BAT ECO SERVICES

Bat Survey

N2 Monaghan to Emyvale

Road Improvements

Dr Tina Aughney

2011

Report prepared for:

Monaghan County Council,
County Offices,
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SUMMARY

Name:	N2 Monaghan to Emyvale Road Improvements.
Description:	Phases 2-4 road improvements involving realignment and widening of current road scheme, approximately 7km in length.
Grid reference:	Various gird references listed in report.
Bat species present:	Soprano pipistrelle, common pipistrelle, Leisler's bat and Natterer's bat.
Roost location:	Potential Bat Roosts (PBRs) in selected trees and roosts located off-line.
Bat access:	Not applicable
Proposed works:	Removal of tree lines, potential removal of a cottage and old church ruins and removal of hedgerows to facilitate road widening.
Impact on bats:	Minor impacts on bats.
Bat survey by:	Dr Tina Aughney
Survey Dates:	23rd, 24th and 25th April 2011

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1. Introduction

N2 Monaghan to Emyvale Road Improvement Scheme is comprised of approximately 7km of road divided into 3 phases and located in the 10km squares of H6030 and H6040. A bat survey was commissioned to provide advice with regard to bat usage in vicinity of the proposed road scheme. This bat survey was undertaken on 23rd, 24th and 25th April 2011 and this report details the results of this survey and describes the bat fauna occurring in the area of the proposed road scheme.

Such surveying was completed due to the fact that bats are protected species under the Wildlife Act (1976) and Wildlife [Amendment] Act (2000). Across Europe, they are further protected under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982), which, in relation to bats, exists to conserve all species and their habitats. The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, enacted 1983) was instigated to protect migrant species across all European boundaries. The Irish government has ratified both these conventions. Also, the EC Directive on The Conservation of Natural habitats and of Wild Fauna and Flora (Habitats Directive 1992), seeks to protect rare species, including bats, and their habitats and requires that appropriate monitoring of populations be undertaken. All bat species are protected under Annex IV of the EU Habitats Directive, while the lesser horseshoe bat is listed under Annex II. Member states are required to designate Special Areas of Conservation for all species listed under Annex II in order to protect them.

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

1.1 Site description

The proposed road scheme is located north of Monaghan Town along the existing N2 heading north to the town of Emyvale. Potential Bat Sites were identified by Flynn, Furney Environmental Consultant ecologists and submitted to Dr Tina Aughney for surveying (See Table 1). During daytime inspection of proposed road route on 23rd and 24th April 2011, additional sites were identified by Dr Aughney as important bat sites (See Table 2).

Table 1: Potential Bats Sites identified by Flynn, Furney Environmental Consultants

Grid Reference	Site No.	Description
H67646 37318	Site 1	Old cottage in ruins, west of route
H67332 37835	Site 2	4 mature ash trees with ivy
H67236 38001	Site 3	Ruined church, east of route
H67274 38457	Site 4	Mature beech trees, east & west of route
H67403 40990	Site 5	Mature sycamore trees, east of route
H67582 42210	Site 6	Mature trees beside road and along stream
H67666 43341	Site 7	Mature ash tree

Table 2: Additional Potential Bats Sites identified

Grid Reference	Site No.	Description
H67332 37835	Site 2a	3 ash trees with heavy ivy growth, east of route
H67211 40062	Site 4a	Mature ash tree with heavy ivy growth, east of route
H67589 42086	Site 5a	2 mature trees with heavy ivy growth, west of route

1.2 Bat survey

This report presents the results of a site visit by Dr Tina Aughney on 23rd, 24th and 25th April 2011 during which the on-site buildings was inspected, Potential Bat Roosts (PBRs) in trees were inspected and identified and night-time bat detector surveys were undertaken in selected areas along the routes.

2. Survey Methodology

Survey of bat fauna was carried out by means of a thorough search of buildings on-site. Presence of bats is indicated principally by their signs, such as staining, lack of spider webs, feeding signs or droppings - though direct observations are also occasionally made. The nature and type of habitats present are also indicative of the species likely to be present.

This bat survey consists of the following elements:

- assessment of habitat survey maps to determine suitable foraging, roosting and commuting areas for bats
- collation of known bat records from the Bat Conservation Ireland database
- bat surveys to determine bat species roosting, commuting and foraging in vicinity of the proposed road route

The bat survey was carried on 23rd, 24th and 25th April 2011. Weather conditions on each of the survey dates were good with light winds and warm temperatures at the beginning of the evening while turning cooler by morning (See Table 3 for details).

Table 3: Bat Survey locations and weather conditions

Date	Location	Survey	Weather
23.4.2011	Cottage	Dusk Detector Survey	14.5 °C, clear sky, calm, dry
23rd to 24th	Cottage	Anabat SD1 Detector	14.5 – 10.7 °C, clear sky, dry, calm
23rd to 24th	Church Ruins	Anabat SD1 Detector	14.5 – 10.7 °C, clear sky, dry, calm
24.4.2011	Site 1 & Church Ruins	Dawn Survey	10.7 °C, clear sky, calm, dry
24.4.2011	Site 4	Dusk Survey	12.8 °C. overcast, breezy, dry
24th to 25th	Site 5	Anabat SD1 Detector	12.8 – 9.8 °C, cloudy, breezy, dry
25.4.2011	Site 6	Dawn Survey	9.8°C, clear sky, breezy, dry

A Passive Monitoring System of bat detection was employed for this survey scheme (i.e. a bat detector is left in the field, there is no observer present and bats which pass near enough to the monitoring unit are recorded and their calls are stored for later analysis). The bat detector is effectively used as a bat activity data logger. This results in a far greater sampling effort over a shorter period of time. Bat detectors are employed as the ultrasonic calls produced by bats cannot be heard by human hearing.

Bat surveying was completed using the Frequency Division AnaBat Detector System (AnaBat SD1 Flash Card Bat Detector). Frequency Division is a technique used to convert the inaudible bat echolocation calls to audible sounds. The AnaBat unit also uses Zero-Crossing Analysis (ZCA) to make the real-time recorded calls visible for display purposes. It is these sonograms (2-d sound pictures) that are digitally stored on the CF card and downloaded for analysis. Each time a bat is detected, an individual time-stamped (date and time to the second) file is recorded.

Two units were employed for each survey date (23^{rd}-24^{th} & 24^{th}-25^{th}). A unit was erected on a tripod (2m high) and located at specific grid reference points. One unit failed to record during survey session on 24^{th}-25^{th} survey night. Therefore, three locations were recorded successfully over the survey period (see Figures 4.1 and 4.2).

