Lagan Cement
Biodiversity Action Plan
Killaskillen, Co. Meath

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Introduction

Biodiversity is a term used to describe the variety of life on earth and includes species, their habitats, and the genetic variability within groups of species that allows them to evolve and maintain healthy populations. This term is preferred to more colloquial words such as 'nature' or 'wildlife' as it better describes the true variety of life and the important functions that it carries out (see later). There are a number of reasons why the conservation of biodiversity is important.

1. The preservation of biodiversity underpins the health of the environment, both globally and locally; along with the underlying geology it is the basis of the landscape, without which it would be flat and featureless; and it is strongly linked to our mental wellbeing.

2. Greater environmental awareness is no longer an option for our society and adopting more sustainable approaches leads to lower costs, greater efficiencies, a better public image and enhanced relationships with stakeholders such as neighbours, employees and shareholders.

3. Environmental and conservation law is becoming ever stricter. As a trusted name, Lagan will want to be seen to be complying with the law at all times.

The importance of biodiversity

Biodiversity provides the Earth's life support system, of which humanity is very much a part. In Ireland we depend on it for clean water and air, maintaining soil fertility, the pollination of crops, attenuating the flow of water off the land during flood, and providing amenity areas. It is the basis of our tourism, agriculture and aquaculture industries and it carries out all of these functions free of charge. In a recent report commissioned by the Department of the Environment, Heritage and Local Government, the value of biodiversity to the national economy was placed at a conservative €3 billion per annum[1]. For many of the services provided it is impossible to assign an accurate value in monetary terms. For instance, how can one put a price on a walk in a forest or along a beach? Scientific studies have shown that the enjoyment people get from outdoor recreation is related to the variety of species present in that area[2]. In other words, there is greater amenity value in walking in a park with a rich diversity of native plants and animals than from walking through a monoculture of trees with few other species.

Biodiversity and the law

Conservation in Ireland is principally governed by European Directives such as those for Birds and Habitats. Under these Directives, over 10% of Ireland's land area has been designated for nature conservation. The Lagan Cement site is not associated with any of these sites[3]. At a national level, many of Ireland's species are protected under the Wildlife Act 1976 (as Amended) 2000. This prohibits wilful interference with dens, nests, roosts or other locations where the listed plants or animals may be located and/or breeding. This is relevant at Lagan Cement where bats may be roosting in tall, ivy-covered trees and abandoned

[1] **Bullock C., Kretch C. & Candon E.** 2008. *The Economic and Social Aspects of Biodiversity*. Stationary Office.
[2] Conservation Magazine Vol. 8 No. 3. July – September 2007. pg8
[3] See www.npws.ie

buildings. Under the Act it is also prohibited to remove 'uncultivated' vegetation from March 1st to August 31st each year in order to protect breeding populations of birds and other animals.

Figure 1: An orb web spider, common in hedgerows and grasslands. The colour on the abdomen is variable but on the Lagan Cement site most seem to be burgundy red such as this one.

General Conservation Principles

When deciding how to value an area of habitat, or how to develop a new area, there are a number of simple principles that are followed to produce the best outcome for conservation. Perhaps the most important one relates to the concept of alien versus native species.

- **Native** species are those that are thought to have colonised Ireland on their own since the end of the last Ice Age.
- **Alien** species are all the ones that have been introduced by humans since their arrival some 9,000 years ago. Natives are always considered better then aliens from a conservation point of view although most of these have settled in well and do not cause major disruption.
- Within the alien group there is a much smaller number which are known as **alien invasive** and these are plants or animals that are released from the confines of the environment in which they have evolved and 'take over'. The advance of alien invasive species is one of the greatest causes of species extinction not only in Ireland but across the world. Table 1 below give some examples, many relevant to Lagan Cement, of each of the three groups.

Table 1 – Native, alien and alien invasive species in Ireland

Native	Alien	Alien Invasive
Fox	Pheasant	Grey squirrel
Badger	Rabbit	Cherry laurel
Oak	Beech	Rhododendron
Birch	Sycamore	Zebra mussel
Holly	Fuchsia	Japanese knotweed
Aspen	Pine	Chinese mitten crab
Hazel	Horse-chestnut	Indian balsam

Defining this list is not always straight forward. Many people believe that the Sycamore is an alien invasive, while Scot's pine trees were native to Ireland for thousands of years and are still considered native by some.

In the context of this plan actions will be prioritised in terms of eliminating any alien invasive species, and encouraging native ones.

The other main principle looks at the diversity of an area. A forested area with ten types of trees will have much greater opportunities for birds, mammals and insects than one with only one type of tree. Therefore the greater the variety that is present, the greater the value to biodiversity. For instance, native species such as Bramble or Ivy tend to form thick carpets where they exist and this is to the detriment of diversity overall. This is not to say these species don't have their value and so a balance must be sought.

Raising awareness of our natural heritage is one of the most important conservation tools. In order for this plan to succeed, there must be a strong emphasis on communicating its benefits and making the results accessible.

The actions that will come out of this plan will adhere to these principles.

How was this plan drawn up?

The starting point for any Biodiversity Action Plan (BAP) is to gather information about what exists on the site in order to establish a baseline. The principle way to do this is to carry out a site survey. However, a short number of visits in one season is not sufficient to get a full picture of all the animals and plants that may be present. For this reason a site visit is always complemented by a literature review, mostly historical, published data that relates either to the site or to the broader area in which the site is located. At Lagan Cement we are fortunate in that many surveys have been carried out by a variety of experts since quarrying began over 10 years ago. These have been prepared for Environmental Impact Statements and together give a good picture of the species and habitats that are present.

Once a sound baseline has been established, actions are devised in order to protect or enhance existing features, remove threats and create opportunities for new species or habitats. The actions should build on the existing resource, be specific in their objectives and have a realistic chance of success. For instance, it is much easier to expand an existing population of a species than to introduce one that may have become extinct.

This plan also includes actions that were committed to as part of a recent planning application that will see the quarry operations on the site expanded.

Figure 2 – Frogs are common on the Lagan Cement site. This is a tiny froglet, of which there were hundreds around the pools of the sand quarry. Frogs are one of only three amphibians in Ireland and are protected under the Wildlife Act.

