Appendix A.8.16

Peregrine Falcon Surveys and Mitigation

Part 1 - 2016 Surveys
Part 2 - 2016 Surveys
Part 3 - 2023 Surveys
Part 4 - Mitigation

A.8.16 Peregrine Falcon Surveys and Mitigationgin

Part 1- 2016 Surveys16 Surveys

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The occupancy and breeding status of Peregrine Falcon *(Falco peregrinus)* in quarries within the survey area for the proposed N6 Galway City Ring Road 2016

Prepared for Scott Cawley

By
John Lusby

BirdWatch Ireland

TABLE OF CONTENTS

LIST OF FIGURES

1. BACKGROUND

The Peregrine Falcon *Falco peregrinus* is an Annex I species listed on the EU Birds Directive (2009/147/EEC) and is protected nationally under the Wildlife Act 1976 and Amendment Act 2000.

Peregrine Falcon populations suffered extensive declines in Ireland and Britain throughout the 1950s and 1960s due to the widespread use of organo-chlorine pesticides (Ratcliffe 1993, Crick & Ratcliffe 1995). These organo-chlorine compounds including DDT and HEOD are persistent in the environment and accumulate in sub-lethal levels in prey species taken by Peregrine, causing egg shell thinning and breakage resulting in reduced productivity, as well as infertility and mortality in adults (Newton 1979, Crick & Ratcliffe, 1995). The Peregrine population in Ireland reached an all-time low of fourteen recorded breeding pairs in 1970 (Temple-Lang 1970). After restrictions on the use of organo-chlorine pesticides, the Peregrine population slowly recovered and since the 1970s have increased in range and numbers. In 1981 the first national survey of Peregrine Falcons in the Republic of Ireland recorded a total of 225 occupied territories (based on approximately 50% coverage of the breeding range in 15 representative areas) (Norriss *et al.* 1983). The third and most recent national survey of breeding Peregrine in the Republic of Ireland in 2002 estimated 390 occupied breeding territories (Madden *et al.* 2009). A marked range expansion in recent years has also been documented by the Breeding Bird Atlas of 2007–11 (Balmer *et al.* 2013), which recorded 'confirmed' or 'probable' breeding for Peregrine in 217 10km squares in Ireland, representing an increase of 343% and 119% since 1968-1972 and 1988-1991 respectively (Gibbons *et al.* 1993, Sharrock 1976). In the Birds Directive Article 12 analysis and reporting Peregrine is listed as increasing in Ireland as a breeding species for both long-term (1981 – 2012) and short-term (2002 – 2012) trends (NPWS 2013). The conservation status of the Peregrine Falcon is currently considered to be favourable in Ireland and as such they are green-listed on the Birds of Conservation Concern in Ireland (Colhoun & Cummins 2013).

Peregrines have traditionally used a range of natural nest sites including coastal cliffs, rock faces and rocky outcrops which provide suitable ledges for nesting (Ratcliffe 1993, Norriss *et al.* 1983, Hardey *et al.* 2009). Alongside the increase in range and numbers in recent decades in Ireland (Balmer *et al.* 2013) there has been a documented increase in the use of quarries and man-made structures for nesting. The national survey of Peregrines in the Republic of Ireland in 2002 demonstrated that the number of occupied territories on natural cliff sites remained virtually stable over the previous ten years, however the number of pairs nesting in quarries increased over the same period with almost one quarter of the recorded occupied breeding territories in quarries in 2002 (Madden *et al.* 2009). Recent evidence indicates that use of buildings has also increased dramatically. The 2002 national survey recorded breeding pairs on 11 buildings, however over three times this number of breeding sites on man-made structures were known in 2013 (J Lusby, pers comm), which is in the absence of a nationwide survey or specific monitoring focus (Madden *et al.* 2009, NPWS 2013).

Regardless of the site type, Peregrines require a suitable ledge or nesting area for breeding. They do not construct a nest, but rather scrape a shallow depression in the substrate on the nest ledge, typically 17 – 22cm in diameter and 3-5cm deep. The nest ledge is generally selected by the female, and is usually at least 50cm long and 50cm wide (Ratcliffe 1993) and will frequently be positioned under an overhang (Ratcliffe 1993, Hardey *et al.* 2009). The old stick nests of a range of species including Raven may also be used (Moore *et al.* 1997).

Peregrine's will usually hold territory at breeding sites from February onwards with courtship display and territorial behaviour increasing from February to late April. The male will begin to deliver prey to the female several weeks before egg laying, and will continue to provide food for the female during laying and incubation. Eggs are usually laid in early April to late April. Incubation lasts for 28-35 days, which is predominantly carried out by the female

(Ratcliffe 1993, Hardey *et al.* 2009). Peregrines will lay repeat clutches if the first clutch is lost or deserted early on, with the likelihood of relaying decreasing the later in the breeding cycle that the pair fails (Ratcliffe 1993). Ratcliffe (1993) estimates that a second clutch is usually completed 24-25 days after the loss of the first.

1.1 *Range of available survey methods for the species*

Survey methods employed by the national survey of breeding Peregrines in the Republic of Ireland in 2002 involved two site visits. The first visit in spring (between 18th March and 8th April 2002) aimed to determine if the territory was occupied. A territory was confirmed as occupied if a pair or single bird was observed on the first visit. A second visit between 15th to 30th June 2002 aimed to assess breeding success (Madden *et al.* 2009).

Hardey *et al.* (2009) recommends four visits from March to early July to establish occupancy and the presence of a breeding pair as outlined below. If there is no evidence of occupation on the first two visits, then further visits to that home range can be omitted. As eyries can be used by Peregrine over consecutive years, Hardey *et al.* (2009) recommends collating available information on Peregrine occupancy and nesting locations within an area to inform survey work. First visits to potential nesting territories should be carried out in March or early April to check for occupation. Survey work should focus on recording observations of birds or signs of occupation including active roosts, fresh kills and moulted feathers. Suspected nesting territories should be scanned from distance before being approached. Peregrine behaviour including courtship display, defensive behaviour, food passes etc. can indicate breeding activity and help determine the nest location. For large cliffs or nesting areas, watches should be carried out to determine activity. Subsequent visits aim to determine nest location and success, which incorporate a combination of sign searching and watches depending on the site and level of detail known from previous visits. Hardey *et al.* (2009) regards evidence of occupancy as the presence of a single bird or a pair, or of fresh signs of occupation that can definitely be attributed to Peregrine in a known or potential nesting territory during the breeding season.

1.2 *Nest site selection and success in quarries*

Raptors can be sensitive to a range of activities and may desert their nests in response to disturbances (Newton 1979). Different species and individuals within species may respond differently to human related disturbance. Birds which are frequently exposed to human activities may become more accustomed and tolerant of certain activities compared to those which do not regularly encounter human activities (Newton 1979). Peregrines have been documented nesting in densely populated urban environments and in close proximity to human activities in active quarries. Ratcliffe (1993) observed quarry nesting Peregrines which ignored frequent rock blasting within the quarry. In a survey of Peregrines in quarries in nine eastern counties in the Republic of Ireland, Moore *et al.* (1997) showed that Peregrines were equally likely to nest in active or disused quarries. Of the three occupied quarry sites recorded by this study for the proposed road development, one quarry was active during the monitoring period, which was also the only site to successfully fledge young. Peregrines have also been recorded to nest in close proximity to major roads, as is the case in an active quarry which held a breeding pair approximately 300m from the M6 motorway in 2016 (John Lusby, pers comm). Therefore, in certain situations Peregrines will tolerate and can successfully nest where there is human activity. Nevertheless, the impact of disturbance will vary according to many factors including the level and type of disturbance, the tolerance of an individual or pair to disturbance, the stage of breeding cycle in which the disturbance occurs, the proximity of the disturbance or human activity to the nest, and can also be influenced by additional stresses on the individual or pair (e.g. weather, food supply etc). Even at sites where birds tolerate regular human activity, an unusual or new activity has the potential to cause disturbance with the potential for negative impacts to breeding.

In addition to direct disturbance, physical works have the potential to alter the suitability and availability of nest sites which may also negatively affect Peregrine. Peregrines may prepare more than one nest each year and may switch from one to the other before laying (Newton 1979), however without close inspection of a site it is not possible to ascertain the suitability and availability of nesting ledges. Where suitable nesting sites do not exist, it is possible to artificially create or enhance nesting opportunities for Peregrine within quarries. Artificial works have been carried out at quarries in the US to enhance sites for breeding Peregrine, including adding substrate and removing sharp objects from existing ledges. Explosives were used to increase the size and nesting potential of a traditional Peregrine eyrie in northern California, which was subsequently successfully used by breeding Peregrine (Pagel 1989). Specific cliff features to encourage nesting Peregrine have been incorporated within a quarry re-habilitation project in Hong Kong (CSI Quarry Rehabilitation Guidelines).

1.3 *Peregrine use of quarries in the survey area for the proposed road development*

Peregrine Falcon are known to use several quarry sites within proximity to Galway City as confirmed by survey work for the proposed road development in 2014 and 2015, in addition to records collated from an independent monitoring study of Peregrines in County Galway coordinated by the National Parks and Wildlife Service (O'Brien, 2015). Five quarry sites were identified within a 5km radius of the route of the proposed road development where Peregrine activity has been previously recorded which has included a breeding pair or single bird. These sites were identified as priority for monitoring in 2016 to determine occupation and activity status of Peregrine. Breeding activity of Peregrine was not assessed at other sites within 5km of the route of the proposed road development during the course of survey work for the proposed road development.

2. INTRODUCTION

The objective of this study is to determine Peregrine occupancy, breeding status and nest site locations within identified quarry sites within the defined survey area to inform the environmental impact assessment of the proposed N6 Galway City Ring Road. This study did not attempt to undertake a complete survey to determine Peregrine distribution and abundance within the survey area in 2016.

As Peregrine may be sensitive to human related disturbance and persecution (NPWS 2013a), site locations were kept confidential by assigning each site a letter in alphabetical order from the most northerly (see Figure 2.1). An exception was made for nest sites which were within 200m of the proposed road development, which were named and location documented. The highest level of information on site and nest location were provided to the local authority and design team to inform the planning of the proposed road development.

The survey area for this study was defined by drawing a buffer of a radius of 5km from the proposed road development, which covers an area of 225km^2. Quarries were identified based on previous evidence through bird survey work for the proposed road development in addition to collation of available records of Peregrine Falcon occupation between 2014 and 2015 (see Figure 2.1). The centre point of the location of quarry sites as displayed are offset at random in relation to direction (360^0) and distance (0 – 800m) to conceal the identity of active sites which may be sensitive to disturbance (NPWS 2013a).