Bats are identified by their ultrasonic calls. This detector system record bat ultrasonic calls on a continuous basis and stores the information onto an internal CF card. Each detector was set to record from 20:00 hrs to 06:00 hrs during each survey date. Data was then downloaded and analyised using Analook (sound software for the AnaBat system). Each time-stamped AnaBat file was analyised and the species of bat recorded was noted as a bat pass. Some files may have recorded more than one species. In this instance, a bat pass is noted for each species (e.g. two species identified in a time-stamped file which corresponded to one soprano pipistrelle bat pass and one common pipistrelle bat pass). However, in the light of two individuals of the same species being recorded in the same time-stamped file, only one bat pass was noted for this time-stamped file. Table 4.1 lists the grid reference sites surveyed using the passive monitoring system.

To support the Passive Monitoring Programme, dusk and dawn surveying was also completed on each survey date (See Table 3 for details) using a bat Pettersson 240x Time Expansion Detector and Heterodyne Bat Detector. Dusk surveys were completed during the hours of 8.30 p.m. to 11.30 p.m. while Dawn surveys were undertaken from 4.30 a.m. to 6.00 a.m.

2.1 Survey Constraints

This survey was undertaken outside the preferred summer months of May to mid-September. However, the temperatures recorded during this survey were appropriate for a summer bat survey. Therefore, while there were some survey constraints, the survey results are considered by the author to be sufficient to make an assessment of bat activity along the proposed route and to provide appropriate mitigation measures.

3. Bat Assessment

The bat ecology impact assessment was completed using data collated from a number of bat surveys (Passive Monitoring System and Dusk and Dawn bat surveys) and a database search of the Bat Conservation Ireland database.

3.1 Bat Survey Results

Bat activity was recorded during this bat survey. The passive monitoring system using AnaBat units recorded the following species: soprano pipistrelle, common pipistrelle, *Pipistrellus* species and Leisler's bat,. The dusk and dawn surveys recorded one additional species: Natterer's bats (see Figures 1 – 4). To interpret results, it is important to note that sunset was approximately 20:00 hrs while sunrise was approximately 05:00 hrs. Therefore, bat activity at the beginning and end of the survey period is likely to be commuting bats exiting/returning to roosting sites while bat activity in between these periods are likely to be foraging bats.

Over the two nights of passive monitoring survey, 3 grid reference locations were monitored (using AnaBat Frequency Division Detectors). In relation to data collection at each of the AnaBat sites, bat activity was recorded at all AnaBat stations and ranged from 15 bat passes at Site 1 (cottage) surveyed on the 23.4.2011 to 298 bats passes at Site 3 (church ruins) surveyed on 23.4.2011 (See Figure 1). A total of 333 bat passes were recorded: common pipistrelle: 169 (51%) bat passes; soprano pipistrelle: 159 bat passes (48%); and Leisler's bat: 5 bat passes (1%). The common pipistrelle was the most recorded bat species.

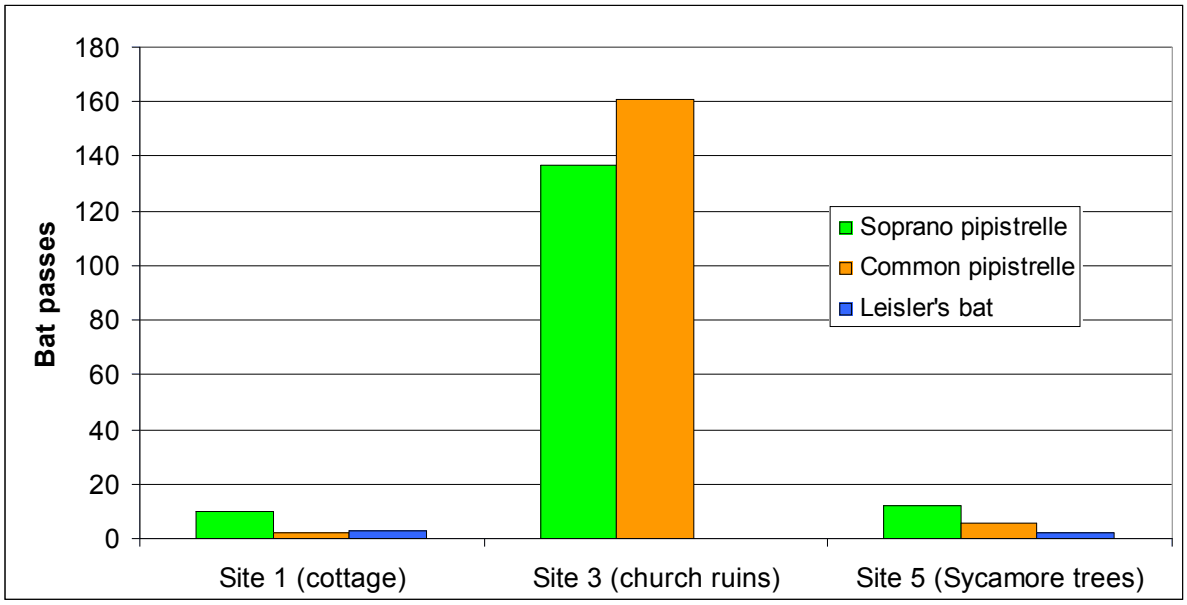

Figure 1: Summary of results of passive monitoring system using AnaBat SDI Flash Card detectors (Each colour corresponds to a bat species).

Sonogram analysis for the passive monitoring system yielded the highest amount of results due to the greater survey effort using this system. The results are presented for each grid reference location with a series of summary graphs to further illustrate the results. Each graph is discussed but without visual observations, these are extrapolated opinions referring to likely behaviour for each species in relation to commuting, foraging and roosting bats.

On 23.4.2011 passive monitoring was completed at two sites (Site 1: cottage & Site 3: church ruins). An AnaBat detector was located at each of these sites. Site 1 (cottage) is located at the southern end of the road scheme and is a single storey unoccupied cottage with slate roof located in a green field surrounded by low hedgerows and improved agricultural grassland fields. There is a high connectivity of hedgerows adjacent to this site. Bat activity recorded at this site was the lowest number of bat passes compared to all other stations. The results indicated that the three species of bat recorded commute at dusk through this survey site. Dusk surveys also supports this and recorded the same three species commuting along hedgerows from a south to north direction along the hedgerow and ditch west of the cottage.

