Owl displacement, distribution and mortality over a 15 year period in Devon in the UK. The findings revealed that 72% of Barn Owls which encounter a major road are likely to be killed. Ramsden

(2003) also showed that the risk of mortality to Barn Owls from motorways increased dramatically with proximity to nest and roost sites. New major road developments caused the loss of all Barn Owls within 0.5km, and severe depletion of populations within 0.5 to 2.5km of the route. An examination of body weights of carcasses and the time of year casualties were recovered also showed that there was no indication that owls killed by traffic were predominantly weak or underweight individuals and therefore in addition to dispersing juveniles, the adult breeding population was also affected. Ramsden (2003) also estimated that the presence of major roads in rural England has removed Barn Owls from an area of between 8,100 and 16,200km² and depleted the population over an area of roughly 48,600km² which corresponds to 40% of the total area of rural England.

Many studies have also employed systematic searches of motorway verges for avian road casualties. In Switzerland, seven Barn Owl casualties per 100km were estimated on an annual basis along a 36.9km stretch of motorway (Bourquin, 1983). Two other studies, both in north-eastern France, estimated an annual casualty rate of 65 Barn Owls per 100km along a 259km stretch of motorway (Baudvin, 1997) and 25 Barn Owl casualties per 100km per year on a 150km stretch of motorway (Massemin and Zorn, 1998). In Britain, a 50km stretch of major road, with single and dual carriageway sections, was searched intensively over two years, and the casualty rate for Barn Owls calculated at 68 per 100km per year (Shawyer and Dixon, 1999).

Although these studies are not directly comparable to Ireland due to differences in local population densities, road types and characteristics, the combined results nevertheless illustrate the potential impacts of major roads on Barn Owl populations. A long-term study through BirdWatch Ireland provides the only data on the impacts of road networks relative to other forms of mortality which affect Barn Owls in the Irish context. Over an eight year period (2006 and 2013) a total of 240 Barn Owl mortality incidents were recorded, of which the majority (62%) were classed as vehicle collision victims. The majority of road casualties were recovered from Motorways or National routes (74%), which is in keeping with results from other studies which suggest that motorways and dual carriageways, due to their design and high vehicle speeds, present a greater threat to Barn Owls than other road types (Ramsden, 2003, Illner, 1992, Shawyer and Dixon, 1999). A total of 46 Barn Owl collision victims were recorded on a stretch of motorway in south Tipperary over a five year period, indicating that certain routes and certain stretches may be "hot spots" and may have an effect on Barn Owl populations at a local level. Similar to other studies, peaks in the number of road casualties were observed outside of the breeding season, with highest numbers recovered in February (20 Barn Owl road casualties), October and November (16 casualties each month). Of thirty four Barn Owl carcasses which were retrieved and reliably aged, the majority were first calendar year or second calendar pre-breeding season birds and therefore were unlikely to have been recruited to the breeding population prior to being killed on the road. The weight at death of twenty three road casualties assessed was also significantly lower than the weight of a representative sample of twenty five live adult males trapped over the study period, which indicates that while adults and breeding birds are killed on the roads, it is predominantly birds which have not yet reached breeding age or which are in poor condition that are affected. This study also analysed thirty three Barn Owl ringing recoveries between 2006 and 2013, to determine the relative importance of vehicle collisions as a cause of death from ringed birds alone, which showed that one third of Barn Owl recoveries were attributed to road traffic accidents (BirdWatch Ireland, unpublished).

1.2 *Mitigation measures for Barn Owls*

The speed of road traffic has been shown to be an important factor in relation to the risk of Barn Owl mortality on major roads (Illner, 1992). Road types also have a significant bearing on the risk and level of Barn Owl road casualties. In one study in Devon, it was found that, although owls were often seen crossing minor roads, they were rarely seen to hunt along them, most likely because of the lack

of suitable wide verges of grassland habitat over which to hunt (Ramsden, 2003). Several studies have linked high Barn Owl road casualties to sections of dual-carriageway and motorway where wide verges of open grassland habitat occur, thus encouraging owls to hunt along the road verges (Taylor 1994, Baudvin, 1997, Shawyer and Dixon, 1999). However, there is also evidence to suggest that many owls are struck while crossing major roads and not hunting along them. In a study on a 50km section of the A303 in southern England (Shawyer and Dixon 1999), it was found that Barn Owl road casualties were more likely to occur where the road traversed linear habitat features along which the birds might hunt. In two studies, more Barn Owl casualties were found along raised (embanked) and level sections of motorway than excavated (sunken) sections (Baudvin 1997, Massemin and Zorn, 1998) and that, in the latter case, most owls were killed along embanked stretches which also lacked roadside hedges and/or which crossed open fields.