Killaskillen in a local context

The Lagan Cement site is located in the lowlands of Meath, near the town of Kinnegad. The character of the landscape is largely determined by the underlying geology and here there is a bedrock of carboniferous limestone and shale, rocks that were formed by the accumulation of the shells of sea animals 350 million years ago. These rocks are alkaline and easily soluble so that the overlying soil is rich and fertile. Along with the climate, this greatly influences the types of plants and trees that can grow here.

Ireland has under gone radical and continuous change over the past thousands of years. Up to approximately 12,000 years ago this part of Ireland was under 1 km of solid ice and so no life existed. The retreat of the ice sheet left behind esker ridges, originally tunnels in the ice that silted up with sand and gravel[4]. These features are in evidence today and are the source of the sand pits to the north and south-west of the site. As temperatures rose the land eventually was swathed in high forest, dominated by oak trees. The scale of this forest is difficult to imagine today as no vestige of it remains in Ireland. The arrival of man ~9,000 years began a process of deforestation that continued until the 1980's and left Ireland the most treeless country in Europe. Climate change ~7,000 years ago saw the gradual development of raised bogs, which originated in lakes and greatly changed the landscape of the midland counties, including Meath. The industrial extraction of peat, along with the intensification of agriculture have resulted in great challenges to biodiversity and have in many cases left sterile wastelands where once there were rich ecosystems. Before Lagan Cement began quarrying operations about 10 years ago, the site was a network of intensively managed agricultural fields bounded with hedgerows and lines of tall trees. The bog to the south had been drained and had ceased to lay down layers of new peat. The Kinnegad river runs to the north of the site and is a tributary of the river Boyne. Its course has been highly altered due to drainage works and this has also been to the detriment of the aquatic ecosystem. Quarrying dramatically altered this landscape but, as we shall see, it has created many new habitats in which unique species have found refuge.

The Site Survey

The study area was surveyed over two days in September 2009. The area covered is shown in figures 3 and 4 which also show the habitats that were found. A habitat can be defined as a place where an organism lives but it can also be described as a community of organisms that share physical or biological properties[5]. This is useful because scientists like to look for the ways in which systems are organised but in reality there tend to be few hard and fast rules. These habitats are classified according to a standardised system that depend on the types of plants present and this helps in assigning value to ecological features. These are taken from *A Guide to Habitats in Ireland*[6] and is widely used in the Republic of Ireland for this type of study. The total study area is approximately 90 ha in extent.

In total nine separate habitats were recorded and these are described in this section. In the interests of clarity scientific names for trees and plants are not given in the main text but are detailed in an appendix to this report.

[4] See *Reading the Irish Landscape* by Mitchell & Ryan (Town House Dublin) for more information
[5] Allaby M. 2004. *Dictionary of Ecology.* Oxford.
[6] Fossitt J. 2000. *A Guide to Habitats in Ireland.* Heritage Council.