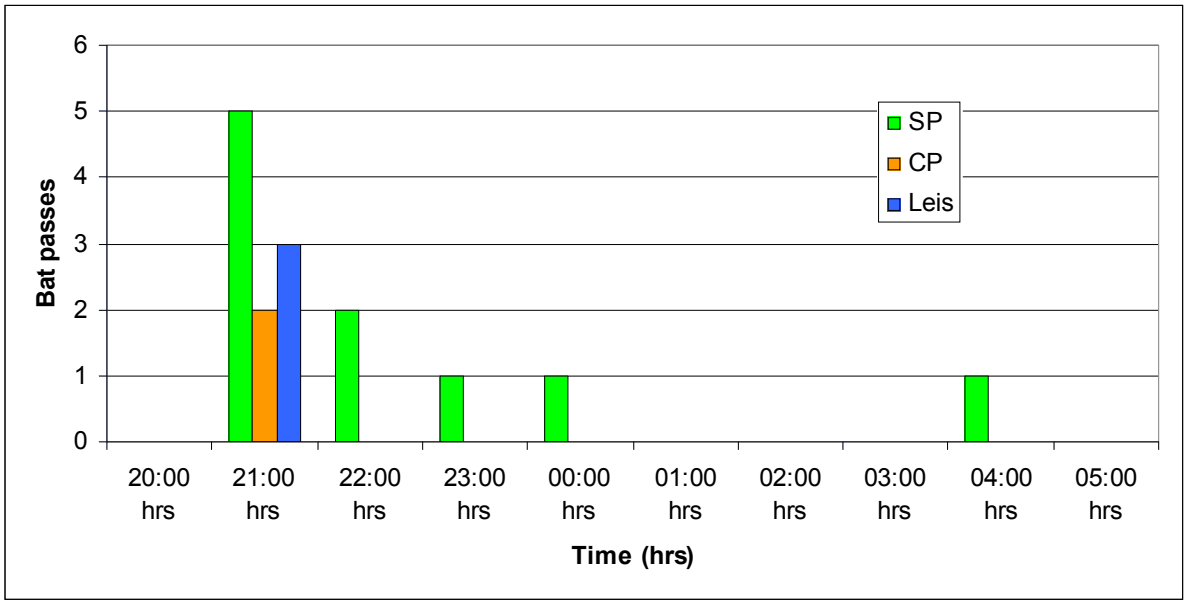

Figure 2: Bat activity recorded on 23.4.2011 (AnaBat SD1 Flash Card Detector) at Site 1 (cottage). SP: soprano pipistrelle; CP: common pipistrelle; Leis: Leisler's bat

Site 3 (church ruins) is located further north of the road scheme to the east of the existing N2. This stone ruin is surrounded by trees and scrub. There is no roof and but walls contain numerous crevices suitable for roosting bats. The site is located adjacent to a number of buildings (occupied houses and farm buildings) and is surrounded by agricultural land and connecting hedgerows and treelines. Bat activity recorded at this site was the highest number of bat passes compared to all other stations. The results indicated that the three species of bat foraged around this survey site. Dawn surveys also support this and recorded the same three species commuting away from the site along hedgerows east of the church ruins towards roosts located off-line. The high number of bat passes were principally due to a small number of individual bats foraging around the trees and scrub throughout the night.

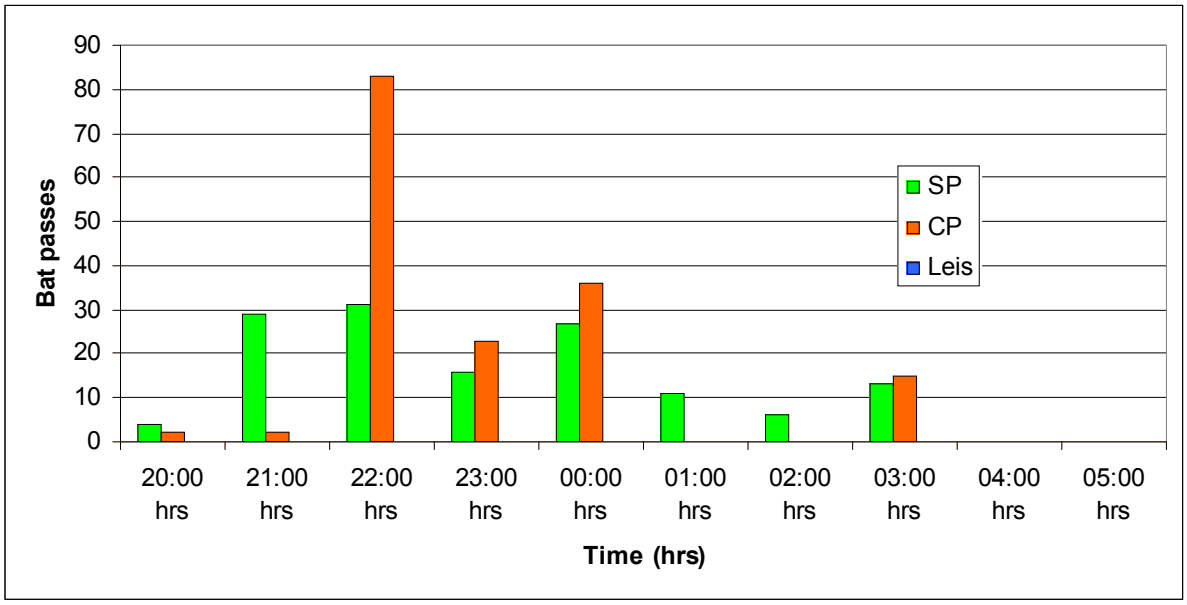

Figure 3: Bat activity recorded on 23.4.2011 (AnaBat SD1 Flash Card Detector) at Site 3 (church ruins). SP: soprano pipistrelle; CP: common pipistrelle; Leis: Leisler's bat

Site 5 (sycamore trees) is located further north of the road scheme and to the east of the existing N2. This site consisted of mature trees adjacent to a house, stream and south of a conifer plantation. The site is surrounded by agricultural land and connecting hedgerows and treelines. The results indicated that the three species of bat foraged around this survey site.