Specific mitigation measures for Barn Owls have not been regularly implemented in motorway schemes in Europe, and there is also a subsequent lack of comprehensive information on the effectiveness of suggested measures. Recommendations to reduce the impacts of motorways on Barn Owls are primarily derived from data regarding the factors that present the greatest potential for negative impact. Two main mitigation measures have been proposed to reduce the risk of Barn Owl mortalities on major roads.

The first involves deflecting the flight path of Barn Owls that come into contact with major roads away from the high-risk areas. This can be achieved by planting the verges with scrub, hedges or trees, or by installing high screens that force birds to rise above passing traffic when traversing the road. This mitigation is likely to be particularly effective on embanked sections of motorway where Barn Owls are most susceptible to collision. There is conflicting opinion as to whether natural vegetation or artificial barriers to flight are the most appropriate. It has been suggested that planting natural vegetation at the edge of the roadside may have an adverse effect on other avian populations. In a publication by the British Highways Agency, it is recommended that tree plantings are kept 15 – 25m from the road edge, to reduced risk to a range of avian species such as Sparrowhawk *Accipiter nisus* (Hill, 2001). This distance however would be too far from the road to deflect the flight paths of Barn Owls when crossing the road.

The second measure is aimed at discouraging Barn Owls from coming into contact with major roads or from hunting along motorway verges. The methods require limiting the quality and quantity of suitable foraging habitat in the form of rough grassland. This can be achieved by intensive mowing or by allowing dense vegetation such as bramble or gorse to prosper and dominate (Ramsden 2003, Baudvin, 1997, Muller and Berthoud, 1997). Again there is conflicting opinion as to the validity of this measure in terms of its benefits for wildlife in general. In the UK roadside verges have been increasingly recognized for their importance as wildlife habitats (Spellerberg and Gaywood, 1993), particularly for small mammal populations. It has been suggested that the presence of small mammals on road verges may be more beneficial to some predator populations than the impacts of road mortality (Garland, 2002). Planting roadside verges with dense shrubs would serve to conceal small mammals from foraging Barn Owls (Baudvin, 1997), and therefore birds would be less likely to be attracted to the road-side. However, alternatively, such vegetation may also increase passerine mortality, encourage deer and result in a reduction in the plant and invertebrate species associated with rough grassland. An alternative, which could benefit Barn Owls, small mammals and biodiversity in general, is to allow rough grassland habitat to flourish along the road side verges but provide continuous screens adjacent to the road surface so that Barn Owls can forage along these areas without high risk of collision (Ramsden, 2003).

2. INTRODUCTION

The objective of the study is to establish detailed information on Barn Owl distribution and abundance within the defined survey area which is based on available information on Barn Owl home range ecology and which incorporates the scheme study area for the N6 Galway City Transport Project, in order to inform the most appropriate route selection to minimise negative impacts on the local population.

2.1 *The Barn Owl survey area*

The defined Barn Owl survey area extends from the N6 near Doughiska, at its eastern end, to the Bearna area, west of the city, and is bounded by Lough Corrib to the north. The study area comprises an area of approximately 225km² as shown in the map below (Fig 1.1).



Figure 1.1 *The Barn Owl survey area.*

The most recent Barn Owl population estimate for the Republic of Ireland derived through density specific survey work is 400 – 500 pairs (Birdlife International, in prep.) however there is significant geographical variation in the distribution of the population, with the south-west being the main stronghold. There is however a number of nest sites known in the mid-west and County Galway in particular. In 2013 of 132 Barn Owl sites registered nationally, 14 were in Galway (Lusby, 2013). Of the known sites in Galway two traditional nest sites and a single known roost site were recorded within the study area in 2013. However the area has not been extensively surveyed to determine complete distribution and abundance. A map showing the distribution of all known sites in 2013 (Fig 1.2) and all active sites in County Galway (Fig 1.3) is shown below.