Figure 2.1 *The survey area for the Peregrine survey showing all five quarry sites where evidence of Peregrine was recorded between 2014 and 2015.*

The specific objectives of this study are to:

- Determine occupancy and breeding status of Peregrine in identified quarries within the survey area for the proposed road development
- Identify specific nest site locations of confirmed breeding pairs in quarries

3. METHODS

Prior to conducting survey work, available information on the recent use of the five quarry sites by Peregrine within the survey area was collated through records from survey work for the proposed road development in addition to interviews with National Parks and Wildlife Service (NPWS) and local experts who independently monitor Peregrine populations in County Galway. To conceal the identity and location of quarry sites used by Peregrines, each quarry was assigned a letter in alphabetical order (A – E) from the most northerly to the most southerly.

The survey methods followed best practice survey techniques for Peregrine as defined by Hardey *et al.* (2009) and were adapted for the specific requirements and time scale of this survey.

The survey was initiated on the 12th of May 2016. The first survey visit, to establish occupancy at four quarries (Quarries A, C, D & E) was carried out between the 12th - 24th of May. Communications with quarry staff and National Parks and Wildlife Service staff in May confirmed that a breeding pair was present at Quarry B. As this is an active quarry, it was necessary to arrange access approval in advance of any site visit, and arrangements were made to visit the site in early June 2016, therefore this site was not included in the first survey visits during May 2016.

The first visit to the other four quarries (Quarries A, C, D & E) between the 12th – 24th of May involved a vantage point watch of three hours to record Peregrine activity. Watches were initiated between 06:00 to 10:00 in the morning or 18:00 to 19:00 in the evening and were conducted in suitable weather conditions. A vantage point watch was conducted from an appropriate and discrete position either within or outside the quarry to provide the best view of suitable rock faces. Searches were carried out in accessible areas to locate signs indicating use of the site by Peregrine including fresh kills, moulted feathers, and pellets, with particular attention given to suitable perches and areas where white-wash was observed. Sites were confirmed as occupied if a bird or pair were observed or if fresh signs were confirmed, and unoccupied if no evidence of Peregrine was recorded.

For sites which were confirmed to be occupied on the first visit, further visits were conducted between the 15th of May and the 10th of June 2016 to establish breeding activity, nest site location and breeding success as required. All follow up survey visits employed vantage point watches of between one to three hours to record Peregrine activity to determine breeding status, including defensive behaviour, attending or visiting a nest, food passes, prey deliveries and the presence of young. At sites where breeding was confirmed, the location of the nest was recorded where possible.

Breeding sites were confirmed to be successful if fledged young or young which were close to fledging were recorded. Sites were classed as failed if, based on the evidence it was apparent that a pair was present at the site and a breeding attempt had likely taken place but young were not successfully raised to fledging. Failed breeding attempts can be difficult to confirm, and can require monitoring from the early stages of the breeding cycle. As the survey was initiated after the typical courtship and laying stages for Peregrine (Ratcliffe 1993), the presence and behaviour of birds recorded during the monitoring period, in

addition to knowledge of the breeding status at the site in previous years was used to inform the likelihood that a breeding attempt had taken place.

4. RESULTS

Three of the five quarry sites visited were confirmed to be occupied by Peregrine in May 2016. Quarry A and C were confirmed to be occupied based on observations of a single Peregrine at both sites on the first survey visit. Quarry B was confirmed to be occupied through communications with quarry staff and NPWS in May 2016. No evidence of Peregrine was recorded at Quarry D and E on the first visit and these sites were classed as unoccupied in May 2016.

Follow up visits to the three occupied quarries (A, B & C) confirmed that pairs were present at all sites. A successful breeding pair was recorded at Quarry B based on the observation of young in the nest which were close to fledging. Successful breeding was not recorded at Quarry A and C, and based on evidence collated at both sites in addition to previous knowledge of breeding activity at these sites, both were classed as failed breeding pairs.

The survey findings and breeding status for each occupied site in 2016 is detailed below.

Quarry A:

Survey visit 1 - 12.05.2016
Vantage point watch: 18:15 – 21:15
A single male Peregrine was recorded. The bird arrived into the quarry from the west carrying prey. The bird perched on the rock face on the back wall in the eastern section of the quarry and remained for over 10 minutes before departing to the east over the back wall and out of view carrying the prey.

Visit 2 – 15.05.2016
Vantage point watch: 09:35 – 11:30
A single male Peregrine was recorded. The bird arrived into the quarry (direction not observed), and perched on the back wall and remained for over 30 minutes. No calling was recorded. The bird departed to the south-west.

Visit 3 – 27.05.2016
Vantage point watch: 10:05 – 12:05
A pair of Peregrine were observed on arrival to the quarry perched at the back wall, they remained for over one hour until they both flushed without calling or any indications of defensive behaviour recorded, and did not return within the next hour.

Visit 4 – 01.06.2016
Vantage point watch: 08:20 – 10:20
No Peregrine were recorded.

Site synopsis:
Based on the presence of a pair (27.05.2016), a male recorded delivering prey to the quarry (12.05.2016) and the history of breeding at this site, it is likely that this pair attempted to breed in 2016. It was not possible to determine a specific nest site location used or stage of failure for this pair as they were not recorded attending or visiting a nest site during the monitoring period.

Quarry A held a pair and is classed as a failed breeding site in 2016.

Quarry B:

Visit 1 – 10:06:2016
Vantage point watch: 12:00 – 13:00
A watch was carried on at the nest location, which was a ledge close to the top of the wall and surrounded by vegetation. Well developed young were observed on the nest ledge, and a prey delivery to the nest was recorded.

Site synopsis:
This site was recorded as a successful breeding site based on the confirmation of well - developed young in the nest.

Quarry C (Lackagh Quarry):

Survey visit 1 - 24.05.2016
Vantage point watch: 07:30 – 10:30
A single Peregrine (sex unknown) was recorded flying out of the quarry to the south-east.

Visit 2 – 25.05.2016
Vantage point watch: 07:05 – 10:00
A female was observed within the quarry on arrival. This bird remained in position for over 40 minutes, calling occasionally. A Raven family party came within 70m of this female and there was no obvious reaction observed. A Kestrel also came within 50 - 100m while hunting above the Peregrine without any reaction. A male Peregrine was observed in flight through the quarry and continued out of view to the south-east while the female remained perched on the quarry wall.

Visit 3 – 27.05.2016
Vantage point watch: 08:00 – 09:45
No Peregrine were observed.

Visit 4 – 10.06.2016
Vantage point watch: 07:30 – 10:30
No Peregrine were recorded.

Site synopsis:
Based on the presence of a pair (25.05.2016), the history of breeding at this site and the fact that recorded activity occurred in proximity to the nest location previously used, it is likely that this pair attempted to breed in 2016. It was not possible to determine a nest site location used or stage of failure for this pair as they were not recorded attending or visiting a nest site during the monitoring period.

Lackagh Quarry held a pair and is classed as a failed breeding site in 2016.

The distribution and status of all quarry sites monitored in 2016 is shown below in Figure 3.1 and Table 3.1. The centre point of the location of quarry sites as displayed are offset at random in relation to direction (360^0) and distance (0 – 800m) to conceal the identity of active sites which may be sensitive to disturbance (NPWS 2013a).

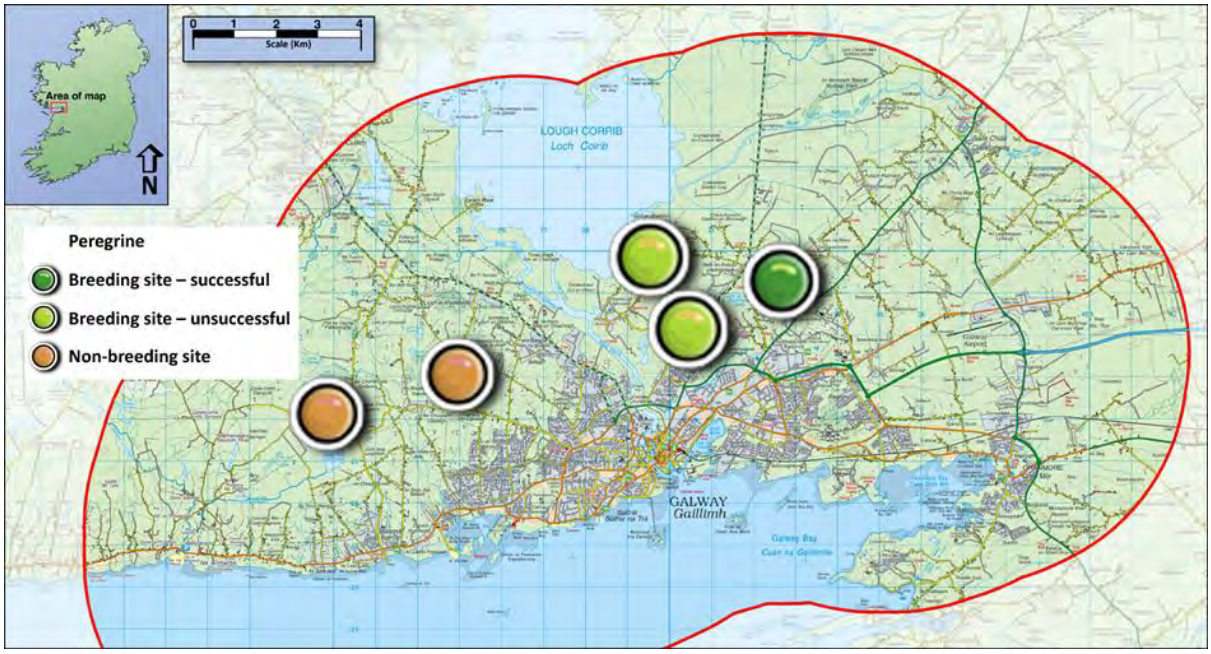

Figure 3.1 *The distribution and status of Peregrine Falcon in quarry sites (n = 5) within the survey area in 2016*

4.1 Additional records outside the survey area in 2016

In addition to the quarry sites monitored within the defined survey area, one quarry within 300m of the survey area was also confirmed to be occupied by breeding Peregrine in 2016. An active quarry, just north of the M6 motorway and situated approximately 300m from the eastern boundary of the survey area, was visited on the 31st of May 2016. A nest site with female brooding young was recorded on the north facing wall in the southern section of the quarry.