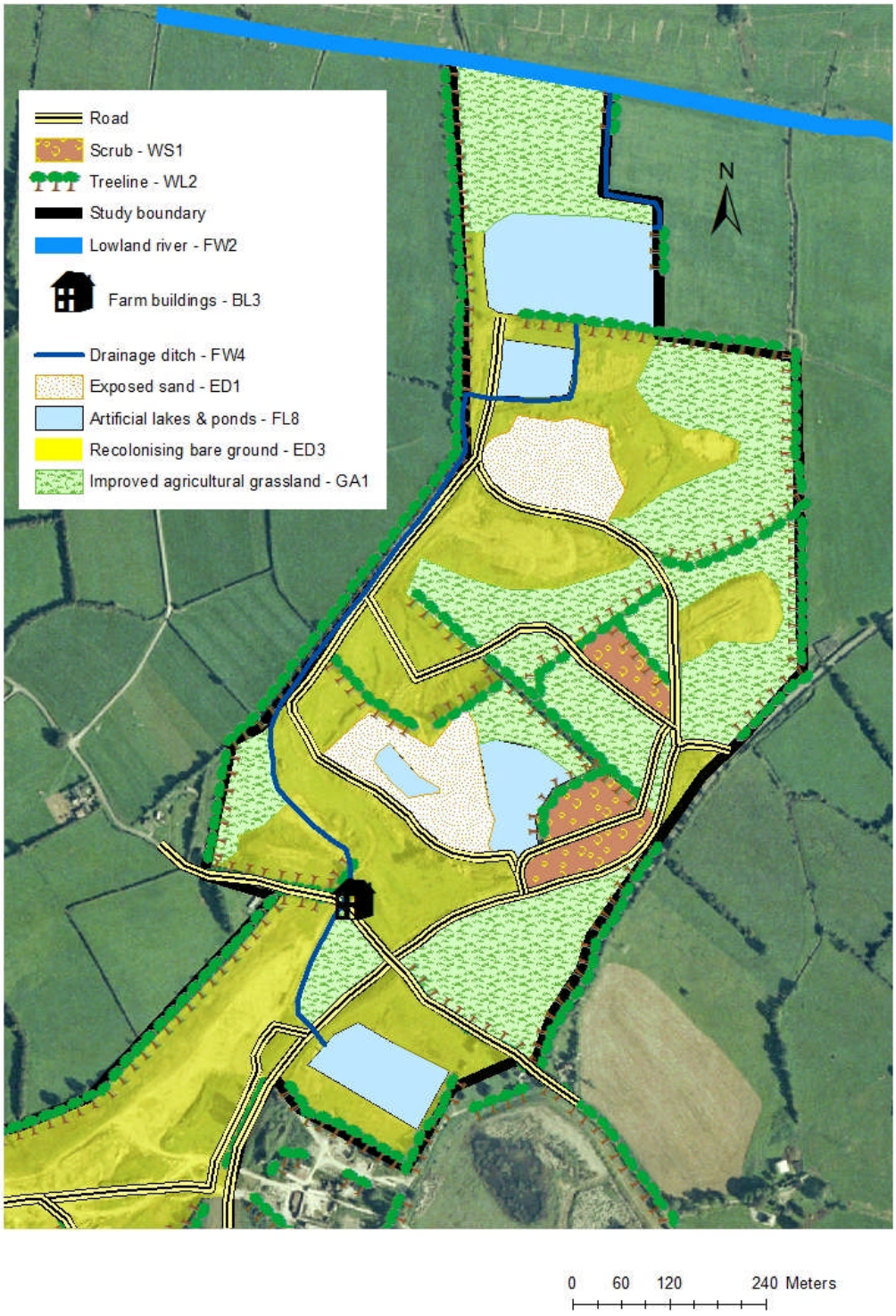

Figure 3 – Lagan Cement north

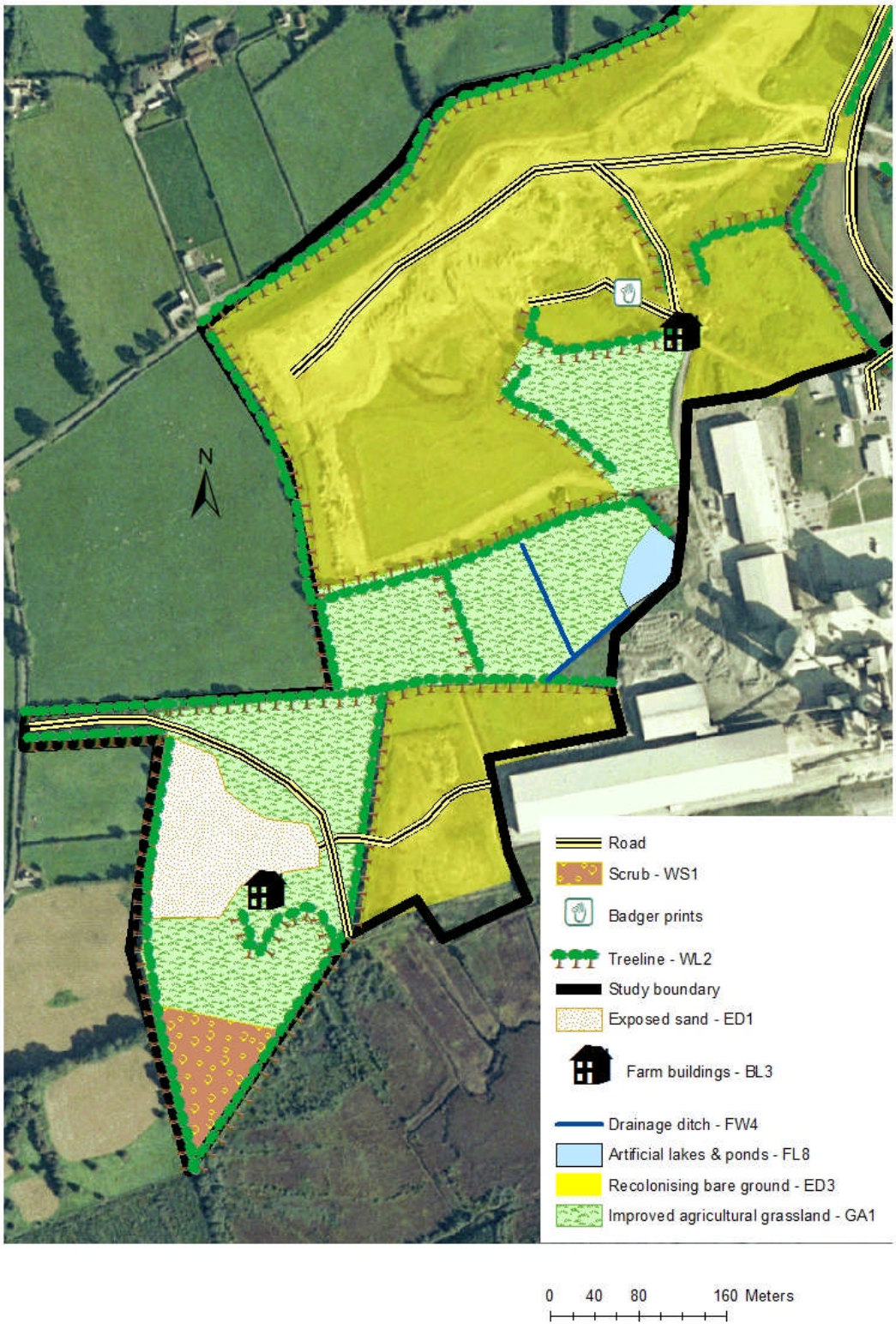

Figure 4 – Lagan cement south

Agricultural fields

Before quarrying activities commenced this land was used for intensive agriculture. Since Ireland joined what was then the European Economic Community in 1973 intensive farming practices became the norm. This meant new regimes in fertilisation, harvesting and the application of chemical herbicides and pesticides. This has resulted in a marked decline in farm biodiversity and fields that were once rich in wild flowers, insects and seed-eating birds now only contain a small number of grass species that dominate the flora of this habitat. This is **improved agricultural grassland (GA1)** and is the most abundant habitat type in Ireland today. Because of the high level of management it is of very low value to biodiversity. This habitat type covers approximately 29 ha which equates to one third of the study area.

Fringing these fields are lines of trees and other vegetation that have been historically present since boundaries were first marked out many centuries ago. Originally they would have been planted and managed in order to keep in livestock (and keep out wolves!) but this practice is now in decline and hedgerows have grown into lines of tall trees. These are **treelines – WL2** and there are nearly 9.5 km of them across the study area. They are tremendously important habitats as they provide resources for a wide ranges of species from plants and insects to large mammals and birds. In essence they harbour the woodland flora and fauna that once existed in the great forests of old. The most obvious component of this habitat are the trees such as Ash, Hawthorn, Wych elm, Sycamore, Spindle and Blackthorn. Oak trees are present but they are only to be found in a few locations. Bramble and Ivy occupy much of the space between the trees although there are numerous other woodland species present such as Dog violet, Primrose and various ferns. Treelines provide essential 'ecosystem services' to our environment, functions that are frequently taken for granted, such as landscape enhancement, flood alleviation, maintaining soil fertility, pollution control and carbon storage. They also act as wildlife corridors; vital links that allow animals and plants to move across the countryside and in doing so avoid the development of isolated pockets or 'islands' of biodiversity.