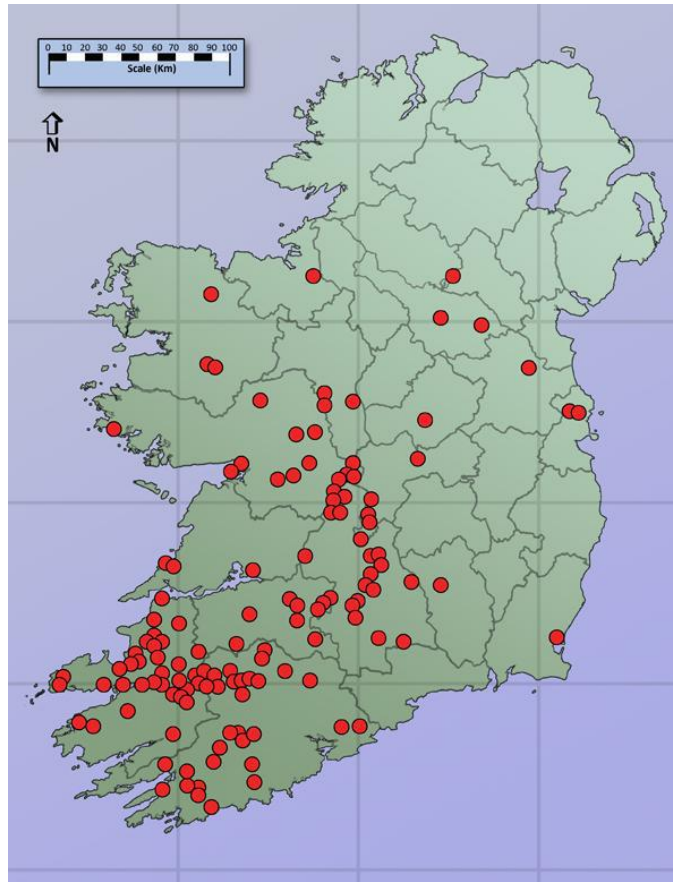


Figure 1.2 All registered Barn Owl sites in the Republic of Ireland in 2013 (n = 132)



Figure 1.3 All active Barn Owl sites in County Galway registered in 2013

2.2 Objectives

The objective of the study is to establish detailed information on Barn Owl distribution and abundance within the defined survey area which is based on available information on Barn Owl home range ecology and which incorporates the scheme study area, to inform the constraints study for the N6 Galway City Transport Project based on nest and roost site locations of Barn Owl. The findings will facilitate the route selection of the scheme, and therefore specific mitigation recommendations based on the selected option is outside the remit of this study, however broad recommendations for developing and implementing such mitigation in the future phases of this development are outlined.

The specific objectives of this study are as follows;

- To undertake a comprehensive Barn Owl census of the defined survey area, according to best practice methods, to identify all active nest and roost sites within buildings and quarries in the survey area;
- To gather and collate all available Barn Owl records from within the survey area to determine potential additional areas where Barn Owls may occur; and
- To outline appropriate survey, monitoring and mitigation to be implemented within future phases of the proposed scheme to determine impacts on the local Barn Owl population and to reduce negative impacts

3. METHODS

3.1 Barn Owl Survey

A desktop study in combination with field assessment was conducted on the 26th June 2014 to determine the extent of the survey area potentially suitable for Barn Owls. This initial assessment identified an area of c.30km² within Galway City and surrounds as largely unsuitable for nesting Barn Owls, which was based on knowledge of nest site selection and requirements in Ireland. Although Barn Owls may use urban areas for foraging, nesting within built up areas is unusual (Copland and Lusby, 2012). In addition, survey work is less effective due to access to buildings and for these reasons this area was excluded from further survey work. Therefore the overall survey area considered as potentially suitable and which was the focus for further survey work comprised an area of c.195km². A map of the survey area is shown in the map below (Fig 2.1).

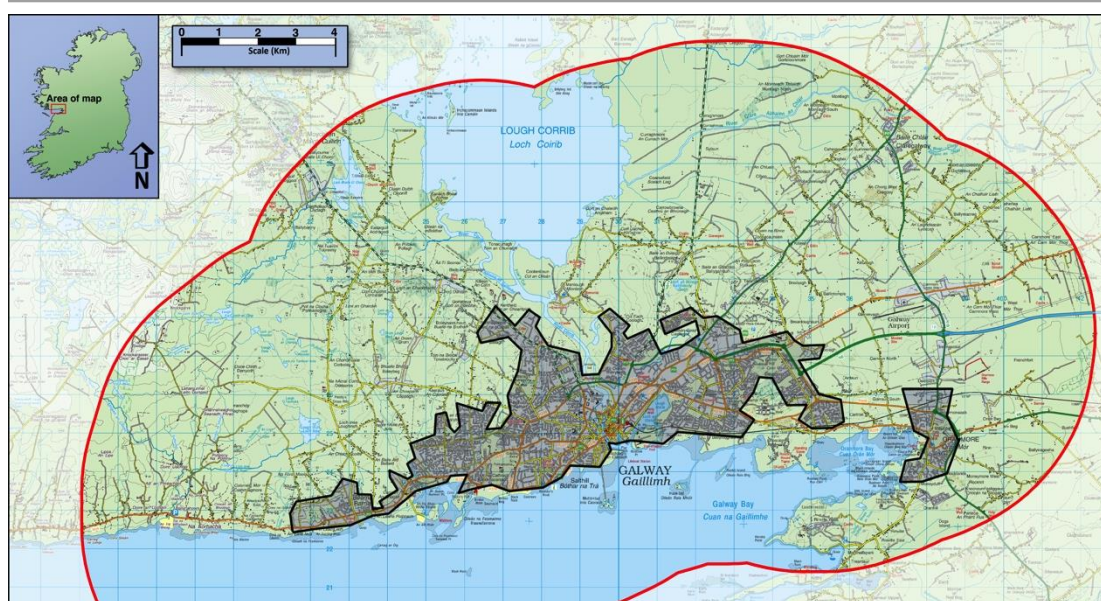


Figure 2.1 The Barn Owl survey area (areas in grey are excluded from the survey)

The field survey was initiated on the 27th June and completed on the 18th July 2014. Field surveyors were equipped with official BirdWatch Ireland identification, a copy of the BirdWatch Ireland insurance policy, Authorisation of Access letter and Health and Safety Statement from Scott Cawley and appropriate health and safety equipment including a torch, hard hat, first-aid kit, whistle and mobile phone.