4.2 Additional records within the survey area in 2017

Based on confirmation of a failed pair of Peregrine in Lackagh Quarry and the timing of the survey conducted, it was not possible to identify the specific location the nest ledge in 2016. A portion of the proposed road development traverses through Lackagh Quarry and therefore this site was monitored in 2017 to determine occupancy, breeding status and identify the specific nest location if possible to appropriately inform the environmental impact assessment for the proposed road development.

A three hour watch (06:10 – 09:10) was conducted from a suitable vantage point above the quarry on the 12th of May 2017. A breeding pair was confirmed and the nest location was identified. These results were used to inform the planning of the proposed road development.

5 CONCLUSIONS

This report provides information on Peregrine occupancy and breeding status in five quarry sites in the survey area for the proposed N6 Galway City Ring Road in the breeding season of 2016, with additional information on the nest site location at one site (Lackagh Quarry) in 2017.

Peregrine occupancy was recorded in three quarries in the survey area in May and June 2016, all of which held breeding pairs. One breeding pair was successful (Quarry B), with pairs in two quarries (Quarry A and Lackagh Quarry) failing to raise young. All three quarry sites which held breeding pairs in 2016 were known sites where Peregrine have previously nested and are regarded as traditional nesting sites. The specific nesting location was recorded for the single successful pair (Quarry B) in 2016, for the other occupied quarries (Quarry A and Lackagh) it was not possible to record a nest location in 2016. In 2017, Lackagh Quarry was monitored to determine breeding status and the nest site location, which confirmed a breeding pair and which identified the location of the traditional nest ledge. This information was used to inform the environmental impact assessment for the proposed road development.

ACKNOWLEDGEMENTS

Many thanks to National Parks and Wildlife Service who provided information on Peregrine within the survey area, particularly Irene O'Brien and Aonghus O'Donaill, and to quarry owners who allowed access to sites.

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Part 2 - 2018 Surveys e Falcon 8 Surveys

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Hardey *et al.* (2009) recommends four visits from March to early July to establish occupancy and the presence of a breeding pair as outlined below. If there is no evidence of occupation on the first two visits, then further visits to that home range can be omitted. As eyries can be used by Peregrine over consecutive years, Hardey *et al.* (2009) recommends collating available information on Peregrine occupancy and nesting locations within an area to inform survey work. First visits to potential nesting territories should be carried out in March or early April to check for occupation. Survey work should focus on recording observations of birds or signs of occupation including active roosts, fresh kills and moulted feathers. Suspected nesting territories should be scanned from distance before being approached. Peregrine behaviour including courtship display, defensive behaviour, food passes etc. can indicate breeding activity and help determine the nest location. For large cliffs or nesting areas, watches should be carried out to determine activity. Subsequent visits aim to determine nest location and success, which incorporate a combination of sign searching and watches depending on the site and level of detail known from previous visits. Hardey *et al.* (2009) regards evidence of occupancy as the presence of a single bird or a pair, or of fresh signs of occupation that can definitely be attributed to Peregrine in a known or potential nesting territory during the breeding season.

1.2 *Nest site selection and success in quarries*

Raptors can be sensitive to a range of activities and may desert their nests in response to disturbances (Newton 1979). Different species and individuals within species may respond differently to human related disturbance. Birds which are frequently exposed to human activities may become more accustomed and tolerant of certain activities compared to those which do not regularly encounter human activities (Newton 1979). Peregrines have been documented nesting in densely populated urban environments and in close proximity to human activities in active quarries. Ratcliffe (1993) observed quarry nesting Peregrines which ignored frequent rock blasting within the quarry. In a survey of Peregrines in quarries in nine eastern counties in the Republic of Ireland, Moore *et al.* (1997) showed that Peregrines were equally likely to nest in active or disused quarries. Of the three occupied quarry sites recorded by this study for the proposed N6 Galway City Ring Road GCRR, one quarry was active during the monitoring period, which was also the only site to successfully fledge young. Peregrines have also been recorded to nest in close proximity to major roads, as is the case in an active quarry which held a breeding pair approximately 300m from the M6 motorway in 2016 (John Lusby, pers comm). Therefore, in certain situations Peregrines will tolerate and can successfully nest where there is human activity. Nevertheless, the impact of disturbance will vary according to many factors including the level and type of disturbance, the tolerance of an individual or pair to disturbance, the stage of breeding cycle in which the disturbance occurs, the proximity of the disturbance or human activity to the nest, and can also be influenced by additional stresses on the individual or pair (e.g. weather, food

supply etc). Even at sites where birds tolerate regular human activity, an unusual or new activity has the potential to cause disturbance with the potential for negative impacts to breeding.

In addition to direct disturbance, physical works have the potential to alter the suitability and availability of nest sites which may also negatively affect Peregrine. Peregrines may prepare more than one nest each year and may switch from one to the other before laying (Newton 1979), however without close inspection of a site it is not possible to ascertain the suitability and availability of nesting ledges. Where suitable nesting sites do not exist, it is possible to artificially create or enhance nesting opportunities for Peregrine within quarries. Artificial works have been carried out at quarries in the US to enhance sites for breeding Peregrine, including adding substrate and removing sharp objects from existing ledges. Explosives were used to increase the size and nesting potential of a traditional Peregrine eyrie in northern California, which was subsequently successfully used by breeding Peregrine (Pagel 1989). Specific cliff features to encourage nesting Peregrine have been incorporated within a quarry re-habilitation project in Hong Kong (CSI Quarry Rehabilitation Guidelines).

1.3 *Peregrine use of quarries in the survey area for the proposed N6 GCRR*

Peregrine Falcon are known to use several quarry sites within proximity to Galway City as confirmed by survey work for the proposed N6 GCRR in 2014 and 2015, in addition to records collated from an independent monitoring study of Peregrines in County Galway coordinated by the National Parks and Wildlife Service (O'Brien, 2015). Five quarry sites were identified within a 5km radius of the route of the proposed N6 GCRR where Peregrine activity has been previously recorded which has included a breeding pair or single bird. These sites were identified as priority for monitoring in 2016 to determine occupation and activity status of Peregrine. Three occupied quarry sites were confirmed as occupied in 2016, all of which held breeding pairs, of which one pair was successful.

1.4 *Peregrine use of Lackagh Quarry*

In 2016 a pair of Peregrine were confirmed to be present at Lackagh Quarry which failed to breed successfully. Due to the proximity of this site to the proposed N6 GCRR, this site was monitored in 2017, which confirmed a successful breeding pair.

2. INTRODUCTION

The objective of this study is to determine Peregrine occupancy, breeding status and nest site location in Lackagh quarry in 2018 to inform the Environmental Impact Assessment Report for the proposed N6 GCRR, hereafter referred to as the proposed road development.

The specific objectives of this study are to;

- Determine occupancy and breeding status of Peregrine in Lackagh quarry within the survey area for the proposed road development
- Identify the specific nest site location if a confirmed breeding pair are present

3. METHODS

The survey methods followed best practice survey techniques for Peregrine as defined by Hardey *et al.* (2009) and were adapted for the specific requirements and time scale of this survey and based on existing knowledge of use of the site by Peregrine. The survey was initiated on the 30th of May 2018, a vantage point watch was carried out which located nesting activity and subsequent visits on the 20th of June and 5th of July 2018 focused on monitoring the confirmed breeding location.

4. RESULTS

A breeding pair was confirmed in Lackagh quarry on the first visit on the 30th of May 2018, and the nest location was identified. The nest location was different to the nest used in 2017. This pair was successful in fledging young as confirmed by follow up visits.

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A.8.16 Peregrine Falcon Surveys and Mitigation

Part 3 - 2023 Surveys Surveys

Survey of Peregrine Falcon to inform the assessment of the Project

Prepared for Scott Cawley

By

J L Ecology

January 2024

Table of Contents

1. INTRODUCTION

The Peregrine Falcon (*Falco peregrinus)* is an Annex I species listed on the EU Birds Directive (2009/147/EEC) and is Green-listed on the Birds of Conservation Concern in Ireland (Gilbert *et al.,* 2013) due to its favourable conservation status. The Peregrine Falcon population is continuing to recover after extensive declines in their numbers and range during the 1950s and 1960s. These declines were largely driven by the widespread use of organo-chlorine pesticides (Ratcliffe, 1993; Crick and Ratcliffe, 1995) including DDT and HEOD which are persistent in the environment and accumulate in sub-lethal levels in prey species taken by Peregrine, causing eggshell thinning and breakage resulting in reduced productivity, as well as infertility and mortality in adults (Newton, 1979; Crick and Ratcliffe, 1995). In 1970 the Peregrine population was at an all-time low in the Republic of Ireland with only fourteen recorded pairs in the country (Temple-Lang, 1970) but started to recover after this time when restrictions on the use of organo-chlorine pesticides were introduced. In 1981 the first national survey of Peregrine Falcons in the Republic of Ireland recorded a total of 225 occupied territories (based on approximately 50% coverage of the breeding range in 15 representative areas) (Norriss *et al.,* 1983). The third national survey of breeding Peregrine in the Republic of Ireland in 2002 estimated 390 occupied breeding territories (Madden *et al*., 2009). A marked range expansion in recent years has also been documented by the Breeding Bird Atlas of 2007–11 (Balmer *et al*., 2013), which recorded 'confirmed' or 'probable' breeding for Peregrine in 217 10km-square grids (10 x 10km squares on the Irish National Grid) in Ireland, representing an increase of 343% and 119% since 1968-1972 and 1988-1991 respectively (Gibbons *et al*., 1993; Sharrock, 1976). The fourth and most recent national survey of breeding Peregrine in the Republic of Ireland in 2017 provided a minimum population estimate of 425 occupied territories based on sites surveyed within the core range, supplemented by additional records of 30 territories outside this range (Irish Raptor Study Group, unpublished data). The short-term (2002 – 2017) population trend is increasing (+8.9%) and the long-term population trend (1981 – 2017) is increasing (88.9%) as reported under Article 12. Peregrines have traditionally used a range of natural nest sites including coastal cliffs, rock faces and rocky outcrops which provide suitable ledges for nesting (Norriss *et al.,* 1983; Ratcliffe, 1993; Hardey *et al.,* 2009). Alongside the increase in range and numbers in recent decades in Ireland (Balmer *et al*., 2013), there has been a documented increase in the use of quarries and man-made structures, including buildings, for nesting and an increase in Peregrines nesting in urban environments.