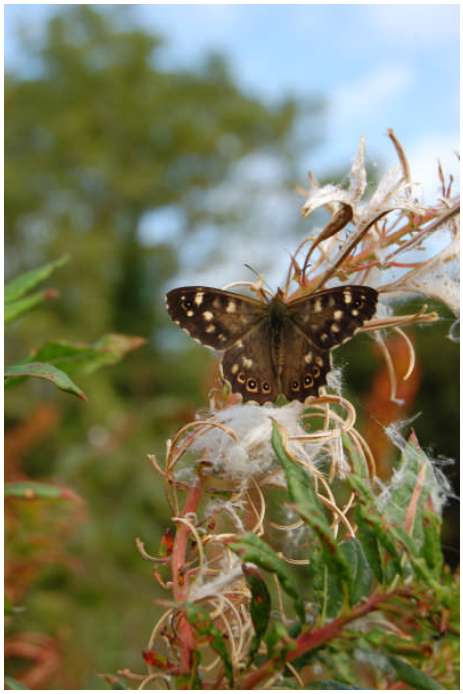

Figure 5 – Treelines provide important habitat for a wide range of species – including this speckled wood butterfly

Where agricultural grassland has been abandoned it is quickly colonised by new species. This is a process known as 'succession' and sees a continual change in the type of vegetation present until ultimately there is high forest. An intermediate stage see the arrival of pioneering woody plants and this is known as **scrub (WS1).** There are a few patches of scrub in the study area, on areas where the continuation of agriculture was impractical, and they are obvious from the emergence of young willow trees. Emergent habitats such as this can provide good cover for nesting birds as well as a range of other animal species but they tend to have a low diversity of plants.

Aquatic habitats

The Kinnegad river runs west to east along the northern boundary of the Lagan site and is a **lowland river (FW2)**. It drains into the river Boyne, a Special Area of Conservation and one

of the most important salmon rivers in the east of Ireland. The channel of the river has been greatly altered since the 1960's when major arterial drainage works were undertaken by the Office of Public Works. This explains why the rivers in this area are so straight, deep and have little or no bankside vegetation (natural lowland rivers meander and would have varying degrees of shading). These works have been to the detriment of the river's biodiversity although the Eastern Regional Fisheries Board continue to count Atlantic salmon passing upstream to spawn. Because of the amount of light reaching the river the bed can be seen to be thick with a profuse growth of Water-cress. Probably as a result of agricultural run-off in the surrounding land the Kinnegad river has been assessed by the Environmental Protection Agency (EPA) as 'moderately polluted'[7]. Under the EU's Water Framework Directive this constitutes 'unsatisfactory' status and remedial measures will be required to improve this by the 2015 deadline.

Throughout the study area there are a series of **drainage ditches (FW4)** although these vary from being small streams to wet trenches. They tend to run alongside treelines although in some places they are culverted (i.e. piped underground) or run across the centre of fields. In the open their route is obvious from the presence of Bulrushes while along treelines there is little aquatic vegetation due to excessive shading. These water bodies are not likely to be of major value to fish (i.e. salmon or trout) although smaller fish such as Minnow or Stickleback will be present.

Within the study area there are six sizable **artificial lakes or ponds (FL8)** that have been created either deliberately or as an indirect consequence of quarrying activities. This does not include the numerous wet areas in the sand quarries that can better be describes as 'wet depressions'. Although not designed for wildlife they have attracted a range of species, particularly birds, and some of these are of conservation significance (see fauna section later in this report). Three of these are settlement ponds, constructed to remove sediment from wastewater outflows, and because their sides have a steep gradient there is little or no vegetation along the margins. What exists is predominantly Rushes with a number of sapling Willow trees emerging from the shallow water.

Figure 6 – Settlement pond to the north of study area showing unvegetated margins

Farm buildings

Buildings (BL3) are not typically associated with wildlife and in general are hostile places for flora and fauna. However, because they simulate a cave environment, and are full of cracks and crevices, they can provide locations for roosting bats. Within the study are there

[7] **Clabby, K.J., Bradley, C., Craig, M., Daly, D., Lucey, J., McGarrigle, M., O'Boyle, S., Tierney, D. and Bowman, J**. 2008. *Water Quality in Ireland 2004 – 2006.* EPA.

are three clusters of abandoned farm buildings which range from derelict houses to outhouses and barns.

Areas associated with quarrying

As part of the quarrying activities a great deal of topsoil and stones have been moved from one location to another. What is originally bare soil and rock is quickly colonised with a wide variety of plant species and is classified as **recolonising bare ground (ED3)**. It is the first stage of the process of succession which see the advancement of scrub. This process is retarded somewhat by the large component of rock and stone and dry, compact nature of the soil in these areas. It covers nearly 41 ha and therefore constitutes nearly half the total study area. While bare ground is still very much apparent a wide variety of plants are found here and this is to be expected as dormant seeds germinate and new seed stock arrives on the wind. Of particular interest in this habitat is the presence of orchids and while these glamorous flowers are not present in September they were noted in this habitat during a previous study carried out in July. Two species were found – the Heath spotted-orchid and Pyramidal orchid, and while these species are not rare they are a uniquely evolved flower and so have a high education and charisma value. This habitat is also important for another charismatic species, the Irish hare, as will be discussed later.

Figure 7 – This pyramidal orchid was photographed near the southern settlement pond in July. Orchids have a unique method of reproduction that many believe to be the pinnacle of plant evolution.

Apart from the settlement ponds there are three further locations where sizable ponds have formed. One is at the base of a former rock quarry and is totally unvegetated. The two others have formed from changes to the land surface following movements of top soil. In these two locations there are relatively extensive beds of rushes. These provide cover for water birds and aquatic insects such as dragonflies.

In two locations in the study area there are sand quarries with **exposed sand (ED1)** habitat. The extraction of sand from the esker ridge has created a habitat that does not exist naturally in Ireland, except perhaps along the eroded banks of some rivers. There are cliff faces that are unvegetated and the damp quarry floor has extensive mats of orange moss, possibly *Funaria hygrometrica* (sadly, most mosses have no common names). There is a mixture of floral types but the real importance of these areas is the colonies of Sand martins and amphibians that they support.

Figure 8 – Sand quarry to the north showing carpet of orange moss

The range of habitats present in turn support a range of animal species. Even in a relatively small corner of county Meath such as this there will be thousands of species from birds and mammals to springtails and nematode worms. Despite the fact that invertebrates make up the vast majority of Earth's biodiversity there simply isn't the expertise to sample and name them. That is why most survey work focuses on larger animals that can be identified with the naked eye. As a result, protected species tend to be larger ones, and especially in Ireland there are very few protected invertebrates. The Wildlife Act 1976 (as Amended, 2000) is the main piece of legislation for the protection of species in Ireland. This lists animals and plants for which hunting or collection is prohibited, as well as closed seasons for hunting or disturbance of breeding sites. Protected animals are not necessarily rare, or endangered with extinction, so 'red data lists' are drawn up to help identify those in most need of protection.

Mammals

Table 1 lists the mammals that are either known to be present in the study area or are highly likely to be present because there is suitable habitat.