Prior to initiating fieldwork all relevant information on existing and previously active sites and sightings from within the survey area were extracted from relevant BirdWatch Ireland databases including the Barn Owl registered site and sightings database and the recent Breeding Birds Atlas (2007 – 2011) database. All data was collated and the details included on suitable large-scale Ordnance Survey maps.

A detailed survey sheet for use in the field was drafted to take account of the following aspects for each site surveyed; date, county, grid reference, site type, site name, suitability rating (0 – 3), status,

nesting opportunities, signs, and whether a roost watch was required and/or carried out. Additional information was recorded relating to the suitability and presence of other raptors, corvids, or other species of note.

All roads within the survey boundaries were systematically travelled and the suitability of all buildings and quarries within the survey area was assessed. Sites that were considered to be potentially suitable were comprehensively searched for signs of the presence of Barn Owls. All sites were categorised on a scale of 0 – 3 based on potential nesting and roosting opportunities for Barn Owls, 0 for unsuitable; 1 representing potentially suitable sites for roosting but unlikely for nesting; 2 being suitable roosting or nesting sites and 3 representing sites considered to be very suitable.

At each site, a thorough search was conducted inside and outside of the building or within the quarry in order to locate signs indicating the presence of Barn Owls, particularly pellets, evidence of whitewash splashings and moulted feathers. Depending on the site characteristics, adjacent buildings and potential perches in the immediate vicinity of the site were also assessed. At certain active Barn Owl sites, due to the concealed nature of nest and roost sites (i.e. blocked chimneys, deep cavities etc.), signs are not always obvious or accessible. Therefore at the particular sites where this was judged to be an issue it was necessary to conduct a vantage point watch lasting a minimum of one hour and commencing at dusk (a 'roost watch') in order to confirm activity. These sites were then recorded as active if calls from an adult or owlets were heard, or if a Barn Owl was observed either within the site or entering or exiting the site. These methods were designed to locate all Barn Owl sites in buildings and quarries within the study area. All signs and sightings of other raptors encountered during fieldwork were also recorded.

Tree sites were not assessed as part of this study. However information on Barn Owl activity was sought whenever landowners were encountered over the course of survey work and on an opportunistic basis during fieldwork. Interviews with landowners have been successfully used to assess Barn Owl occupation in previous Barn Owl surveys (Toms *et al.*, 2001). Landowners were asked a series of standardized questions, shown images of Barn Owls and played vocalizations of the species for identification purposes. An assessment was made as to the reliability of each individual report, based on the account, the observer's description and their relevant level of knowledge. Reports that were considered to be potentially unreliable based on professional judgment of the surveyor were discarded. Reliable reports were divided into two categories, "breeding season" which consists of the period March to July and "non-breeding season" which comprises the remainder of the year. Greater importance was afforded to those sightings which originated from within the defined breeding season period as these are likely to represent birds holding territory, as opposed to non-breeding season sightings which could represent dispersing juveniles.

At all active or potentially active sites or those where it was deemed necessary to conduct a roost watch to accurately determine status, additional nocturnal visits were carried out to confirm activity and breeding status.

Although the methods of this survey were specifically designed to confirm Barn Owl distribution within the survey area, other raptor species which were encountered during survey work in 2014 were also recorded.

4. RESULTS

4.1 Barn Owl survey

The field element of the Barn Owl survey was carried out between the 27th of June and the 18th of July 2014. Collation of existing information revealed seven sightings of Barn Owls within the survey area between 2008 and 2014, of which two were within the defined breeding season. The distribution of sightings is shown below in Figure 3.1.

Collation of existing data highlighted three sites which were previously active within the study area; two traditional nest sites in castles, and a single roost in a ruined mansion.



Figure 3.1. The distribution of all Barn Owl sightings recorded in the study area between 2008 and 2014

A total of 76 sites were comprehensively surveyed for the presence of Barn Owls in the study area. Of these the commonest site type was derelict cottages (27), followed by stone barns (13), castles (11), derelict two-story farmhouses (7), disused metal-roofed barns (5), quarries (3), derelict mansions (3) and derelict or disused churches (2). Other sites included a derelict mill, a priory, a round tower, a derelict school and a derelict warehouse. A full breakdown of site types is shown below in Figure 3.2.