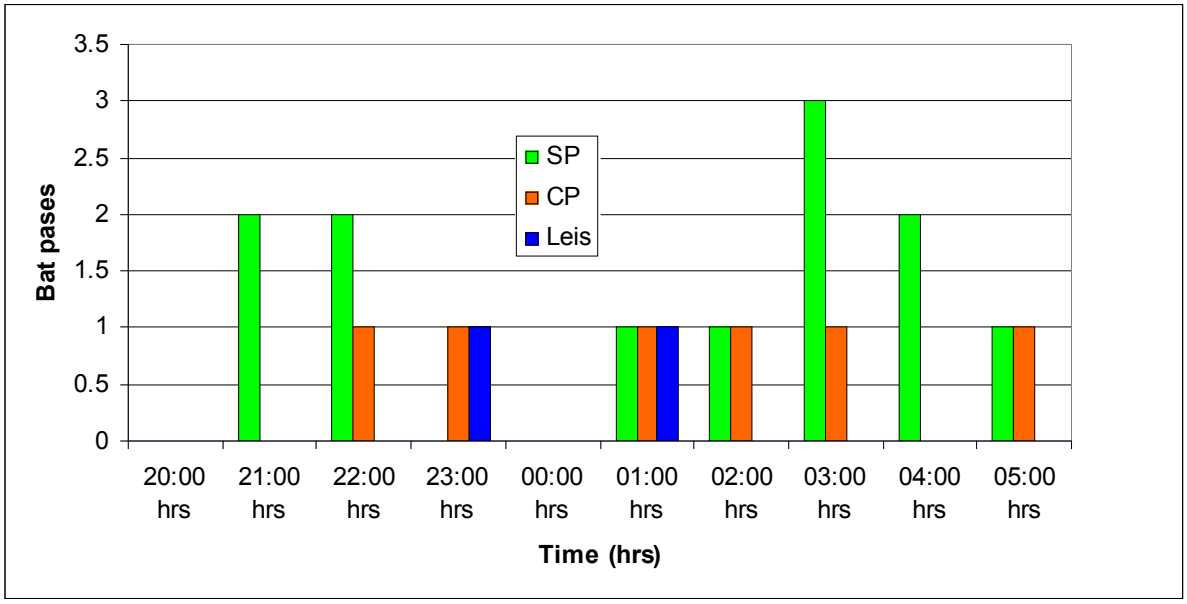

Figure 4: Bat activity recorded on 24.4.2011 (AnaBat SD1 Flash Card Detector) at Site 5 (sycamore trees). SP: soprano pipistrelle; CP: common pipistrelle; Leis: Leisler's bat

3.2 Dusk and Dawn Surveys

Dusk and dawn surveys were completed. A Dusk Survey completed at Site 1 (cottage) on the 23.4.2011 recorded no bats emerging from the building. Bats recorded in vicinity of the buildings (soprano pipistrelle, common pipistrelle and Leisler's bats) were all commuting past the cottage.

A Dawn Survey completed on 24.4.2011 at Site 2 (mature ash trees with ivy) and Site 3 (church ruins) recorded soprano pipistrelles and common pipistrelles commuting along tree lines and hedgerows away from the church ruins. Roosting sites for these individual bats are likely to be located in buildings further east of the current N2 road.

A Dusk Survey was completed at Site 4 (mature beech trees) on 24.4.2011. Bat activity was high in this area with two crossing points identified for commuting bats. A large occupied house is located adjacent to this site west of the current N2 route while the road junction with a sign post for Drumcaw L5260 is located to the east of the N2. Bats commuted across the N2 at this junction using mature tree canopies on either side of the road as a hop-over. Soprano pipistrelles (11 individuals) and Natterer's bats (2 individuals), likely to be roosting from the building to the west of the route, travelled across the N2 at this point from west to east and continued to commute down the Drumcaw road. Common pipistrelles (three individuals) travelled in the opposite direction, coming from roosts located on the Drumcaw road and commuted across the N2 from an east to west direction but using the same hop-over point. A second hop-over point was located approximately 200m further north of the N2 where soprano pipistrelles (4 individuals) travelled from a west to east direction along a treeline towards the N2. Leisler's bats (3 individuals) commuted from and east to west direction across the N2 but due to its high flying, this species was not reliant on hop-overs to safely commute across the N2.

A Dawn Survey was completed on 25.4.2011 at Site 6 (mature trees) and this site is located south of Emyvale. This survey was completed by walking the 2km stretch of roadway at dawn. Only soprano pipistrelles (2 individuals) and Leisler's bats (1 individual) was detected commuting. This may have been due to the cooler temperatures recorded at dawn reducing insect activity and therefore bat activity.

3.3 Potential Bat Roosts (PBRs)

The importance of trees to bats varies with species, season and foraging behaviour. For Leisler's bats, trees are essential for both summer and winter roosts while Daubenton's and Natterer's bats utilise trees more often during the summer months. Other species such as

brown long-eared bats and pipistrelle bats avail of trees in the winter months. In general, individual males throughout the season use tree roosts, more often, while females will use trees for temporary night roosts or night perches for consuming prey. Hollow trees are widely used by bats for both summer and winter roosts (weather dependent) and bats will roost in 'sound' trees in crevices, holes and under split bark. Bats rest, give birth, raise young and hibernate in tree holes, crevices and beneath loose bark. Species of trees utilised by bats include oak, ash, beech and Scots pine. Trees, especially native ones also play host to numerous insect species which are prey items for bat species. Trees also provide shelter for swarming insects which bats will avail of. In addition, trees are important commuting routes for bats. A gap in a hedge/treeline of greater than 10m may force some species of bats to seek an alternative commuting route.

There are a large number of trees deemed as potential bats roosts along the proposed route (44 trees identified). The majority of these trees have value as potential bat roosts due to the heavy ivy growth present on the trees. These locations are as follows:

Table 4: Potential Bat Roosts in trees located along the N2 Monaghan to Emyvale

Grid Reference	Site No.	Description
H67332 37835	Site 2	Ash trees with ivy, east of route: x4
H67332 37835	Site 2a	Ash trees with heavy ivy growth, east of route: x3
H67236 38001	Site 3	Mature trees, church ruins: x2
H67274 38457	Site 4	Mature beech trees, east and west of route: x18
H67211 40062	Site 4a	Ash tree with heavy ivy growth, east of route: x1
H67403 40990	Site 5	Mature sycamore trees, east of route: x4
H67589 42086	Site 5a	Mature trees with heavy ivy growth, west of route: x2
H67582 42210	Site 6	Mature trees beside road: x9
H67666 43341	Site 7	Mature ash tree, west of route: x1

3.4 Bat Conservation Ireland Database Records

A database search was completed for the 10km radius search of the grid reference H6739. Within this radius, details with regards to seven roosts (soprano pipistrelle, common pipistrelle, Pipistrelle species, Leisler's bat, bat, brown long-eared bat and whiskered bat), four transects (One from the All Ireland Car Monitoring Scheme: H40 30km square: soprano pipistrelle, common pipistrelle, Leisler's bats, *Myotis* spp., Nathusius' pipistrelle and

Pipistrellus spp.; two transects from the All Ireland Daubenton's Bat Waterway Survey: Monaghan Town (H6800034700) & New Mills Bridge (H7189838769): Daubenton's bat, Leisler's bat, Pipistrelle species and soprano pipistrelle) and seven Ad Hoc bat detector records (soprano pipistrelle, common pipistrelle, *Pipistrellus* species, Leisler's bat and Daubenton's bat) are on the database (search completed on 26.4.2011).