Table 2 – Mammals in the study areas

Species	Protected?	Red Data List[8]
Wood mouse	No	-
House mouse	No	-
Brown rat	No	-
Hedgehog	Yes	Internationally important
Pygmy shrew	Yes	-
Brown long-eared bat	Yes	Internationally important
Pipistrelle	Yes	Internationally important
Leisler's bat	Yes	Internationally important
Whiskered bat	Yes	Indeterminate
Natterer's bat	Yes	Indeterminate
Daubenton's bat	Yes	Internationally important
Rabbit	No	-
Irish hare	Yes	Internationally important
Otter	Yes	Internationally important
Badger	Yes	Internationally important
Fox	No	-
Irish stoat	Yes	-

[8] Whilde A. 1993. *Threatened Mammals, Birds, Amphibians and Fish in Ireland*. Her Majesty's Stationary Office.

Of the protected species the most obvious in the Lagan Cement site is the Irish hare. This is one of very few animals that is endemic to Ireland, i.e. it is found nowhere else, and is a distinct species related to the mountain hare of alpine Europe. Unlike its cousin it is not confined to upland areas and can be found in all kinds of habitats in Ireland. Recent studies have shown that it has undergone a marked decline in numbers but the reasons for this are not clear. Drainage of wetlands and the intensification of agriculture are likely to be among the causes[9]. In the study area the Hare prefers the recolonising bare ground habitat and is also found in the cutover bog to the south of the site.

Badgers build their setts in woodlands and along treelines although they can forages in all kinds of places, including quarries. A recent survey found a number of setts and in the September study signs of their activity was found along a muddy path (right).

Figure 9 – a Badger paw print leading into recolonising bare ground habitat to the west of the study area

Bats are highly likely to be roosting in the abandoned farm buildings as well as in ivy-covered trees. They will forage along the paths of the numerous treelines in the area. Three species of bat, the pipistrelle, brown long-eared bat and leisler's bat have been directly recorded from the site while natterer's, whiskered and daubenton's bats are likely to be present since they are known from the area and suitable habitat is present.[10]

Perhaps notable by their absence are the red squirrel and the pine marten. The former is in decline and was recently declared extinct from county Meath[11] while the latter is expanding its range into the east of Ireland although the dense forests it prefers are not present on the site. Deer also seem to be absent.

Birds

A number of surveys have identified the birds that are to be found and table 2 gives a full list. All birds, their nests and eggs are protected under the Wildlife Act and it is prohibited to interfere with their breeding sites from March 1st through to August 31st. BirdWatch Ireland has developed a 'traffic light' system for determining the conservation status of birds where red = high concern; amber = medium concern; and green = low concern. Birds are probably the best indicators of the health of our environment because they are highly mobile (and so respond quickly to changes), are reasonably easy to identify, and are very popular – with an army of unpaid volunteers surveying them every year.

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[9] **Reid, N., Dingerkus, K., Montgomery, W.I., Marnell, F., Jeffrey, R., Lynn, D., Kingston, N. & McDonald, R.A.** 2007. *Status of hares in Ireland. Irish Wildlife Manuals, No. 30*. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government.

[10] See http://www.batconservationireland.org/php/data.php

[11] **Carey M., Hamilton G., Poole A. & Lawton C.** 2007. *The Irish Red Squirrel Survey.* COFORD.

Table 3 – Birds in the study area[12]

Species	Conservation Status[13]
Goldfinch	Green
Wood pigeon	Green
Blackbird	Green
Hooded crow	Green
Rook	Green
Jackdaw	Green
Starling	Amber
Teal	Amber
Snipe	Amber
Reed buntings	Green
Heron	Green
Mallard	Green
Song thrush	Green
Stonechat	Green
Meadow pipit	Green
Skylark	Amber
Raven	Green
Little grebe	Amber
Mute swan	Amber
Kingfisher	Amber
Peregrine falcon	Green
Moorhen	Green
Coot	Amber
Green sandpiper	Green
Sand martin	Amber
House martin	Amber
Swallow	Amber
Linnet	Amber
Kestrel	Amber
Pheasant	Green
Woodcock	Amber
Grey wagtail	Green
Pied wagtail	Green
Wren	Green
Dunnock	Green
Robin	Green
Mistle thrush	Green
Chiffchaff	Green
Goldcrest	Green
Blue tit	Green
Coal tit	Green
Great tit	Green
Magpie	Green
Chaffinch	Green
Redpoll	Green

[12] Note: this list includes records from the whole Lagan cement site and not just the study area

[13] **Lynas P., Newton S.F., & Robinson J.A.** 2007. The Status of birds in Ireland: an analysis of conservation concern 2008 – 2013. Irish Birds: Volume 8; Number 2.

A number of species here are of particular significance. Both the kingfisher and peregrine falcon are of special conservation importance because they are listed on Annex I of the EU Birds Directive. This means that they are worthy of special protection measures across Europe. The kingfisher turns up regularly on the settlement pond to the north of the study area. It is likely that a pair are nesting along the banks of the Kinnegad river and use the ponds for hunting. The wooden stakes around the ponds provide ideal perching stands although there are no suitable nesting sites. Kingfishers require vertical muddy banks in which they excavate a burrow, up to half a metre deep.

The peregrine falcon is a dramatic bird of prey, well know for its speed and aerial acrobatics. The widespread use of organochlorine pesticides in the 1950's saw a dramatic decline in their numbers since the chemical travelled up the food chain and resulted in thin-shelled, fragile eggs being laid. This lead to a ban in their use and there has been a dramatic rebound in the peregrine population since then. The bird's preferred habitat is coastal or mountain cliffs but the steep sides of quarry pits perfectly simulates these conditions (they are also known to nest on tall buildings in city centres). In 2009 a pair of peregrines were observed in courtship behaviour on and around the main stack of the Lagan cement site. It is believed that they have established a territory around the quarry and may be nesting in one of the nearby silo buildings.

One of the most impressive bird sights in Ireland is that of a colony of breeding sand martins, of which there are two in the study area. True to their name they have dug their nests in the sandy cliff faces and this man-made habitat has become one of the most important nesting areas for this species (84% of British and Irish nests are in quarries![14]). The sand martin is on BirdWatch Ireland's amber list and so quarries are essential for the continued survival of this species.

Figure 10 – Sand martin nests in the sand pit to the north. A second colony exists along the sand quarry to the south-west.