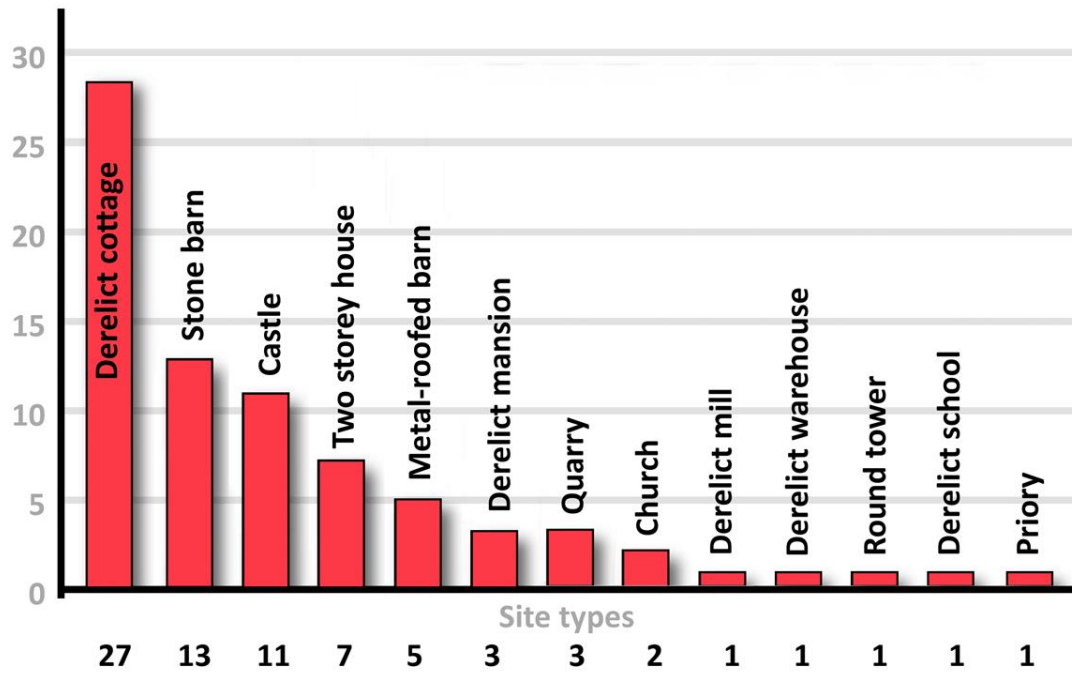


Figure 3.2 Variation in all site types surveyed (n=76).



Image 3.1 An example of a derelict cottage which were the most common site type within the survey area.



Image 3.2. Roscam Round Tower and Merlin Park Castle, a Category 1 and Category 3 site respectively.

A total of 47 (63%) sites were assigned to category 0 as they were considered to be entirely unsuitable for Barn Owls, 11 (14%) were assigned to Category 1, offering potential for roosting, though unlikely for nesting. Four (6%) were assigned to Category 2, having likely roosting and/or nesting opportunities. The remaining 14 (15%) sites were Category 3, as they offered excellent roosting and nesting opportunities (Figure 3.3 and 3.4 below). Therefore there were a total of 29 sites that could be used by Barn Owls in the survey area.

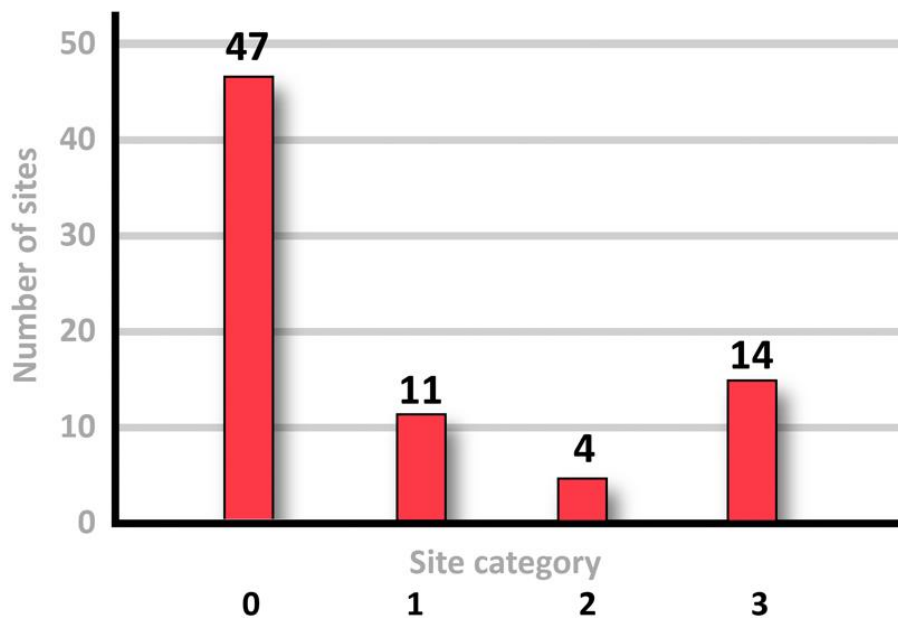


Figure 3.3 The variation in suitability (categories 0 – 3) across all sites surveyed (n = 76)