The development of road infrastructure has the potential to affect the quality and quantity of available habitat for Peregrine, and cause displacement through disturbance and loss of nest sites. It is necessary to assess these potential impacts of road infrastructure on Peregrine populations and individual nest sites and to ensure appropriate protection for the species during the planning, construction and operation of such infrastructure and within the relevant legislative requirements.

This report details an assessment of the presence and distribution of Peregrine within the defined survey area surrounding the Project and includes the Assessment Boundary for the Project defined in Chapter 5 of the updated EIAR.

1.1 The presence of Peregrine in relation to the Project

A survey of Peregrine to identify breeding sites within 5km of the proposed N6 Galway City Ring Road (GCRR) was previously undertaken in 2014 and 2015 (Lusby, 2015). Traditional Peregrine breeding sites in the surrounds of Galway City have also been identified by the National Parks and Wildlife Service and these breeding sites are monitored on an annual basis as part of a dedicated Peregrine monitoring programme in County Galway. Over the past ten years (2014 – 2023), four Peregrine breeding sites have been identified by these sources within a 5km radius of the proposed N6 GCRR in County Galway. All four breeding sites are in quarries and are traditional nest sites that have been occupied by Peregrine for more than three years over the last decade.

1.2 Relevant legislation

All wild bird species in Ireland are protected under both national legislation and European legislation. The legislative framework under the Wildlife Acts 1976 - 2018 provides for the protection of all wild birds and their nests, eggs and young (www.npws.ie/legislation). It is an offence to intentionally cause disturbance at a nest site or to breeding Peregrine.

The European Communities (Birds and Natural Habitats) Regulations (2011-2015) transpose the EU Birds Directives (79/409/EEC) into Irish law. Article 5 of the EU Birds Directive prohibits '*deliberate killing by any method, deliberate destruction of, or damage to, their nests and eggs or removal of their nests, deliberate disturbance of these birds particularly during the period of breeding and rearing, in so far as disturbance would be significant having regard to the objectives of the Directive*'.

2. SURVEY METHODOLOGY

2.1 Defining the zone of influence

The zone of influence was defined by creating a buffer of 1km surrounding the route for the proposed N6 GCRR in County Galway as shown below in Figure 1. This zone of influence was informed by the estimated distances at which disturbance to Peregrine can occur (Goodship and Furness, 2022) to ensure inclusion and assessment of all Peregrine breeding sites which have the potential to be impacted by the Project.

Figure 1: The survey area for the survey of Peregrine

2.2 Collating information on Peregrine within the defined survey area

Information on the presence and distribution of Peregrine within the zone of influence (henceforth the defined survey area) was collated from various sources. The primary sources were the results and associated data derived through the survey of Peregrine Falcon within the study area undertaken previously to inform the environmental evaluation of the proposed N6 GCRR for the 2018 EIAR (2014 – 2015) (Lusby, 2015) and information from consultation with the National Parks and Wildlife Service in relation to the annual monitoring programme of Peregrine breeding sites in County Galway, which includes all known breeding sites in the defined survey area (Irene O'Brien, pers comm). Other sources of information were also interrogated to collate information on other sites which may not be included in the aforementioned above sources, which included published sources (*The Atlas of Breeding Birds in Britain and Ireland (1968-72); The New Atlas of Breeding Birds in Britain and Ireland (1989-91*); *The Bird Atlas (2077-11*)) and The National Biodiversity Data Centre.

2.3 Identification of potentially suitable sites for Peregrine within the defined survey area

To inform field surveys, all built-structures, quarries and rocky outcrops which may be suitable for breeding Peregrine were identified within the defined survey area. This included identification of all sites where Peregrine are known to have nested in the last ten years (2014 – 2023) within the defined survey area. This assessment was carried out to identify all sites which could be used by breeding Peregrine to inform the field surveys. The landowners of these sites were identified, where possible, to request permissions to access these sites to undertake a thorough investigation of the site, which included an inspection of the suitability of the site for Peregrine, a search for signs to indicate presence of Peregrine and/or undertake vantage point watches to determine occupancy and breeding status. To avoid duplication of survey effort and unnecessary risk of disturbance to breeding Peregrine, information on occupancy and breeding status of Peregrine at traditional sites was provided by the NPWS for selected quarry sites generated through their annual monitoring programme; these sites were not visited as part of this survey and communication was maintained with NPWS throughout the 2023 breeding season to ensure standardisation of data received. Where access to sites was not possible (landowner could not be identified / contacted or permission to access was not granted), the suitability of these sites to Peregrine could not be effectively determined; this was recorded as such.

2.4 Peregrine surveys

Field surveys were conducted between the 14th of April and the 26th of June 2023 to confirm Peregrine occupancy and breeding status at all accessible sites identified. The objective of the survey was to determine the breeding status (i.e. if a breeding pair was present and a breeding attempt occurred) and the nest site location to inform potential impacts and mitigation requirements where relevant and necessary. An inspection was carried out of the site to identify signs (*e.g.* prey remains, whitewash, pellets, etc.) to indicate the presence of Peregrine, followed by vantage point watch/es where necessary to confirm occupancy and breeding status at the particular site.

2.5 Survey limitations

The objective of the Peregrine Survey was to identify all Peregrine breeding sites within the defined survey area, however there are certain constraints to achieving this which should be recognised. There are a range of sites on the outskirts of Galway City centre which can be considered potentially suitable for breeding Peregrine and which are difficult to effectively survey due to access. To reduce the risk of overlooking such sites, consultation was carried out with Peregrine experts to identify any such sites. Given the location of potential sites in and around the city centre in relation to the survey area, it is considered that even if Peregrine did breed at such a site, they would not be affected by the Project.

The Peregrine survey was initiated in early May and all accessible sites were surveyed at least once in the May and June 2023, therefore it can be expected that breeding activity is confirmed at all sites surveyed where birds bred successfully. In instances where a breeding pair may fail early in the breeding season, prior to the survey visits, then it may not be possible to confirm breeding activity at that specific site.

The focus of the survey was to identify all breeding sites within the defined survey area. It is possible that there are sites used by Peregrine outside of the breeding season that have not been recorded, however the potential impacts to these sites are not considered to be significant as they are not associated with a breeding pair.

The objective of the survey was to confirm the breeding status at all sites where Peregrine were present. No attempt was made to gather information on breeding success or productivity of individual pairs or nesting attempts as this information is not considered to be necessary to inform the risks and impacts. Peregrine typically use the same nest sites each year and breeding success and productivity may vary over consecutive years

depending on a range of factors. Once a nesting attempt is initiated then this is sufficient information to determine that a breeding pair is present and to classify a site as a breeding site, even if that particular nesting attempt was not successful in that year.

3. RESULTS

3.1 Collating information on Peregrine within the defined survey area

The desk-based review identified four quarries where Peregrine have nested over the last ten years (2014 – 2023) within a 5km radius of the proposed N6 GCRR. Of these, two breeding sites in quarries are within the defined survey area and two breeding sites in quarries are located outside the defined survey area. Peregrine were confirmed to be nesting in three of these quarries during the survey of Peregrine Falcon undertaken previously to inform the environmental evaluation of the proposed N6 GCRR (2014 – 2015) (Lusby, 2015) and one quarry has been used by Peregrine for breeding since the aforementioned survey. All four sites have been confirmed and monitored on an annual basis by NPWS Peregrine monitoring programme (Irene O'Brien, pers comm).

3.2 Identification of potentially suitable sites to inform field surveys

The initial assessment identified six sites which included three quarries and three built structures as potentially suitable for breeding Peregrine within the defined survey area. This included the two quarries which are known to be traditional nest sites used by Peregrine in previous years. The built structures included two castles and one ruined mansion.

3.3 Peregrine surveys

Field surveys were carried out between the 14th of April and the 26th of June 2023 to determine the suitability for and the presence of Peregrine at all accessible sites identified as potentially suitable through this survey. The presence of Peregrine was confirmed at two of the six sites assessed within the defined survey area during the breeding season in 2023. These were two quarries which are both traditional nest sites used by Peregrine. A breeding pair was confirmed at one quarry, a nest attempt was initiated, and the nest location was identified. A breeding pair was confirmed at the second quarry, however this pair did not nest successfully in 2023 and a nest location was not identified. Peregrine were not confirmed at any other site assessed (n = 4) within the defined survey area during the breeding season in 2023. Peregrine breeding pairs were confirmed to be present in both quarries which are located outside the defined survey area, breeding attempts were recorded and nest sites located in both sites during the breeding season in 2023.

The nest site at one quarry is within the Assessment Boundary for the Project. The breeding pair at the second quarry are located approximately 400m from the Assessment Boundary for the Project.

The locations of all sites at which evidence of Peregrine was recorded in the defined survey area, including two confirmed breeding pairs and the two confirmed breeding pairs located outside the defined survey area, are shown in Figure 2.