4. Potential Impacts of proposed works on Bat Fauna

The principal concerns related to bats in view of road schemes are:

- Habitat fragmentation thereby reducing commuting routes in the landscape
- Loss of roosts through the removal of trees along the road routes
- Loss of foraging habitats

Therefore, for this assessment, this report will draw on guidelines already available in Europe and will use the following documents:

- *A conservation plan for Irish vesper bats, Irish Wildlife Manual No. 20 National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.*
- *Bat Mitigation Guidelines for Ireland. Irish Wildlife Manuals, No. 25. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.*
- *National Biodiversity Plan. Department of Arts, Heritage, Gealtacht and the Islands.*
- *The status of EU protected habitats and species in Ireland: Conservation status in Ireland of habitats and species listed in the European Council Directive on the Conservation of Habitats, Flora and Fauna 92/43/EEC. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government.*

4.1 Ecological Assessment

The following bat species have been recorded during this bat survey: common pipistrelle, soprano pipistrelle, Leisler's bat and Natterer's bats.

In summary, the proposed development will need to consider the following:

a. Bats and their bat roosts are protected by Irish (Wildlife Act 1976 and 2000 Amendment) which make it an offence to wilfully interfere with or destroy the breeding or resting place of these species. All species of bats are listed in

Schedule 5 of the 1976 Act and therefore are subject to the provisions of Section 23.

b. The EU Habitats Regulations Directive 1992 seeks to protect rare and vulnerable species, including all species of bats. All ten species of bat are protected with the lesser horseshoe bat listed as an Annex II species while all other bats (commonly known as vesper bats) are listed as Annex IV species.

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

d. The National Biodiversity Plan confers general responsibilities on all participants in the development process to take into account of protected species. "*The overall objective is to secure the conservation, and where possible the enhancement, and sustainable use of biological diversity in Ireland and contribute to conservation and sustainable use of biodiversity globally".*

NPWS Conservation Status Assessment report for each of the species recorded is presented in a summary below the species list:

Natterer's bat *Myotis nattereri* (Species Code 1322)

Leisler's bat *Nyctalus leisleri* (Species Code 1331)

Common pipistrelle *Pipistrellus pipistrellus* (Species Code 1309)

Soprano pipistrelle *Pipistrellus pygmaeus* (Species Code 5009)

All Irish bat species are given a Favourable Status in Republic of Ireland. The principal pressures on Irish bat species are as follows:

- urbanized areas (e.g. light pollution)
- bridge/viaduct repairs
- pesticides usage
- removal of hedges, scrub, forestry
- water pollution
- other pollution and human impacts (e.g. renovation of dwellings with roosts)

- infillings of ditches, dykes, ponds, pools and marshes
- management of aquatic and bank vegetation for drainage purposes
- abandonment of pastoral systems
- spieleology and vandalism
- communication routes: roads
- forestry management

For this ecological assessment, the habitats adjacent to the proposed road route may be considered in terms of extent, diversity, naturalness, rarity, fragility, typicality, recorded history, position, potential value and intrinsic appeal (Regini, 2000). The potential of these habitats for bat fauna is considered in this framework also.

i Bats may use trees with heavy ivy growth as occasional roosts, many of which are located within the survey area.

ii Bats may use mature trees with tree holes etc., as roosting sites all year around. Large mature trees are located adjacent to the N2 at Site 2 and Site 4.

iii Extensive foraging and commuting areas are available to bats within the survey area.

iv An extensive array of buildings are located adjacent to the survey area, some of which were recorded as likely bat roosts during this bat survey.

1 *Improved agricultural grasslands and wet grasslands*.

Provides forage for common bat species especially soprano and common pipistrelle and Leisler's bat. However, their ecological value is increased within this survey area due to the high degree of connectivity as a result of hedgerows, mixed woodland and treelines. Medium ecological value.

2 *hedgerow and treeline boundaries*.

Present throughout the survey site. Such provide wildlife corridors and foraging areas for many bat species. Bat roosts may be present in mature trees or larger ivy-covered trees. However, these linear habitats are essential for commuting bats. High ecological value.

3 *mixed woodland*.

The survey area includes a section of mixed woodland at Site 4 and a small immature area of trees further north along the N2. This habitat type provides foraging area for an array of bat species but its value is increased due to the high degree of connectivity as a result of hedgerows and treelines. May be considered as of High ecological value for bats.

4 *conifer plantations*.

There is one section of conifer plantations within the survey area (north of Site 5) adjacent to mixed woodland and are considered important for bats, as commuting areas to foraging habitats such as mixed woodland. May be considered as of Medium ecological value for bats.

5 *rivers and streams*.

A small number of streams cross the N2. These links habitats (grasslands, treelines, hedgerows, scrub and woodland) in the area and creates an area of Medium ecological value for roosting, commuting and foraging bats.

4.2 Predicted Impacts

All bat species recorded during this bat survey are Annex IV species under the EU Habitats Directive and all have a Favourable Status in Ireland.

Due to the fact that bats disperse widely into the landscape, road schemes have the potential to impact on bats. Habitats such as treelines, hedgerows, woodland removed to make way for both the main route and link roads impacts on bats. But this impact increases when commuting routes are severed especially in relation to slow flying bat species (Natterer's bats).

Bat fauna within the survey area will be affected by both the construction phase and operational phase of the road scheme. Mitigation measures, as below, are recommended to ameliorate the potential impacts of the proposed road scheme on bat populations.

Principal impacts of road scheme, in general, on bat fauna may be summarised as follows:

1 Loss of treelines, hedgerows or other linear features as a result of construction will impact on commuting bats. This is considered as a Moderate Negative impact and maybe reduced to Minor Negative if remaining linear features are reconnected within the landscape.

2 Loss or fragmentation of foraging habitats may diminish the available insect prey species and reduce feeding area for bats in some locations. This is considered as a Moderate Negative impact and maybe reduced to Minor Negative if replanting along the road route with similar native tree and shrub species is undertaken.

3 Potential loss of church ruins may reduce roosting sites for individual bats. This is considered a Minor Negative impact and may be reduced if this building is not removed as a result of the road improvements.

4.3 Mitigation Measures

Mitigation is best achieved through avoidance. It is proposed that the following measures be put in place to avoid or lessen the degree of impacts.

Mitigation by avoidance

1. Aim to limit removal of trees, hedgerows and treelines along proposed route. Where possible, young trees and shrubs should be salvaged from existing hedgerows and treelines marked for removal. Such specimens should be replanted as part of landscaping plan.
2. Treelines, hedgerows or other linear habitats should remain in-situ and remain protected from the construction of link roads.
3. Habitats identified as important foraging areas for bats should be protected from damage.
4. Access routes should maintain a buffer zone in order to protect woodland, hedgerow and treelines.
5. Avoid damage to the church ruins and surrounding trees.

Mitigation by Reduction

1 Removal of linear habitats

a) Removal of treeline/hedgerow/woodland should be minimised to the minimum area required to construct the road route.

2 Re-routing of linear habitats

Any treelines/hedgerows or woodland margin habitats outside the landtake of the scheme should be fenced off to a distance equal to the outer canopy. This is to ensure that root damage is not caused to trees which are to be retained.