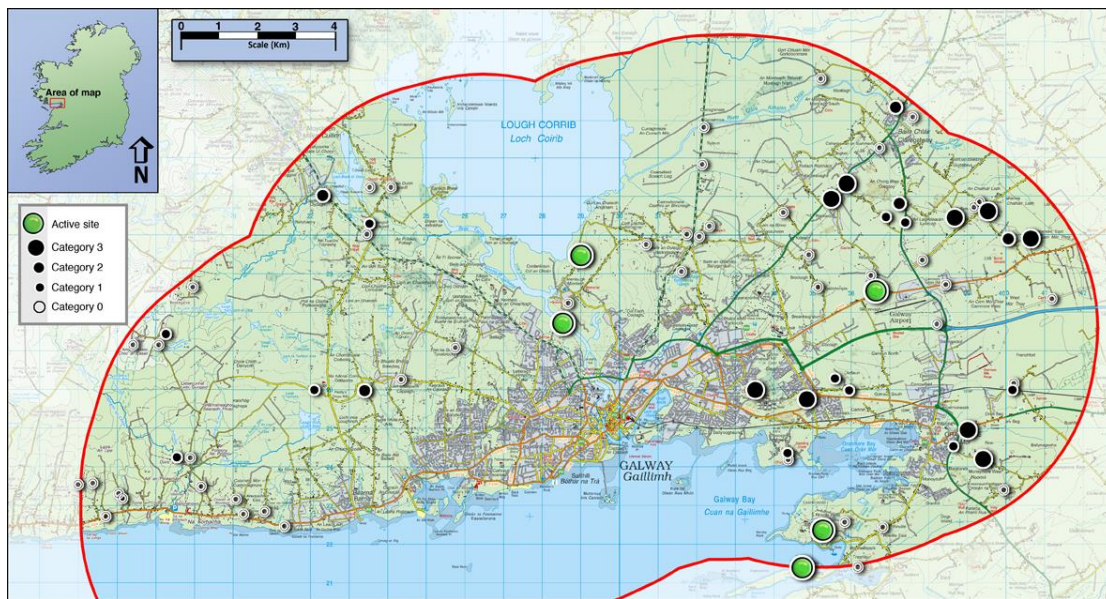


Figure 3.4 The distribution and suitability of all sites surveyed (n = 76)

The presence of Barn Owls was confirmed at five of these sites within the survey area, which included all three sites which were previously known to BirdWatch Ireland and an additional two previously undocumented sites. These included two castles, a ruined mansion, a derelict two-story farmhouse and a quarry. The distribution of all sites is shown in Figure 3.5 below.



Figure 3.5 The distribution of all sites where signs of Barn Owl were recorded

A total of 21 nocturnal visits were carried out across all 14 sites classed as category 3 both to determine occupation, and for those sites where signs were encountered, to determine activity and breeding status. Two sites in castles were confirmed as nest sites, a ruined mansion was classed as

regular roosts which are likely to be associated with both nesting pairs, and an independent occasional roosting site in a derelict farm house was also recorded. Monitoring revealed that both nesting sites failed to breed in 2014. A map showing the location and status of each site is shown below (Fig 3.6) followed by additional relevant information on each individual site.