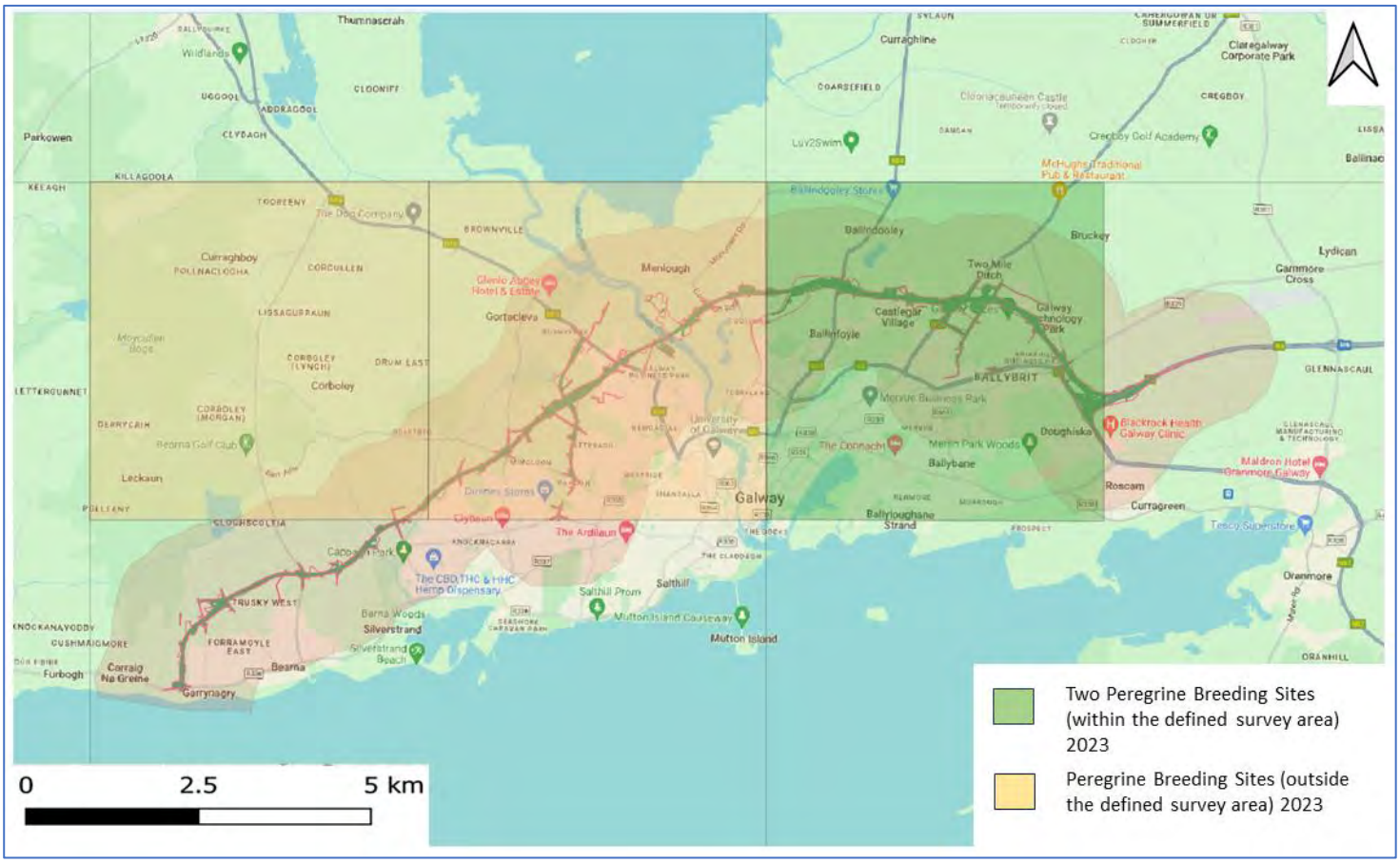

Figure 2: All sites where evidence of Peregrine was recorded in the defined survey area in 2023, including two breeding pairs inside and two breeding pairs outside the defined survey area

4. CONCLUDING STATEMENT

The presence of Peregrine was confirmed at two of the six sites assessed within the defined survey area during the breeding season in 2023. These were two quarries which are both traditional nest sites used by Peregrine. Informed by the NRA Ecology Guidelines, Peregrine, is considered to occur at levels within the defined survey area that are important at the County Level. This is based on the fact that Peregrine, which is a species protected under the Wildlife Acts and is on the Green-list on the *Birds of Conservation Concern in Ireland* (Gilbert *et al.,* 2021) occurs at levels (two breeding pairs confirmed within the defined survey area) that represents more than 1% of the County population (NRA, 2009) informed by the most recent Peregrine national survey in 2017 (IRSG, unpublished data) and annual monitoring of Peregrine in County Galway (Irene O'Brien, pers comm).

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A.8.16 Peregrine Falcon Surveys and Mitigation

Part 4a - Mitigation

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Recommendations for mitigation to minimise the impacts of the proposed N6 Galway City Ring Road on breeding Peregrine Falcon *(Falco peregrinus)* in Lackagh Quarry

Prepared for Scott Cawley

By
John Lusby

BirdWatch Ireland

SUMMARY

The Peregrine Falcon *Falco peregrinus* is an Annex I species listed on the EU Birds Directive (2009/147/EEC) and is protected nationally under the Wildlife Act 1976 and Amendment Act 2000. Lackagh Quarry, on the outskirts of Galway City is a traditional nesting site for Peregrine and the results of the ecological surveys undertaken for the N6 Galway City Ring Road (GCRR) identify that a breeding pair has occupied the site in each year between 2016 to 2019. The route for the proposed N6 GCRR traverses Lackagh Quarry and is therefore likely to reduce the suitability of the site for breeding Peregrine due to the existing nesting ledges becoming unsuitable and/or direct disturbance associated with construction or operation of the proposed road development. To minimise the potential impacts of the proposed road development of the N6 GCRR on breeding Peregrine in Lackagh Quarry, mitigation measures are included in the Environmental Impact Assessment Report (EIAR) for the N6 GCRR to reduce disturbance to breeding Peregrine during the nesting cycle. A seasonal constraint on construction works near Lackagh Quarry will be implemented, whereby works from the Lackagh Tunnel to the N84 Headford Road Junction will commence prior to mid-February. This will ensure that if its magnitude displaces Peregrine from the quarry, any construction related disturbance will be initiated prior to nesting and can influence nest site selection, which is targeted to reduce the likelihood of nest desertion and will not impact upon an incubating female in the nest. The installation of rock bolts on the cliff faces in the vicinity of the nest site will be undertaken in a sensitive manner (as advised by a suitably experience ecologist) so as to minimise any potential disturbance to the nest site during the breeding season. The mitigation strategy also includes for the retention of one of the two ledges previously used by breeding Peregrine (in 2016 and 2017) in Lackagh Quarry. However, there remains a risk that breeding Peregrine will be temporarily or permanently displaced from Lackagh Quarry as a result of the proximity of the road carriageway to the existing nest ledge which will be retained and due to the lack of suitable alternative ledges in the quarry post-construction as identified in the EIAR. The displacement of breeding Peregrine from Lackagh Quarry would likely result in a reduction in the breeding population of Peregrine in the survey area for the N6 GCRR, as there are no other suitable nesting opportunities available in this area which are not already occupied by breeding Peregrine. The loss of Lackagh Quarry as a breeding site for Peregrine has the potential to have long-term effects on the local population and is significant at the county geographic scale.

As identified in the EIAR for the N6 GCRR, the proposed road development will result in a significant residual impact on Peregrine falcon. In response to the submission made by the Department of Culture, Heritage and the Gaeltacht to An Bord Pleanála on the 21 December 2018 (see Appendix 1) and in an effort to reduce this residual impact, it is proposed to implement additional mitigation in the form of the provision of an alternative nest site for Peregrine at a suitable location in close proximity to Lackagh Quarry. The objective of this mitigation is to ensure that Peregrines, if displaced from the previously used nesting ledges in the quarry, can remain and breed in the area. An artificial nest site will be provided in a suitable location and will be in place prior to the commencement of works which have the potential to disturb or displace breeding Peregrine. Three locations which are suitable for the placement of an artificial nest site for Peregrine are identified. Although it is not possible to guarantee uptake of this artificial nest site, the provision of this site will increase the likelihood of the continued occupation of breeding Peregrine in Lackagh Quarry and its surrounds which would mitigate the significant negative residual effect on Peregrine at the local and county geographic scale as a result of the construction of the proposed N6 GCRR.

1. INTRODUCTION

The Peregrine Falcon *Falco peregrinus* is an Annex I species listed on the EU Birds Directive (2009/147/EEC) and is protected nationally under the Wildlife Act 1976 and Amendment Act 2000. The conservation status of the Peregrine in Ireland is currently considered to be favourable and as such they are green-listed on the Birds of Conservation Concern in Ireland (Colhoun & Cummins 2013).

The breeding population of Peregrine in Ireland is continuing to recover after a period of extensive declines during the 1950s and 1960s, which was primarily due to secondary poisoning by organochlorine pesticides that resulted in reduced breeding productivity and adult mortality (Ratcliffe 1993, Crick & Ratcliffe 1995). In 1970, only fourteen breeding pairs of Peregrine were recorded in Ireland (Temple-Lang 1970), with similar population declines documented in the UK, where direct persecution to reduce the threat posed by Peregrines to homing Pigeons during the war also contributed to the population declines (Ratcliffe 1993). After restrictions on the use of organochlorine pesticides, the Peregrine population has slowly recovered with an expansion in range and increase in numbers since the early 1970s. The Breeding Bird Atlases of 2007–11 (Balmer *et al.* 2013) shows a marked range expansion over this period, with 'confirmed' or 'probable' breeding for Peregrine recorded in 217 10km squares in Ireland in 2007-11 (Balmer *et al.* 2013), which represents an increase of 343% since 1968-1972 (Sharrock 1976). The breeding population of Peregrine in Ireland has been surveyed at intervals of approximately ten years or more since 1981, which shows a gradual increase in the population size over this period. The first national survey of Peregrine in the Republic of Ireland in 1981 recorded a total of 225 occupied territories (based on approximately 50% coverage of the breeding range in 15 representative areas) (Norriss *et al.* 1983). The third national survey of breeding Peregrine in the Republic of Ireland in 2002 estimated 390 occupied breeding territories (Madden *et al.* 2009). The fourth and most recent survey of Peregrine in the Republic of Ireland in 2017 shows a further increase to an estimated minimum population estimate of 425 occupied territories (IRSG, unpublished data).

DISTRIBUTION AND NEST SITE SELECTION

Peregrines have traditionally used a range of natural nest sites including coastal cliffs, rock faces and rocky outcrops which provide suitable ledges for nesting (Ratcliffe 1993, Norriss *et al.* 1983, Hardey *et al.* 2009). Alongside the increase in range and numbers in recent decades in Ireland (Balmer *et al.* 2013) there has been a documented increase in the use of quarries and man-made structures for nesting. The national survey of Peregrines in the Republic of Ireland in 2002 demonstrated that the number of occupied territories on natural cliff sites remained virtually stable over the previous ten years, however the number of pairs nesting in quarries increased over the same period with almost one quarter of the recorded occupied breeding territories in quarries in 2002 (Madden *et al.* 2009). Recent evidence indicates that use of buildings and other man-made structures by Peregrine in Ireland has also increased, with associated increases in Peregrine numbers in lowland areas away from the more traditional coastal and upland areas, which has included nesting within urban areas in cities and towns (J. Lusby *pers comm*.). The 2002 national survey recorded breeding pairs on 11 buildings (Madden *et al.* 2009), however the number of breeding sites on man-made structures is now substantially higher (J. Lusby *pers comm*, NPWS 2013). A similar trend has been recorded in the UK, in 2014 the breeding population of Peregrines in the UK, Isle of Man and Channel Islands was estimated at 1,769 pairs. This is 22% larger than the population estimate from the previous survey in 2002 (Wilson *et al.* 2017). Most of this increase is accounted for by increases in lowland England, whereas populations in some upland areas declined. Peregrines now breed in many towns and cities throughout the UK, using buildings, such as churches, warehouses, tall chimneys, and tower blocks; on industrial plants such as power stations, chemical processing plants and cooling towers; and in open country on pylons, radio masts, viaducts and bridges (Dixon & Shawyer, Drewitt 2014, Wilson *et al.* 2017). In North America, Peregrine populations have also increased in urban areas which has been attributed to an increase in the availability

of potential nest sites compared to those in natural and historical cliff habitats (Venu 2018). In the Eastern United States, the carrying capacity of Peregrine populations increased with an increase in urban nest sites (Gahbauer *et al.* 2015). In the Mid-west the Peregrine population is now predominantly concentrated in urban areas (Wakamiya & Roy 2009) constituting about 80% of nests on anthropogenic sites (Redig & Tordoff 1997).