3 Mature trees

a) Trees which are to be removed will be felled during the autumn months of September, October or November (felling during the spring or autumn months avoids the periods when the bats are most active).

b) Any trees showing crevices, hollows etc., should be removed while a bat specialist is present to deal with any bats found. Such animals should be retained in a box until dusk and released on-site. A bat expert will survey all trees due for removal prior to construction works commencing.

c) Large mature trees will be felled carefully, essentially by gradual dismantling by tree surgeons, under supervision of a bat specialist.

d) Care will be taken when removing branches as removal of loads may cause cracks or crevices to close, crushing any animals within. These cracks should be wedged open prior to load removal. The dead branches should be lowered to the ground using ropes to avoid impacts which may injure or kill bats within.

e) Any ivy covered trees which require felling will be left to lie for 24 hours after cutting to allow any bats beneath the cover to escape. This measure applies to the majority of trees identified on-site.

4 Protection of church ruins

While no bats were recorded roosting in the church ruins during this survey does not mean that bats would not avail of suitable crevices within the structure. Natterer's bats, in particular, will roost in such buildings. If the proposed route involves the destruction of this building, a full survey of crevices with the use of an endoscope and torch light is required prior to works. Works should be undertaken in the autumn months of September, October and November or the spring month of March.

5 Protection of habitats

Any semi natural habitats adjacent to proposed route, link roads and access routes should be fenced off to prevent unnecessary damage or degradation. Working areas should be clearly defined prior to the commencement of construction or fenced to ensure they are kept to a minimum.

6 Maintain roosts : no disturbance to roosts

Buildings located close to the route should be protected from disturbance during construction works.

7 Limit work spaces and lighting during construction

a) Open areas required to facilitate road works along the route should be limited to areas where tree felling and hedgerow removal is not required. Lighting of such work spaces can also disrupt traditional foraging grounds for bats and therefore should be limited and should not occur during foraging period (30 minutes prior to sunset to 30 minutes after sunrise).

b) Works at night time should be avoided in areas where foraging bats are concentrated.

c) All other areas should be screened to prevent lighting spilling out onto adjacent habitats and lighting used should be directional onto works.

8 Culverts or tunnels

a) Any proposed culverts or tunnels over streams or existing roads can be used by commuting bats if 2m x 2m in relation to culverts over streams. To facilitate bat usage of such routes, continuous treeline/hedgerow would be required to direct bats towards such structures.

9 Bat boxes and bat tubes

A bat box scheme should be included in the area to offset the potential loss of roosts due to tree removal. It is recommended that a minimum of 12 bat boxes (Schwegler' woodcrete preferably) would suffice. These bat boxes/tubes should be located in trees or poles outside

the landtake of the scheme but as close as possible to the sites of the vegetation which has been lost. The site details are as follows:

i. Site 2 (mature trees east of the N2)

ii. Site 4 (mature trees west of the N2)

iii. Site 5 (mature trees east of the N2)

Details of sourcing these boxes and erection can be supplied. 'Schwegler' woodcrete bat boxes are recommended but other designs are available – timber, concrete and concrete/sawdust). Consult the following publication: *Bat Boxes: A guide to the history, function, construction and use in the conservation of bats by R. E. Stebbings and S. T. Walsh (The Bat Conservation Trust, 1991).* Brown long-eared bats, Leisler's bats, common pipistrelles and soprano pipistrelle bats will frequently use bat boxes both as temporary and maternity roosts. Special hibernation bat boxes are also available. Suppliers of artificial bat roost units:

i) Schwegler Bat Boxes, Jacobi, Jayne & Co: www.jacobijayne.com

ii) Alana Ecology: www.alanaecology.com

The main function of bat boxes is to provide alternative safe roosting sites for groups of bats where natural sites become unavailable. The internal diameter of a bat box is required to be sufficient to allow bats to cluster together in numbers to retain body heat. It is important to understand the life cycle of bats and their tendency to use an array of roosting sites through the year. In summary, bats require different roost conditions for hibernation, during the sensitive time of rearing their young (maternity roost), night roosts for resting stops during night feeding and satellite roosts in between the main hibernation and maternity season. Roosting conditions also vary with each species. In general, hibernation boxes require greater insulation (wall thickness of 100mm timber) to provide a constant temperature for bats throughout the winter to prevent bats from freezing. All other boxes, typically called summer boxes, are designed to provide secure and dry sheltered conditions. These boxes have relatively thin walls (about 20-30mm timber) and are used by bats outside the hibernation period. These requirements mean that any Bat Box Schemes should provide suitable bat boxes to cover the general requirements of different bat species all year around.

'Woodcrete' boxes are made of a mixture of concrete, sawdust and clay moulded into to shape. They have the advantage of allowing natural respiration, stable temperature and durability. 'Woodcrete' boxes last, on average, for 25 years.

To ensure that bats use the bat boxes, it is very important to site them carefully. Some general points to follow include:

1. Straight limb trees (or telegraph pole) with no crowding branches or other obstructions for at least 3 metres above and below position of bat box.
2. Diameter of tree should be wide and strong enough to hold the required number of boxes.
3. Locate bat boxes in areas where bats are known to forage or adjacent to suitable foraging areas. Locations should be sheltered from prevailing winds.
4. Bat boxes should be erected at a height of 3-5 metres to reduce the potential of vandalism and predation of resident bats.
5. It is recommended to erect a number of bat boxes on one tree at an array of aspects. South facing boxes will receive the warmth of the sun, which is necessary for maternity colonies. In large bat box scheme it is generally recommended to have three bat boxes arranged at the same height facing North, South-East and South-West. This ensues a range of temperatures are available all day. If the South facing boxes become too warm, bats can safely remove to the cooler North facing box.

Acceptance of boxes by bats is less predictable than those for birds. Therefore, it is essential to monitor their use over a period of time. Those boxes that remain unused within two years of date of erection should be re-located. Bat boxes should also be checked in wintertime for general wear and tear and to remove droppings from the previous summer use.

NB: Bats use boxes intermittently and the chance of finding a bat in a box at the time of inspection is considered to be 1 in 10.

Bat boxes should be inspected, by bat licence holder, at least once within 12 months of erection at appropriate season in order to monitor bat use and the species using boxes. Any bats found should be counted and identified to species level.

Safety is also essential during erection and monitoring of bat boxes. Use of hard hats, a strong aluminium ladder with safety strap for trees, and use of gloves (if handling bats) are recommended. Only a licensed person (NPWS Licence) can handle bats.

Monitoring: construction and operation phase

The mitigation measures should be monitored by wildlife experts at intervals during the initial years of operation of the development to ensure successful implementation. Good practice also requires that impacts on adjoining areas are also monitored.

1 Mitigation measures for bats will be monitored for the first 3 years after implantation of the scheme and additional measures taken as required to ensure that the location of wind turbines are not impacting on bats.