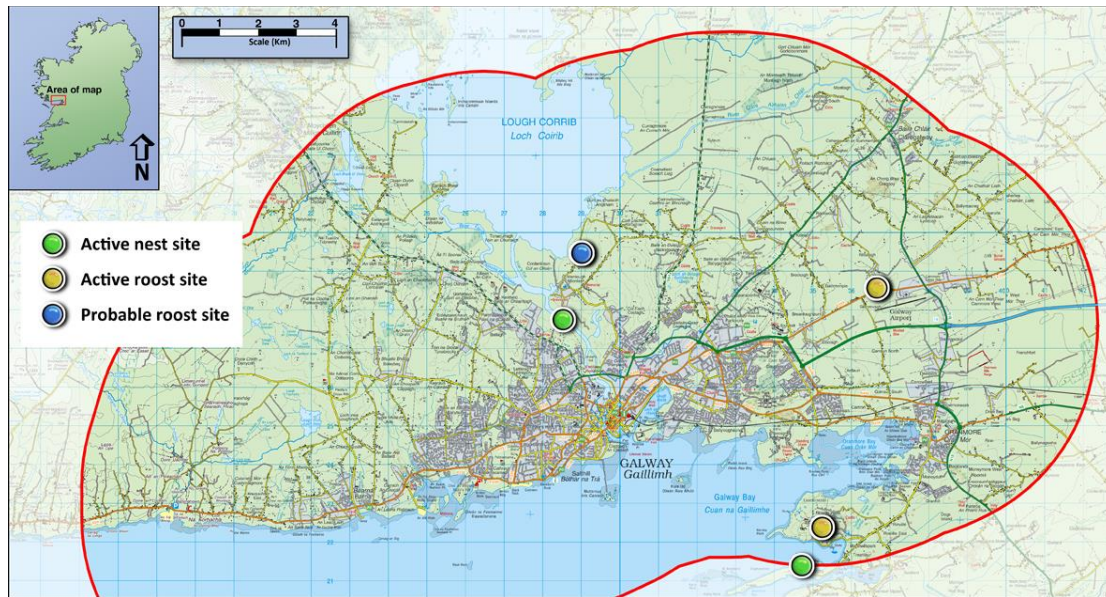


Figure 3.6 The location and status of all Barn Owls sites within the survey area

Site Name	Site Type	Pair	Nest/Roost
Menlough Castle	Castle	Yes	Nest
Ardfry House	Castle	Yes	Nest
Rinville House	Ruined mansion	No	Roost
Carnmore	Derelict farm house	No	Occasional roost
Anglingham Quarry	Quarry	Unknown	Unknown

Table 3.1 The location and status of all active sites

Ardfry House

Status: Ardfry house is a traditional Barn Owl nest site which has been active for over six years. A pair was confirmed in 2014 but did not breed successfully. The last recorded successful breeding attempt was 2011. Ravens were also present in 2014 and Kestrel have also previously nested within the building, but not in 2014.



Image 3.3. Ardfry house

Menlough Castle

Status: Menlough castle is a traditional nest site with records of Barn Owl occupancy as far back as the early 1970's (Fairley and Clark, 1972, Clark, 1974). A pair was recorded in 2014 and breeding activity was confirmed but they did not breed successfully, and this site has not produced young in the last five years, which may be as a result of human disturbance.



Image 3.4. Menlough Castle

Rinville house

Status: This is a traditional roost site which is located across the bay <1.5km and within sight of Ardfry Castle, and is likely to be used as a regular roost site by the nesting pair from the latter site. Breeding attempts have however been recorded at Rinville house but successful breeding has not been recorded in the last five years, although the site has been regularly used over this period.

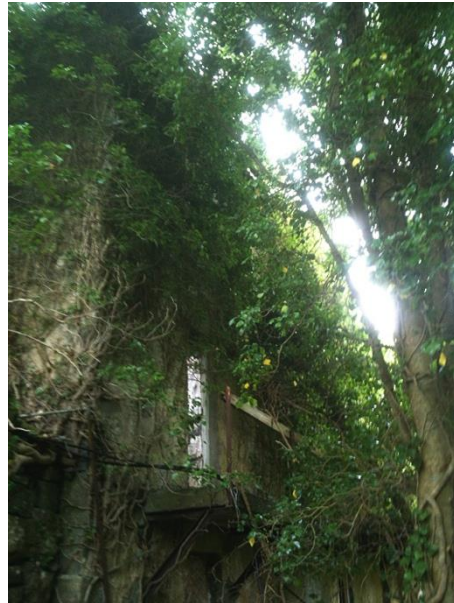


Image 3.5. Rinville House

Carnmore farm house

Status: This site was discovered for the first time during the course of the current survey work. Four Barn Owl pellets were found on the 2nd of July 2014, however these were not deemed to be fresh (> 2 months old) and there were no other signs recorded. Nocturnal visits confirmed the site to be inactive and therefore it is classed as an occasional roost. Further visits would be required to determine how regularly this site may be used or whether it was only occupied for a short period by a dispersing bird.



Image 3.6 Carnmore farm house

Anglingham Quarry

Status: Anglingham quarry provides numerous suitable roosting and nesting opportunities for Barn Owls. Although no signs to indicate the presence of Barn Owls were confirmed during the initial

daytime inspection, a nocturnal visit was conducted on the 3rd of July which recorded the presence of an adult male calling from within the quarry. A repeat visit on the 18th of July recorded no vocalisations or other indications of activity. This site is located approximately 2.3km from Menlough Castle and it is possible that the calling male was from the latter site. However it is possible that Anglingham Quarry is an independent roost site, a site occupied by a lone male or a nest site which had already failed by the time it was discovered during the course of this survey work. Further monitoring during the breeding season 2015 would be required to accurately determine the status of this site. Therefore the status of this site is listed as unknown.



Photo 3.7. Anglingham Quarry.

4.2 *Other raptor records*

Although the methods of this survey were specifically designed to confirm Barn Owl distribution within the survey area, other raptor species which were encountered during survey work in 2014 were also recorded. A total of 17 other raptor sites were confirmed, which included eight Kestrel sites (three nests and five roosts), six Peregrine sites (three nests and three roosts), two Sparrowhawk sites (one nest and one displaying pair) and a single Long-eared Owl nest. The details of all sites are shown below in Table 3.2 and Figure 3.7. Specific surveys were not undertaken for these species and therefore these sites should not be assumed to be a complete representation of raptor activity within the Barn Owl survey area, but merely those encountered as part of the Barn Owl survey.