PROVISION OF ARTIFICIAL NEST SITES

The provision of artificial nesting sites has also aided the population recovery of Peregrines and their colonisation of urban areas. Natural nest sites are typically located on cliffs, rocky outcrops or crags with ledges or cavities where the eggs are laid on a flat surface containing enough gravel or soil substrate for the birds to make a scrape or depression, while in the urban setting, artificial nest sites with gravel substrates located on structures serve the same purpose (Venu 2018). Artificial nesting sites are particularly beneficial in situations where traditional or existing nest sites are no longer suitable or where birds are present but where there are no suitable nesting sites (Dixon & Shawyer). The provision of artificial nest sites has facilitated a population increase and improved breeding for Peregrines in urban areas such as Cape Town, South Africa (Altwegg *et al*. 2014) and in the San Francisco Bay Area in the United States (Venu 2018). Several studies have recorded higher breeding productivity of Peregrines using artificial nest sites compared to natural sites, for example, Gahbauer *et al.* (2015) showed that nests with overhead cover had higher productivity than those without, as did nests in trays or boxes compared to sites without any human-provided nesting aids.

The most common artificial nest sites for Peregrine are large, open-fronted nest boxes made of wood or metal which are fitted to the exterior of buildings and other man-made structures including bridges, pylons and road infrastructures. There are several designs of nest boxes and the type of nest box and dimensions can be tailored to the specific requirements of the site, provided the nest box is sufficiently large, sheltered and protected from disturbance, with a suitable substrate for nesting and safe space or ledge for juveniles to move prior to fledging. In situations where there are no existing or suitable structures available, purpose-built towers fitted with a nest box can be erected. For example, a disused four-sided tower crane fitted with a nest box was installed at Battersea in the UK to provide a nest site for Peregrines which had previously nested on an adjacent building and resulted in the successful relocation of the pair (Nick Dixon *pers comm*). In addition to nest boxes, open trays can also be used where there is an existing sheltered ledge or within a structure which is protected from the elements (Dixon & Shawyer). The modification of existing ledges within quarries can also provide new or improved nesting opportunities for Peregrine. Such enhancement works have been carried out at quarries in the United States to improve sites for breeding Peregrine, including adding substrate and removing sharp objects from existing ledges. Explosives were used to increase the size and nesting potential of a traditional Peregrine eyrie in northern California, which was subsequently successfully used by breeding Peregrine (Pagel 1989). Specific cliff features to encourage nesting Peregrine have been incorporated within a quarry re-habilitation project in Hong Kong (CSI Quarry Rehabilitation Guidelines).

2. BREEDING PEREGRINE AND THE PROPOSED N6 GALWAY CITY RING ROAD

The distribution and breeding status of Peregrine Falcon in Galway City was assessed in the years between 2016 and 2018 to inform the Environmental Impact Assessment Report (EIAR) for the N6 Galway City Ring Road (GRCC). Potentially suitable nesting sites for Peregrine were identified within a 5km radius of the proposed N6 GCRR. These sites were monitored between May to July 2016 to determine the presence of Peregrine. Breeding Peregrine were confirmed at three sites within the survey area, all of which were quarries (Lusby 2017). The three quarries,

namely Angliham, Twomileditch and Lackagh were confirmed to be traditional nesting sites for Peregrine based on records of occupation in previous years, in addition to the confirmation of the presence of breeding Peregrine in these sites between 2016 to 2019 (Lusby 2018, Aonghus O'Donaill, *Pers comm*).

Of the three breeding sites confirmed within the survey area for the N6 GCRR, the Peregrine occupying Lackagh Quarry are considered to be at risk of impact from the proposed road development. The route for the proposed N6 GCRR traverses through Lackagh Quarry and is likely to reduce the suitability of the site for breeding Peregrine due to the existing nesting ledges becoming unsuitable and/or direct disturbance associated with construction or operation of the proposed road development.

BREEDING PEREGRINE IN LACKAGH QUARRY

In 2017 and 2018 additional monitoring was undertaken in Lackagh Quarry to determine the breeding status and nest location, and to assess the nest site availability to inform the impact assessments of the proposed road development on breeding Peregrine and the mitigation measures required to minimise the predicted adverse impacts.

In 2017, the Peregrine nested on a ledge close to the north corner of the east wall of Lackagh Quarry (Lusby 2017). This nest location is located less than 40m from the proposed road development. In 2018, the Peregrine nested on a ledge, over 100m to the west of the previous nest site, close to the top of the northern quarry wall (Lusby 2018). This nest site was also used in 2019 (J Lusby *pers comm*.) and is approximately 50m from the proposed road development.

Assessment of the available nesting opportunities for Peregrine in Lackagh Quarry indicated a limited availability of alternative suitable nesting ledges. The limited availability of nesting sites is also highlighted by the fact both of the ledges which have been used by breeding Peregrine in Lackagh Quarry are regarded as poor quality nest sites. The nest ledge used in 2016 and 2017 is prone to flooding (Aonghus O'Donaill *pers comm*), and the nest site used in 2018 and 2019 is situated less than one meter below the top of the quarry wall, which is not a typical nesting location for Peregrines (Ruddock & Whitfield 2007) and is considered vulnerable to human disturbance and predation (J. Lusby *pers comm*).

POTENTIAL IMPACTS OF THE N6 GALWAY CITY RING ROAD ON BREEDING PEREGRINE IN LACKAGH QUARRY

The legislative framework under the Wildlife (Amendment) Act, 2000 provides for the protection of all wild birds and their nests, eggs and young (www.npws.ie/legislation). It is an offence to intentionally cause disturbance at a nest site or to breeding Peregrine.

Peregrines are sensitive to a range of activities and can desert their nests in response to disturbances (Newton 1979), however the response to disturbance can vary between individuals and in relation to the nature, extent and timing of disturbance activities. Birds which are frequently exposed to human activities may become more accustomed and tolerant of such disturbances compared to those which do not regularly encounter human activities (Newton 1979). Peregrines nest in densely populated urban areas throughout their range (Wilson *et al.* 2014, Drewitt 2014, Venu 2018), in close proximity to human activities in active quarries (Moore *et al.* 1997, Lusby 2017) and on major road infrastructures (Venu 2018). In a survey of Peregrines in quarries in nine eastern counties in the Republic of Ireland, Moore *et al.* (1997) showed that Peregrines were equally likely to nest in active or disused quarries, and Ratcliffe (1993) observed quarry nesting Peregrines which ignored frequent rock blasting. One of the three breeding pairs of Peregrine within the survey area for the N6 GCRR nest in an active quarry (Lusby 2017). Peregrines have also been recorded nesting in close proximity to major roads in Ireland, including an active quarry which held a breeding pair located approximately 300m from the M6 motorway in 2016 (Lusby 2017). There are many examples of

Peregrines using artificial nest sites fitted to major road infrastructures such as bridges throughout their breeding range (e.g. https://www.newnybridge.com/peregrine-falcons/).

Although Peregrines can tolerate and successfully nest in proximity to human activity and associated disturbances, certain types of disturbances are tolerated over others. The impact of disturbance will vary according to many factors including the level and type of disturbance, the tolerance of an individual or pair, the stage of breeding cycle in which the disturbance occurs and the proximity of the disturbance to the nest. Breeding Peregrines are more likely to be disturbed by activities taking place above their nest (Herbert & Herbert 1969). Ratcliffe (1972) suggested Peregrines could tolerate any number of people in the nesting haunt, provided the eyrie was safe and inaccessible. The stage of the breeding cycle in which the disturbance occurs is also likely to be important, for example a pair may become accustomed to regular disturbance events over time (Ratcliffe 1993), whereas sporadic disturbance or disturbance which is initiated during a sensitive stage of the breeding cycle (e.g. laying, incubation) may be detrimental and cause desertion of the nest. Displacement to alternative nest sites can occur due to disturbance although this may be temporary depending on the disturbance source, or birds may be become reconciled to the disturbance and return to the disturbed nest site (Ratcliffe 1962).

It is not possible to determine the specific response of breeding Peregrine in Lackagh Quarry to the construction and operation of the proposed N6 GCRR, however, based on the proximity of the proposed road development to the previously used nesting ledges, the level of disturbance during the construction and operation, the fact that similar disturbance events have not recently occurred in Lackagh Quarry, and the lack of suitable alternative ledges in the quarry post-construction, it is likely that Peregrines will be temporarily or permanently displaced from Lackagh Quarry and its surrounds. To minimise the potential impacts of the proposed road development of the N6 GCRR on breeding Peregrine in Lackagh Quarry, mitigation measures are included in the EIAR for the N6 GCRR to reduce disturbance to breeding Peregrine during the nesting cycle. A seasonal constraint on construction works near Lackagh Quarry will be implemented, whereby works from the Lackagh Tunnel to the N84 Headford Road Junction will commence prior to mid-February. The seasonal constraint on construction works near Lackagh Quarry will ensure that any construction related disturbance will be initiated prior to nesting and can influence nest site selection, which is targeted to reduce the likelihood of nest desertion and impacts on an incubating female in the nest. The installation of rock bolts on the cliff faces in the vicinity of the nest site will be undertaken in a sensitive manner (as advised by a suitably experience ecologist) so as to minimise any potential disturbance to the nest site during the breeding season. The mitigation strategy also includes for the retention of one of the two ledges previously used by breeding Peregrine (in 2016 and 2017) in Lackagh Quarry. However, there remains a risk that breeding Peregrine will be temporarily or permanently displaced from Lackagh Quarry as a result of the proximity of the road carriageway to the existing nest ledge which will be retained and due to the lack of suitable alternative ledges in the quarry post-construction as identified in the EIAR. The displacement of breeding Peregrine from Lackagh Quarry would likely result in a reduction in the breeding population of Peregrine in the survey area for the N6 GCRR, as there are no other suitable nesting opportunities available in this area which are not already occupied by breeding Peregrine. The loss of Lackagh Quarry as a breeding site for Peregrine has the potential to have long-term effects on the local population and is significant at the county geographic scale.