2 These monitoring measures may require additional works or supplementary mitigation, which should be included within the overall budget of the proposed road scheme.

3. A monitoring programme should be formulated and agreed upon prior to construction of the road route.

Residual impact of the proposal

The overall impacts of the proposed road scheme on the bat fauna in the area, without mitigation measures adopted, may be considered as Minor to Moderate Negative.

Loss of hedgerows, treelines, wet grassland and woodland habitats will be expected to have some negative impacts due to loss of foraging areas and commuting routes and may add to local species isolation through further fragmentation of habitats. Some potential bat roosts in trees will be lost to development. If all 'best practice' mitigation measures are undertaken, impacts on bat fauna utilising watercourse habitats may be considered as minor. Impacts – Minor Negative.

Given best practice design and operation of the proposed development, with recommendations included within this report incorporated, and with accompanying mitigation and remedial measures included, the Residual impact of the development may be considered as of minor impact in terms of impacts on bats. Impacts expected - Minor Negative.

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Appendices

Bat ecology – general

The bat is the only mammal that is capable of true flight. There are over 1,100 species worldwide, representing almost a quarter of all mammal species. There are 47 species in Europe - in Ireland, ten species of bat are currently known to exist, which are classified into two families, the Rhinolophidae (Horseshoe bats) and the Vespertilionidae (Common bats).

Prey

All the European bat species feed exclusively on insects. A Pipistrelle, weighing only 4 to 8 grammes, will eat up to 3000 insects every night, ensuring a build up of fat in the bat's body to allow it to survive the winter deep in hibernation.

Breeding and longevity

Irish bats can produce one young per year but, more usually, only one young is born every two years (Boyd & Stebbings, 1989). This slow rate of reproduction inhibits repopulation in areas of rapid decline. Although bats have been known to live for twenty or more years, this is rare as most die in their first and the average lifespan, in the wild, is four years.

Threats

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

Extinction

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

Description of bat species known or expected on site

Common pipistrelle *Pipistrellus pipistrellus*

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

Soprano pipistrelle *Pipistrellus pygmaeus*

The soprano pipistrelle's echolocation calls peak at 55 kHz, which distinguishes it readily from the common pipistrelle on detector. The pipistrelles are the smallest and most often seen of our bats, flying at head height and taking small prey such as midges and small moths. Summer roost sites are usually in buildings but tree holes and heavy ivy are also used. Roost numbers can exceed 1,500 animals in mid-summer.

Leisler's bat *Nyctalus leisleri*

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

Natterer's bat *Myotis nattereri*

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

List of Irish bat species and adjudged status on site

Bats		Status on site
Chiroptera[1]		
Common Pipistrelle[2]	*Pipistrellus pipistrellus*	Present
Soprano Pipistrelle	*Pipistrellus pygmaeus*	Present
Nathusius' Pipistrelle	*Pipistrellus nathusii*	Absent
Brown Long-eared	*Plecotus auritus*	Absent
Leisler's	*Nyctalus leisleri*	Present
Lesser Horseshoe	*Rhinolophus hipposideros*	Absent
Whiskered	*Myotis mystacinus*	Absent
Natterer's	*Myotis nattereri*	Present
Daubenton's	*Myotis daubentonii*	Absent
Brandt's	*Myotis brandtii*	Absent

[1] Bat distribution records from O'Sullivan (1994) and Richardson (2000).

[2] Two common species of pipistrelle bat are present in Ireland, recent taxonomic revision. The species are identified by the frequency they use for echolocation (46Hz [Common] and 55Hz [Soprano]), and both occur in similar habitats. Roosts occur in buildings and trees.

Photographic Evidence

Plate 1: Cottage (Site 1) located along the N2 existing road (west of route).

Plate 2: Site 2, mature trees with heavy ivy growth (east of route)

Plate 3: Church Ruins surrounded by trees and shrubs (Site 3) (east of route).

Plate 4: Site 4, mature trees east and west of N2 existing road

Plate 5: Site 5, sycamore trees (east of existing N2 road route).

Plate 6: Site 6, mature trees (east and west of existing N2 road route).

Plate 7: Site 7, ash tree with heavy ivy growth. Plate 9: Site 4a, ash tree with ivy8

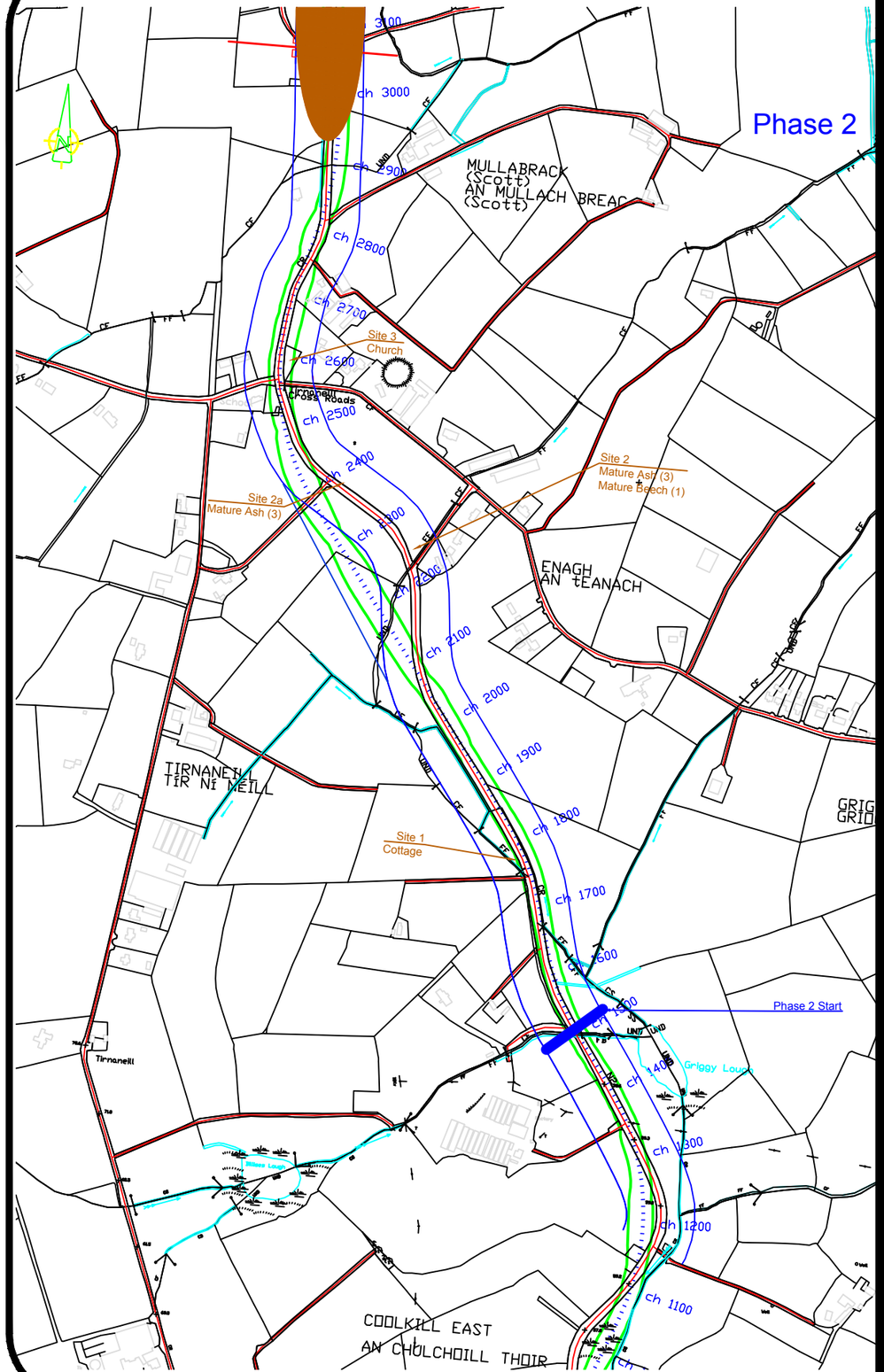
Plate 9: Site 2a, three ash trees with heavy ivy growth, east of road route.