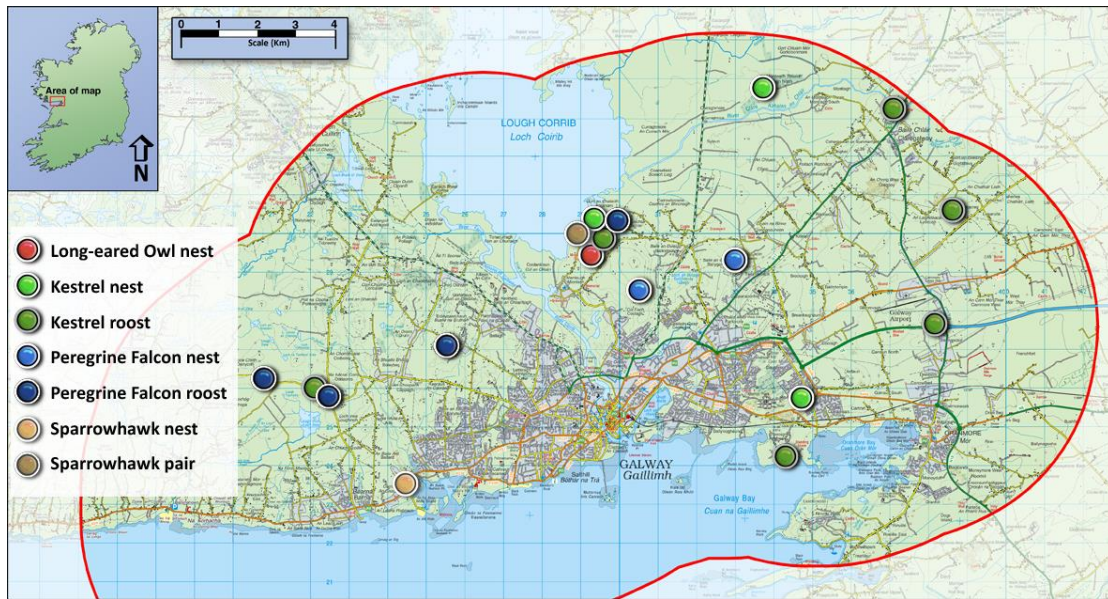


Figure 3.7 The distribution and status of all other known raptor sites in the survey area in 2014

Species	Site type	Nest/roost 2014
Peregrine	Quarry	Nest
Peregrine	Quarry	Nest
Peregrine	Quarry	Nest
Peregrine	Quarry	Roost
Peregrine	Quarry	Roost
Peregrine	Quarry	Roost
Kestrel	Quarry	Nest
Kestrel	Building	Nest
Kestrel	Tree	Nest
Kestrel	Building	Roost
Kestrel	Building	Roost
Kestrel	Building	Roost
Kestrel	Building	Roost
Kestrel	Quarry	Roost
Sparrowhawk	Tree	Nest
Sparrowhawk	Unknown	Pair observed
Long-eared Owl	Tree	Nest

Table 3.2 The site type and status of all other raptor sites within the survey area in 2014

5. RECOMMENDATIONS

This study provides information on Barn Owl site locations within the survey area, which will help inform the constraints study for the N6 Galway City Transport Project in order to minimize the negative impacts to Barn Owls. It is recommended that once the proposed options are selected that appropriate mitigation recommendations are developed and should be based on more detailed information on the location of active nest and roost sites in relation to the proposed options and the physical characteristics of the road which will influence risk of collision. In addition a habitat survey of the areas adjacent to the proposed route will also influence risk level and data on habitat and landscape characteristics should also be used to inform appropriate mitigation. GPS tracking or radio telemetry may be employed as a means of determining Barn Owl habitat use, movements and home range in relation to the options developed in order to employ the most appropriate mitigation.

Continued monitoring of registered sites during the post construction phase should be implemented to assess the impacts on the local Barn Owl population and the effectiveness of mitigation measures applied. This should include monitoring of known sites to determine activity, survival and dispersal in combination with a road casualty survey conducted over a one year period to record all road collision victims and to identify potential "hot spots" which may require mitigation.

Recommendations

- Barn Owl experts should inform appropriate mitigation based on the proposed options, proximity to known Barn Owl sites, road characteristics, as well as adjacent habitat and landscape characteristics.
- A detailed plan for post construction monitoring should be developed and implemented, which may include monitoring the status of known sites within the Barn Owl survey area, monitoring survival and dispersal and a comprehensive road casualty survey conducted for a period of one year after the route opens in order to determine the impact of the development on the local Barn Owl population as well as dispersing individuals.

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