3. RECOMMENDATIONS

As identified in the EIAR for the N6 GCRR, the proposed road development will result in a significant residual impact on Peregrine Falcon. In response to the submission made by the

Department of Culture, Heritage and the Gaeltacht to An Bord Pleanála on the 21 December 2018 (see Appendix 1) and in an effort to reduce this residual impact, it is proposed to implement additional mitigation in the form of the provision of an alternative nest site for Peregrine at a suitable location in close proximity to Lackagh Quarry. The provision of a suitable, alternative nest site, alongside the mitigation measures outlined in the EIAR, namely the seasonal constraint on the commencement of construction works at Lackagh Quarry and retention of one of previously used nest ledges, would reduce the risk of construction related disturbance effects to breeding Peregrine in the short-term (during the construction period) and reduce the risk of displacement of breeding Peregrine from Lackagh Quarry and surrounds in the long-term (during the operation of the proposed road development). Furthermore, given that the previously used nest ledges in Lackagh Quarry are deemed to be of poor quality, the provision of a suitable and safe nesting site could help to secure the future of Peregrine in this area. An artificial nest site of appropriate design will be in place prior to the commencement of works which have the potential to disturb or displace breeding Peregrine. Although it is not possible to guarantee uptake of this artificial nest site, the provision of this site will increase the likelihood of the continued occupation of breeding Peregrine in Lackagh Quarry and its surrounds which would mitigate the significant negative residual effect on Peregrine at the local and county geographic scale as a result of the construction of the proposed N6 GCRR. Should the artificial nest site be taken up by the resident pair of Peregrine (as confirmed by monitoring as outlined below) then the seasonal constraint on the commencement of construction works at Lackagh Quarry should be lifted, as this would not result in effects to breeding Peregrine.

Provision of an alternative nest site for Peregrine

It is recommended that an alternative nest site, consisting of a nest box fitted to a suitable structure is provided in close proximity to Lackagh Quarry (<1km) prior to the commencement of works which have the potential to disturb or displace breeding Peregrine. The objective of this mitigation recommendation is to ensure that Peregrines, if displaced from the previously used nesting ledges in the quarry, can remain and breed in the area. Three options are outlined as suitable locations for the installation of the artificial nest site as detailed, one of which is fitting a nest box to an existing structure and two are installing a purpose-built structure to accommodate a nest box. The nest box should be open-fronted with a sheltered cavity, containing a substrate (a mix of gravel or pea shingle and compost or woodchips) and sufficient space to allow the young to exercise in safety as they develop (Dixon & Shawyer). The nest box should be fitted with a raised edge to help retain the substrate and the juveniles as they become more active. The nest box should not be placed in locations facing full sun throughout the day (Ratcliffe 1995). The design and specifications of a nest box for Peregrine is detailed here: http://www.schwegler-natur.de/portfolio_1408366639/schwegler-wanderfalkennistkasten/?lang=en and included in Appendix 2 to this report. Two possible locations for this nest site are discussed below.

1: Communications tower

The communications tower (ITM 530660 728015) located approximately 500m to the south of the previously used nest ledges in Lackagh Quarry, and approximately 450m to the south of the proposed road development provides a suitable location and is the preference site for the provision of a nest box for Peregrine. The tower is located within sight and sufficiently close to Lackagh Quarry to increase the potential of uptake by breeding Peregrine if displaced from the quarry, while also located at a sufficient distance from the proposed road development to avoid disturbance associated with the construction and operation of the proposed road development. The nest box should be fitted close to the top of the tower (the top third of the tower) and should be in place prior to the initiation of works in Lackagh Quarry.

There are several aspects which need to be considered prior to the installation of a nest box on the communications mast. Firstly, as it is an offence to cause intentional disturbance to breeding Peregrine or their nest, this may impose a restriction on maintenance work (e.g. repairs) or other activities in close proximity to the nest site (a distance which could cause disturbance) during the nesting season, should the nest site be occupied. Secondly, it is typical for the ground level surrounding an active nest to be littered with feathers and bones of prey consumed by Peregrine.

If it is not possible to install a nest box to the existing structure, a purpose-built tower (as detailed below) could be installed in close proximity.

The location of the communications tower in relation to Lackagh Quarry is shown below in Figure 1.

Figure 1: The location of the communications tower (ITM 530660 728015) which would be suitable for the placement of a nest box for Peregrine (shown by the red pin).

2: Purpose-built tower

A purpose-built tower fitted with a nest box can be installed at either of the two locations proposed below. The purpose-built tower and nest box should be in place prior to construction activities in the quarry. The tower can be constructed from suitable materials provided it is safe, secure and long-lasting to accommodate a nest box of approximately 260kg (empty nest box). The tower can be of similar design to a pylon or tower crane, with four supporting bases, narrow four-sided tower with supporting girders. The nest box will be positioned at a minimum height of 25m above ground level. The nest box should be accessible to licensed professionals to allow maintenance and monitoring of the nest as required. A perimeter fence should be installed around the base of the tower to restrict access to the general public and to and reduce the potential for disturbance.

One example of a purpose-built tower for Peregrine which has been used to inform the design of the proposed tower at Lackagh Quarry is a disused four-sided crane tower with a nest box installed at Battersea in the UK to provide a suitable nest for Peregrine to encourage their relocation from nesting on a nearby building. The nest box in this situation was installed at 30m above ground level which was a similar height to the existing nest site on the building (Nick Dixon *pers comm*.) Images of this structure can be viewed here: http://parliamentperegrinediary.blogspot.com/, other examples of purpose built towers for Peregrine are included in Appendix 3.

Location 1 for purpose-built tower:
The Galway City Council owned lands to the south of the N6 GCRR and south east of Lackagh Quarry would provide a suitable location for an artificial nest site for Peregrine. The purpose-built tower should be sited at a minimum distance of 100m from the proposed road development, in the south west corner of the plot 586d.403 at approximately ITM 530736 728267 as shown in Figure 2 below.

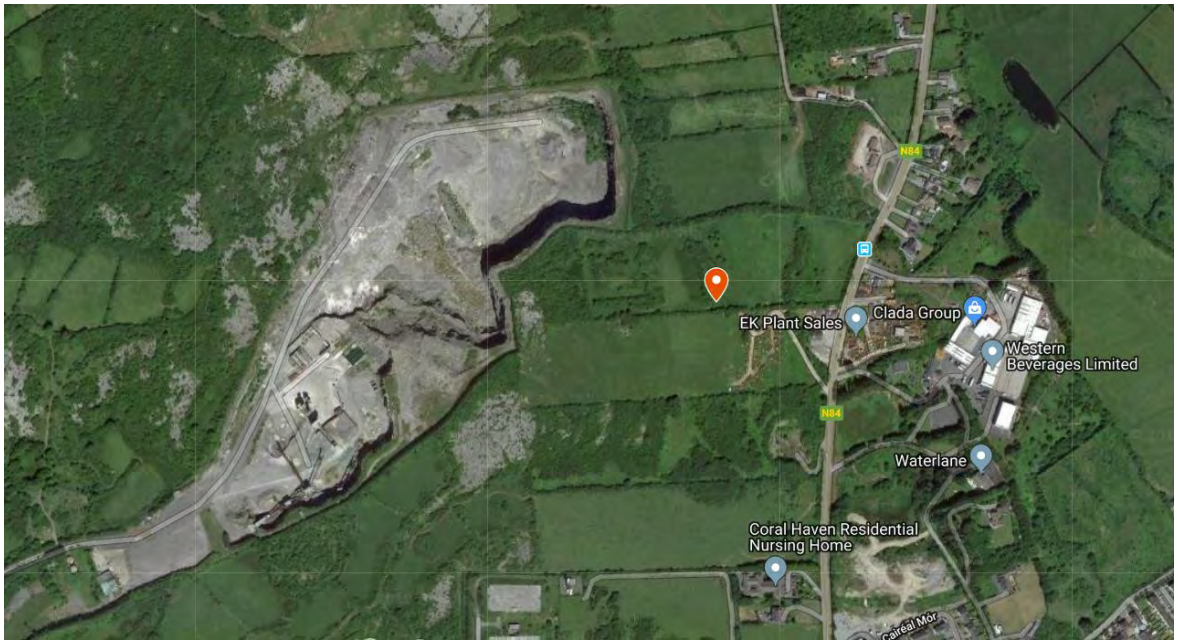

Figure 2: The proposed location for a purpose-built tower to accommodate a nest box for Peregrine (ITM 530736 728267 (shown by the red pin)).

Location 2 for purpose-built tower:
The area within the proposed development boundary for the proposed road development to the north of the nest site used in 2016/2017, in the north east corner of the quarry would provide a suitable location for the purpose-built tower, as shown in Figure 3 below.

Figure 3: The proposed location for a purpose-built tower to accommodate a nest box for Peregrine (shown by the red pin)*).*

Mitigation recommendation: Provide alternative nest sites for Peregrine
Objective: Minimise the potential that Peregrine are temporarily or permanently displaced from Lackagh Quarry and surrounds as a result of the construction of the N6 Galway City Ring Road
Mitigation measures (step by step approach): - An artificial nest sites of appropriate design for Peregrine to be provided in close proximity to Lackagh Quarry (<1km) - Examples of appropriate designs of nest boxes for Peregrine are detailed here: http://www.schwegler-natur.de/portfolio_1408366639/schwegler-wanderfalkennistkasten/?lang=en - The nest box should be open-fronted with a sheltered cavity, containing a substrate (a mix of gravel or pea shingle and compost or woodchips) and sufficient space to allow the young to exercise in safety as they develop (Dixon & Shawyer). The nest box should also be fitted with a raised edge to help retain the substrate and the juveniles as they become more active. - The nest box should not be placed in locations facing full sun throughout the day (Ratcliffe 1995) - The first option is for the nest box to be fitted to the communications tower (ITM 530660 728015). The nest box should be in place prior to the initiation of works which have the potential to cause disturbance to Peregrine in Lackagh Quarry. The nest box should be

secured close to the top of the tower (the top third of the tower) in a suitable location which provides a clear flight line to the nest box.