Little grebes are to be found diving for food in the settlement ponds while in wet places the walker is continuously disturbing crouching snipe, which dramatically burst out from the undergrowth without warning! Both of these birds are amber listed and so their presence on the site is significant from a conservation perspective.

[14]**Gibbons D.W., Reid J.B. & Chapman R.A.** 1993. *The New Atlas of Breeding Birds in Britain and Ireland: 1988 – 1991.* T&AD Poyser.

Reptiles and Amphibians

In Ireland there are only four species of reptile and amphibian: the Common frog; the Smooth newt; the Common lizard; and the Natterjack toad. The latter is confined to extensive sand dune systems in Kerry and Wexford. Frogs were regularly encountered in the study area, particularly in the shallow pools on the sand quarries, although they will spawn anywhere there is standing water. Although no lizards were sighted they are common and widespread and have been spotted on the site in the past. Newts, while also common, are much more localised than frogs and are not encountered as frequently. A single newt larva was recorded in a shallow pond in the sand quarry to the west of the study area.

All these species are protected under the Wildlife Act while the frog is also listed in the red data book as being of 'international importance' in Ireland.

Figure 11 – Lizards such as this are likely to be common in the study area

Invertebrates

There are countless invertebrates present in and around every available surface, from the soil to the canopies of trees and from dead wood to within the buds of emerging leaves and flowers. Little is known about the status and extent of the majority of these species and even in Ireland new species are being described all the time. Because of this very few invertebrates are protected by law and it is not know whether many are rare or endangered. Having said that, some groups of species are well studied but these tend to be conspicuous with butterflies and odonates (the collective term for dragonflies and damselflies) getting the bulk of the attention.

Those invertebrates that are known to be rare or protected tend to be confined to pristine or rare habitats (e.g. the freshwater pearl mussel is confined to only the cleanest rivers) and so it is unlikely that any are present within the study area. A number of common butterflies were observed including speckled wood, red admiral, painted lady, small tortoiseshell and small white. Many species emerge from the larval stage seasonally and so will not be flying in late summer. There are far more types of moths than butterflies but because they fly at night they are not so noticeable. There are likely to be lots of species in the study area.

Figure 12- This is the larvae of a puss moth and was photographed on a willow tree on the Lagan cement site, near the study area. Note the false eyes making the caterpillar looking more ferocious than it looks.

The ponds and wet habitats in the study are relatively new and so only the odonates that are good colonisers will be present. Those species that were noted include the common darter (one of the commonest), common hawker (one of the largest) and common blue-tip.

The Action Plan 2009-2013

Actions identified in this plan include those that were committed to as part of a recent planning application to Meath county council. Some of the actions are therefore designed as mitigation for predicted impacts arising from the quarry expansion however it is hoped to go well beyond this so that genuine enhancement works will be carried out.

The site survey and literature review showed that the study area has populations of many species of conservation value. The actions in this plan seek to protect and enhance these features. Successful conservation is as much about raising awareness as it is about science and this must become an integral component of this plan.

The actions in this plan are set out over the 5 years up to 2013. At the end of this period it is likely that additional actions will be needed to build on successes or to revisit actions that have not had the desired outcome.

In order to have the greatest chance of success actions must be realistic, cost effective, and have specific indicators of achievement. One essential component that is not addressed in this report is the responsibility for ensuring that actions are carried and it is recommended that once the plan has been approved a ‘biodiversity champion’ be appointed within the company to monitor its implementation.

To aid in its implementation, a BAP map has been drawn and is shown in figure 14.

Action 1: Do nothing

Timescale: Immediate

Scope: Areas shown in the habitat map (figures 3 & 4) as recolonising bare ground and scrub, totally approximately 44 ha.

Target: Maintain the area of habitat suitable for Irish hare.

Mechanism: Intervening is not always necessary in order to create habitats and a hands-off approach has already been shown to be beneficial for a number of species. This is particularly the case for the Irish hare which has established itself across the Lagan Cement site. The hare in Ireland is adapted to a wide variety of habitats but it is not present in woodlands[15]. Populations are believed to have undergone a massive decline over the past 100 years and so maintaining this population is considered important at a county scale. Hares are mostly active at night time, 'lying up' during the day under cover of vegetation such as tall grass or heather. Judging from sightings and the presence of droppings and footprints, the hare is distributed across the recolonising bare ground habitat as well as the cutover bog to the south, but is mostly absent from the improved agricultural grassland areas. This distribution provides good connectivity beyond the Lagan Cement site and so contributes to a healthy population. The hares probably lie up at the base of treelines, within rushes around wet depressions and under areas of scrub. They are well suited to this rough, patchy ground and so doing nothing in these areas will continue to provide a refuge for these important animals.

[15] **Reid, N., Dingerkus, K., Montgomery, W.I., Marnell, F., Jeffrey, R., Lynn, D., Kingston, N. & McDonald, R.A.** 2007. *Status of hares in Ireland. Irish Wildlife Manuals, No. 30*. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government.

Action 2: Creation of Native Woodland

Timescale: 20 years minimum

Scope: There is potential to create nearly 25 ha of native woodland within the study if all available areas of improved agricultural grassland (GA1) were to be utilised. A minimum area of 3 ha has been committed to under the recent EIA. Should the total area be exploited then this would be a significant addition to native woodland in Meath (currently only 0.79% of the county is covered with native woodland)[16].

Target:

David, you will need to decide how much of the available land you want to devote to this action. We can then decide on an annual rate of coverage

Mechanism: The preferred forest type in this region is 'pedunculate oak-ash forests with hazel and enchanter's nightshade *Circaea lutetiana'* given the soil type and geographic location[17]. There is additional scope to create riparian woodland, along selected areas shown in figure 14. This is a woodland type of high conservation value (listed in Annex I of the Habitats Directive) and is associated with improved water quality and flood alleviation. Given the fertile soils and lowland nature of the adjoining Kinnegad river the most appropriate forest type here would be 'gallery forest' dominated by Willow with occasional Alder[18]. A phased approach should be adopted over the five year period whereby particular land parcels are planted with appropriate stock. An outline plan for each land parcel should be drawn up in advance of planting to determine stock source, species types and planting densities.