Plate 10: AnaBat SDI Bat Detector on tripod.

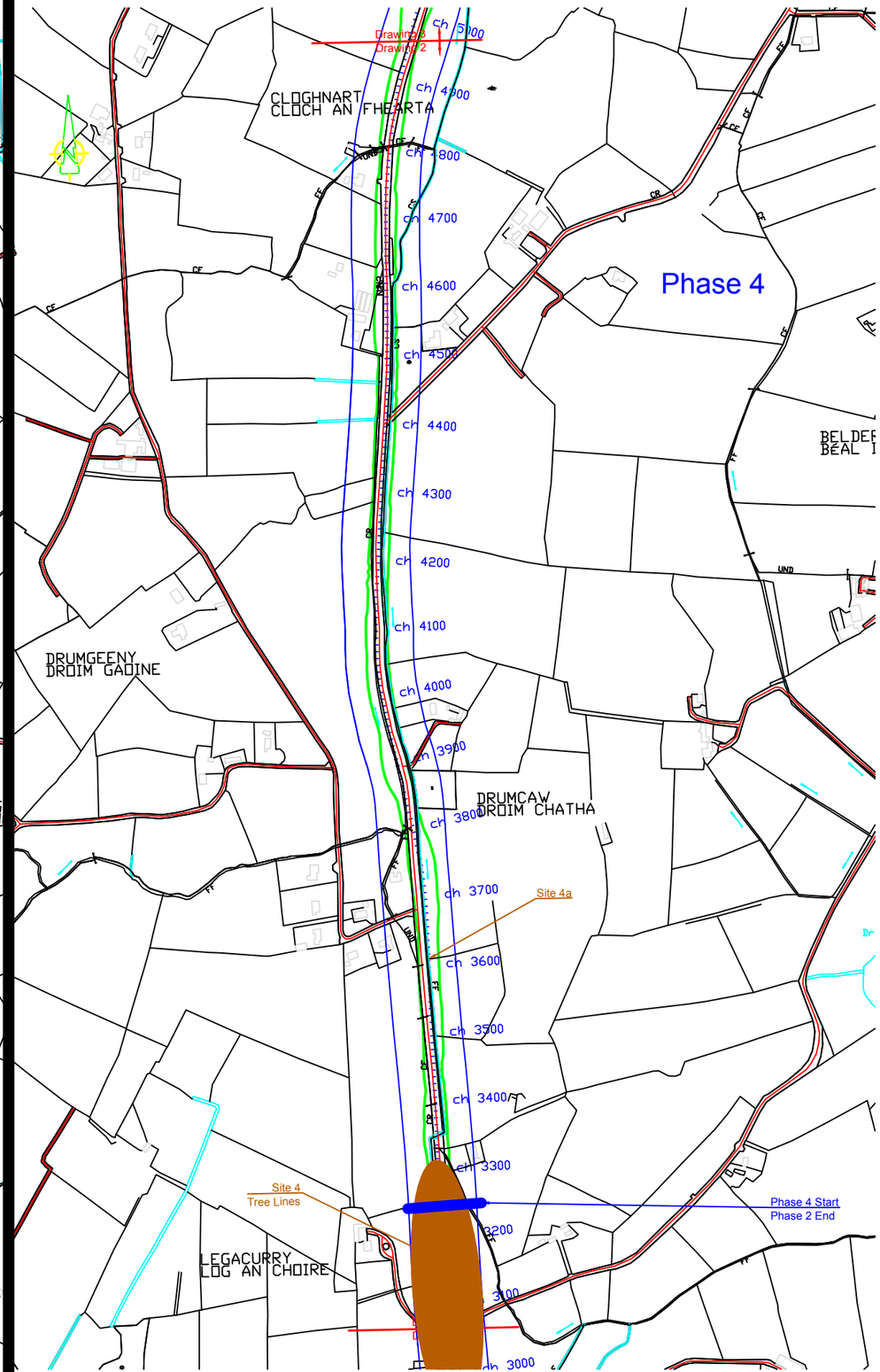
Appendix A: Bat Survey Drawings

Bat Survey Drawing Nos. N2-4-01

N2-4-02



Drawing - A



Drawing - B

Flynn, Furney.
environmental consultants

Client:

Monaghan County Council
Comhairle Contae Mhuineacháin

General Notes / Legend

- 50m Offset
- Landtake
- Site — Bat Sites

Flynn Furney Environmental Consultants Ltd
www.flynnfurney.com

Project Name and Address

N2 Realignment
Phase 2,4 and 3
Ecology Drawings

Bat

Drawing No.	N2–4–01	
1	First Issue	29.4.11
No.	Revision/Issue	Date

Project	Sheet Set
N2	01/02
Date 29.04.2011	
Approx Scale 1:4000 in A1	

Drawing - C

Drawing - D

Flynn , Furney.

Client:

Monaghan County Council

Monaghan County Council

General Notes / Legend

50m Offset

Landtake

Site Bat Sites

Flynn Furney Environmental Consultants Ltd

www.flynnfurney.com

Project Name and Address

N2 Realignment
Phase 2,4 and 3
Ecology Drawings

Bat

Drawing No. N2-4-02

No.	Revision/Issue	Date
1	First Issue	28.4.11

Project: N2

Date: 28.04.2011

Sheet Size: 02/02

Approx Scale: 1:4000 in A1