- Should it not be possible to install a nest box on the communications tower, a purpose-built tower should be installed: 1) to the south of the N6 GCRR on Galway City Council owned lands to the south-east of Lackagh Quarry, or 2) within the proposed development boundary for the proposed road development to the north of the nest site used in 2016/2017 in the north-east corner of the quarry. The purpose-built tower should be sited at a minimum height of 25m above ground level and should be in place prior to construction activities in the quarry.

Monitoring

Monitoring should be undertaken by a suitably qualified ecologist to determine the response of Peregrine to the disturbances associated with the construction of the proposed road development and to the mitigation measures implemented to determine their success. Monitoring should be carried out during March to July over a minimum of three visits as per the methods outlined in Lusby (2018) and Hardey *et al.* (2009) to identify the nest location and outcome of breeding including determining use of the artificial nest site, during the construction phase and for a period of three years once the proposed road development is in operation.

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APPENDIX 1.

Submission by the Department of Culture, Heritage and the Gaeltacht to An Bord Pleanála

In the EIAR, there is a degree of uncertainty as to whether Lackagh Quarry will remain a suitable breeding site for Peregrine during and post-construction. No alternative breeding site for the Peregrine pair associated with this nest site is known locally. To counterbalance the potential loss of this breeding resource, a suitable alternative nest site(s) needs to be created, noting that the most recent National Peregrine Survey did not record any urban nesting pairs from Galway City. There may be opportunities to install artificial nesting platforms or boxes on other suitable features or buildings. Failing that, a bespoke nesting structure in an appropriate area should be constructed.

The EIAR could benefit from more clarity as to the efficacy of the mitigation measure to temporarily dissuade active breeding of Peregrine at Lackagh Quarry by commencing works from the Lackagh Tunnel to the N84 Headford Road Junction prior to mid-February. The appropriateness of potentially working in the vicinity of, and disturbing an active nest site to install rock bolts on the cliff face may be challenging. If an alternative suitable Peregrine nesting resource was created prior to any road development works being undertaken then the possibility of temporarily rendering the nesting ledges at Lackagh Quarry unavailable for Peregrine during the construction period as a mitigation measure to avoid the disruption of a breeding attempt could be considered.

APPENDIX 2.

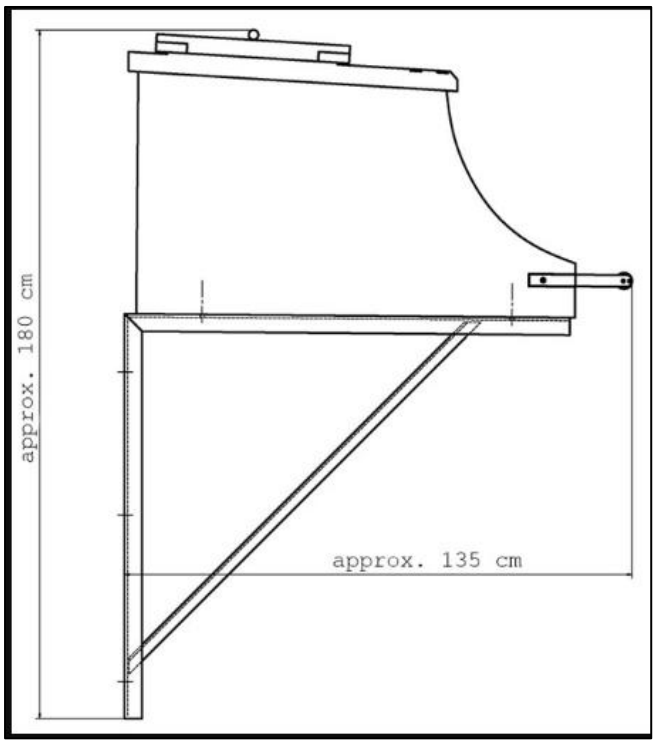
Peregrine Falcon Nest Box

(extracted from http://www.schwegler-natur.de/portfolio_1408366639/schwegler-wanderfalkennistkasten/?lang=en)

Installation height: Generally, in heights above 25 – 30 m. North- or east-facing sites have proved to be most effective. The "balcony" with its perch should be placed so that there is a clear area directly below. The box can be attached directly to a building using screws (e.g. on flat roof sections) or, by means of a mounting rack and wall plugs, onto an outside wall. Recommended litter/ bedding: Place some gravel or other loose material in the box. Peregrines do not construct nests, instead the female scrapes a hollow in which to hatch the eggs. The breeding period starts any time between mid-March and the beginning of April.

Material: Special, high-strength, reinforced lightweight concrete. This ensures that the box is very long-lasting (decades) and allows a proper and structurally correct manner of installation. The naturally grey, smooth concrete can be painted individually during installation to match the building, if required.

External dimensions: W 80 x H 73 x D 130 cm.
Nesting chamber: W 67 x H 54 x D 72 cm.
Weight: approx. 260 kg (empty box).



APPENDIX 3.

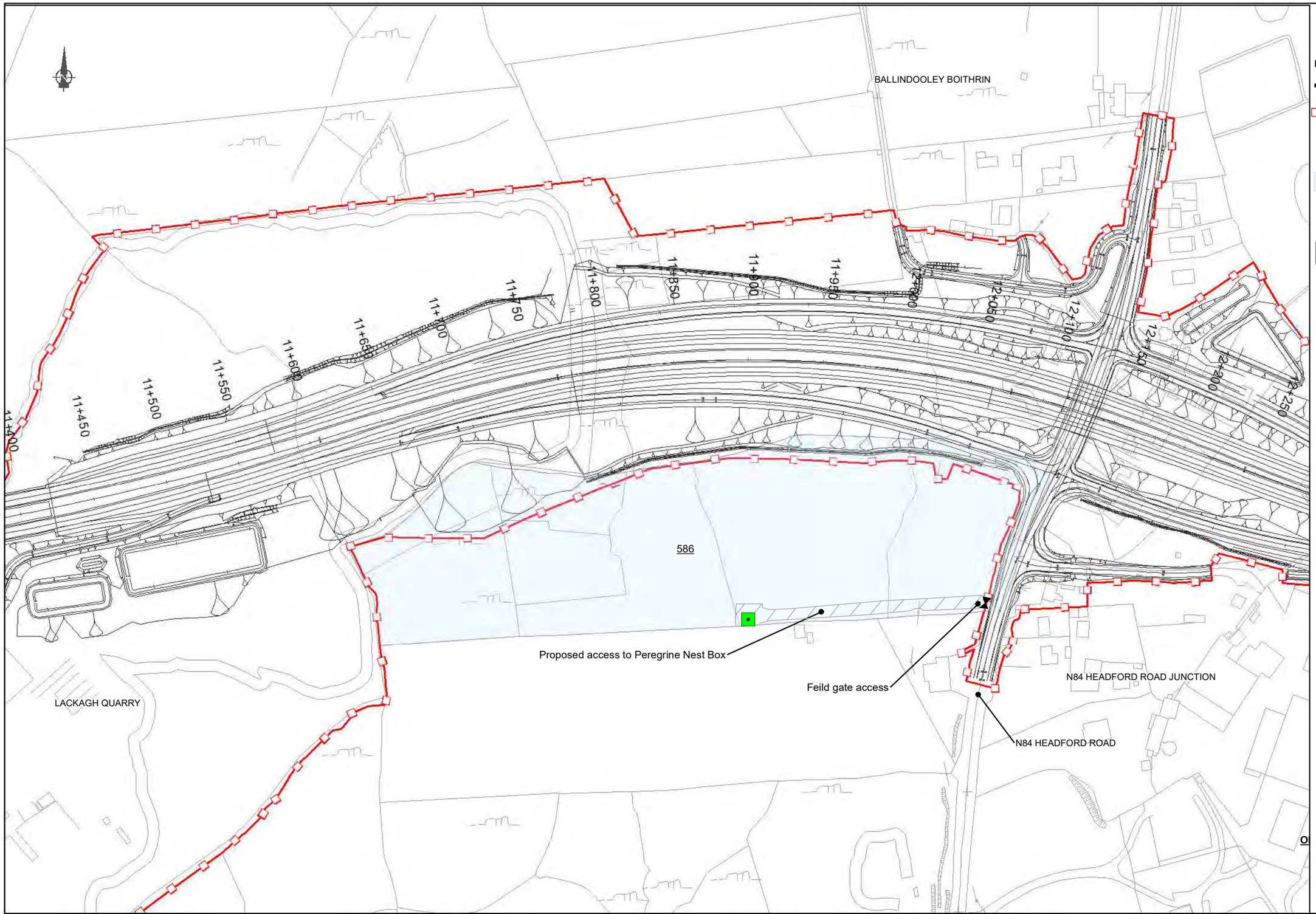
Examples of purpose-built towers which have been fitted with a nest box for Peregrines are shown below:

http://parliamentperegrinediary.blogspot.com/
http://www.friendsofcamas.org/projects/peregrine-tower-webcam-project
https://images.app.goo.gl/FsmGBHSdBwjNW1a86
https://www.gettyimages.de/detail/nachrichtenfoto/the-newly-erected-nesting-tower-designed-to-house-a-nachrichtenfoto/828929510
http://www.conservewildlifenj.org/blog/2018/02/09/photo-from-the-field-new-falcon-tower-on-bonnet-island-lbi/

A.8.16 Peregrine Falcon Surveys and Mitigation

4b - Peregrine Nest Box Location

A3



FOR INFORMATION

Legend

- CityBoundary
- Proposed Development Boundary
- Proposed Road Development
- Galway City Council Lands
- Proposed Pereguine Nest Box Location (10m x 10m)
- 4m wide access for Construction & Maintenance

Clients

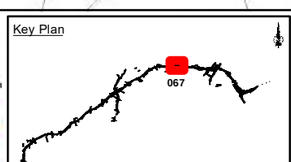
Comhairle Chontae na Gaillimhe Galway County Council

N6 Galway City Transport Project

An Roinn Iompair Turasóireachta agus Spóirt

TII

Key Plan



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Job Title
N6 Galway City Ring Road

Scale: **1:2,500**

Date: **Februay 2020**

Issue	Date	By	Chkd	Appd
D1	29/01/2020	AG	MH	EMC

Drawing Title
Proposed location of Peregrine Nest Box

Drawing Status
FOR INFORMATION

Job No	Drawing No	Issue
233985-00	GCRR-SK-PP-067	D1