Figure 13 – Thousands of years ago Meath was covered in oak forest, today only a tiny fraction of this habitat remains

[16] **Higgens G.T., Martin J.R. & Perrin P.M.** 2004. *National Survey of Native Woodland in Ireland.* National Parks and Wildlife Service

[17] **Cross J.** 1997. *Native Woodland Manual.* Forest Service

[18] **Little D., Collins K., Cross J., Cooke D., & McGinnity P.** 2008. *Native Riparian Woodlands – A Guide to Identification, Design, Establishment and Management.* Woodlands of Ireland. Native Woodland Scheme Information Note No.4

Action 3: Pond Enhancement

Timescale: 2-3 years

Scope: The three settlement ponds are currently attracting wildlife, particularly water birds, but there is ample scope to enhance these areas by developing a vegetated riparian zone. This would create nursery areas for small fish, provide cover for breeding birds, and additional habitat for aquatic invertebrates, particularly dragonflies and damselflies.

The pond to the far north of the study area is known to be regularly frequented by kingfisher, a species of particular conservation importance. It is believed that they are breeding along the Kinnegad river as there is no suitable breeding sites around the ponds. This could be addressed by building artificial nesting sites into a raised bank along the side of the pond that adjoins the stream flowing into the river. Nesting boxes are commercially available at low cost over the internet.

Target: 1. Establish a pair of breeding kingfisher on the northern pond.
2. Create vegetated margins at least 3 m wide along at least one side of each of the identified settlement ponds.

Mechanism: Along one side of three ponds, excavate the bank to produce a very shallow gradient (see figure 14). This should be done in winter (to avoid bird nesting season) and to give a good idea of winter water levels. Once this has been done there is no need to plant species as colonisation will be rapid.

On the northern pond, the eastern bank should be built up and a small number (perhaps two) kingfisher nesting boxes inserted. Over the banks a small number of Alder trees should be planted and this will provide shade and cover that will hopefully encourage kingfishers to nest.

The wooden stakes that are currently situated around the ponds should remain as they provide excellent perching sites for kingfishers.

Action 4 – Protection of Sand martin colonies

Timescale: Immediate

Scope: There are two important sand martin colonies within the study area and these are shown in figure 14. It is not known how many nesting pairs of birds these support but the northern site is significantly larger than the southern one.

Target: Maintain the two sites of breeding populations of sand martins in the study area.

Mechanism: The cliff faces in which the sand martins nest are by their nature quite fragile and so vulnerable to damage. It is understood the Lagan Cement continue to extract sand from these quarries from time to time. There are two important points that should be noted in order to protect the nesting sites while continuing to extract small quantities of sand.

- Under the Wildlife Act it is prohibited to interfere with the nesting sites of birds from March 1st to August 31st each year. Sand should not be extracted during this time.
- If small quantities of sand are to be extracted during the winter months then the cliff areas, on which the sand martins depend, should be avoided.
- The impact of continued sand extraction from these areas on the integrity of the breeding colonies should be assessed and if it is believed that negative impacts are likely over the next 5 years then avoidance measures should be taken.

Action 5 – Enhancement and protection of bats

Timescale: 1-2 years

Scope: At least 10 bat boxes should be erected across the site (as per commitment in EIS). While three bat species have been confirmed from the Lagan cement site a further two species may be present and in particular Daubenton's bat may occur around the settlement ponds. There are three farm buildings in the study area that provide excellent roosting opportunities for bats although these have never been surveyed.

Roosting bats were recorded in farm buildings within the development zone and are likely to occur in some of the trees that will be felled.

Target:
1. Erect 10 bat boxes at suitable locations across the study areas.
2. Establish the status of bats within the study area
3. Protected bats roosting within the development zone.

Mechanism: Bat boxes are easily sourced over the internet however it will be necessary for a bat ecologist to position these in the most appropriate locations. It is recommended that while this is being done, the derelict farm buildings and settlement ponds should also be surveyed to determine their significance for breeding and foraging bats. This will provide valuable information to be included in any education programme (see action 6).

Towards the end of the 5 year plan it is recommended that the bat boxes are surveyed for occupancy and additional measures taken to improve use if necessary.

Any mature trees scheduled for removal shall first be inspected by a bat specialist for the presence of potential bat roosts and mitigation implemented accordingly to prevent disturbance to any animals in residence. Trees that are to be removed should be felled during the months of September to November inclusive. Felling during the autumn months avoids the periods when bats are most active or in hibernation and also avoids the peak bird nesting season. Any ivy covered trees which require felling should be left to lie for 24 hours after cutting to allow any bats beneath the cover to escape.

All retained trees should be fenced a minimum of 7m from the trunk or a distance equivalent to canopy height to ensure that their root structure and branches are not damaged by plant machinery. No soils, machinery or other building materials should be stored in retained habitats which will also be clearly delineated and fenced.

Destruction or evacuation of a known bat roost is a notifiable action under current legislation and a derogation licence must be obtained from the National Parks and Wildlife Service (NPWS) before works can commence on the structures identified as harbouring bats. As bats in the old farm buildings and modern shed are presently in low numbers and a maternity roost is not present, the removal of the structures can be undertaken immediately once a licence for the work is granted by the NPWS. Demolition of the structures where bat signs were observed should be done carefully with the expectation that bats may be found. A bat specialist shall be present during roof removal

to deal with any animals found. The roof of such structures should be carefully removed by hand to protect any animals which may be beneath slates. If discovered, bats should be retained in a box until dusk and then released on site.

Figure 14 – BAP map showing action areas

Action 7 – Education and Outreach

Timescale: Year 1 and potentially annually thereafter

Scope: Developing a nature trail and interpretive material should cover the entire study area and be open to visitors to the site as well as employees.

Target: 1. Make findings of this biodiversity study available to stakeholders.
2. Open a nature trail on the site by 2013.

Mechanism: There are a number of actions under this heading.

Action 7a: Open a nature trail. There are already a number of paths/rough roads across the study area that can easily be used for access. A suggested route is shown in figure 15. While most of this path is open there are some areas that will need development e.g. where debris has been dumped. This trail is approximately 4.2 km round trip (starting and finishing at the main reception building) which could reasonably be completed in 1 – 2 hours depending on the length of time. This could be incorporated with the Irish Heart Foundation's 'Slí na Sláinte' walking initiative which encourages a healthy lifestyle.

Action 7b: Figure 15 shows 'nature stops' where interpretive panels could be positioned at interesting features. A DL sized leaflet with map could easily be designed to accompany the trail and be based on the findings of this report.

Action 7c: Team up with an conservation group such as the Irish Wildlife Trust (www.iwt.ie) to carry out nature walks along the trial.

David, I have to declare a vested interest in action 7c as I am chairman of the IWT. We have a corporate membership programme whereby we provide activities at very competitive prices. You could use this to either implement the actions in the plan or to use our education department to deliver the community outreach programme. We can discuss this further but if it is not something you are interested in we can delete this action.

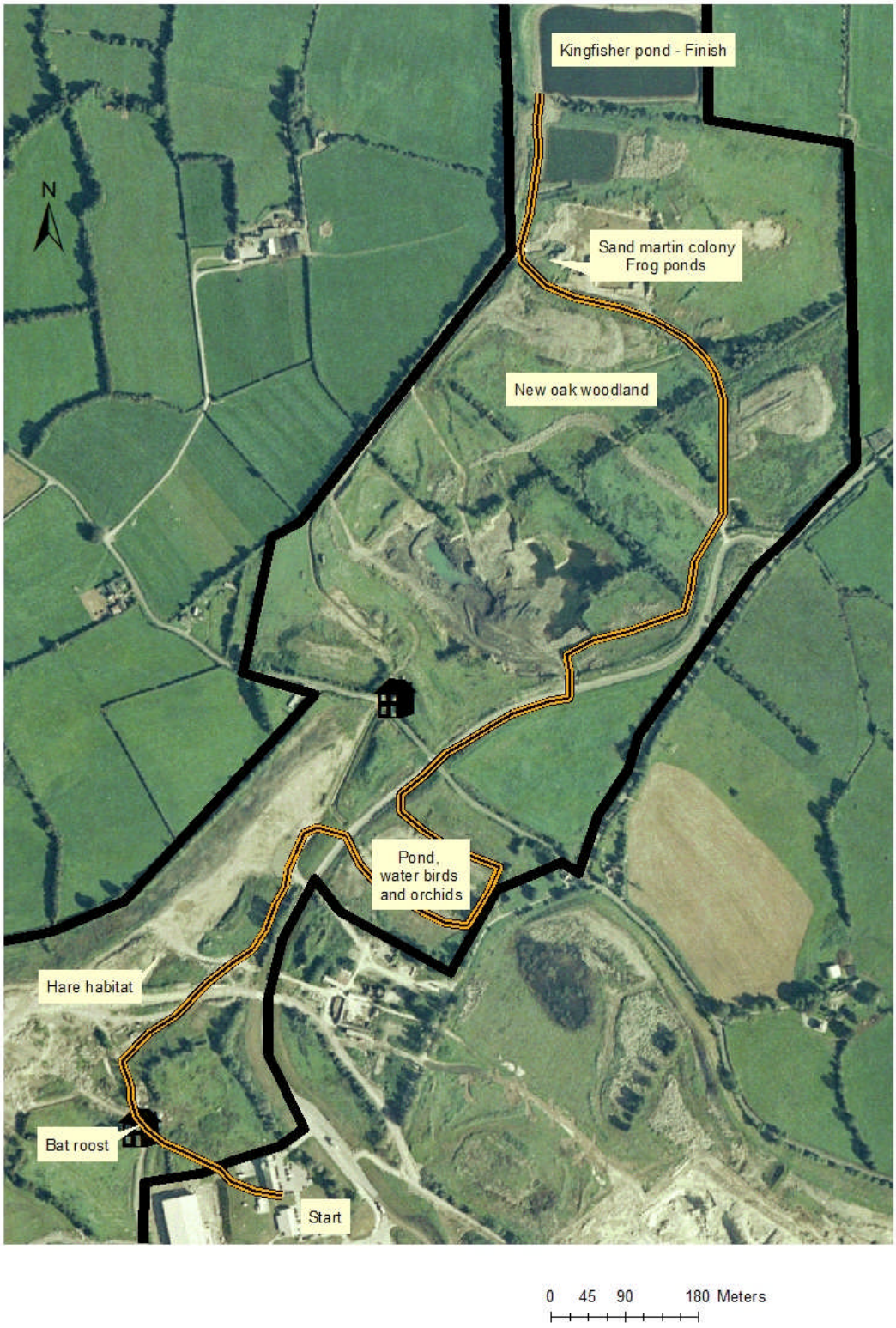

Figure 15 – Proposed route of Lagan Cement nature trail

Action 8 – Protection of badgers setts within development zone

Timescale: Immediate, and as development proceeds

Scope: Four badger setts were identified during survey work carried out in Summer 2009 (Smal C., 2009). These are shown in figure 16. One of the conditions of granting planning permission for the quarry expansion was to retain the bog woodland to the south-west. Therefore two of these setts (S3 and S4) will no longer be impacted by the development and will be situated approximately 80m from the new quarry boundary. The other setts (S1 and S2) will be impacted and so these mitigation measures will apply.

Target: To ensure the protection of badgers in the path of development.

Mechanism: A 30m exclusion zone is to be established around setts S1 and S2, which are not thought to be breeding setts. This area is shown in figure 16. Within this zone there should be no movement of machinery or removal of vegetation until such time as affected setts can be evacuated and destroyed by experts under licence from NPWS.

If relevant, light work, such as hand digging or scrub clearance should not take place within 10m of sett entrances.

Affected setts (S1 and S2) should be clearly marked and the extent of bounds prohibited for vehicles clearly marked by fencing or adequate physical boundary. Protective fencing will be established at the outset of works to afford adequate protection to these setts and their surrounding habitats during construction operations. The extent of fencing will be determined during a site visit by a project engineer and a qualified ecologist. Temporary fencing will be sufficiently durable and robust to cover the period of construction.

Badgers will need to be evacuated from any affected setts by zoological experts prior to construction taking place - for humanitarian consideration. Such evacuation may not take place during the badger breeding season which is from December to June (inclusive). The setts will then be destroyed under supervision by qualified experts. These operations must be carried out by personnel licensed to do so by National Parks and Wildlife Service, Dept. of the Environment.

The manner of exclusion for each sett will be determined by a qualified badger expert or experienced ecologist. Most active setts require closure by means of one-way gates placed over sett entrances, and left in place for 21 days, with regular monitoring to check activity at the sett. Larger setts may require evacuation by means of badger-proof fencing erected onto timber post and rail fencing and provided with badger gates. This exclusion must take place over a minimum of 21 days with regular monitoring to check activity at the sett. Inactive setts (deemed inactive after 5 days of monitoring) may be evacuated by means of light blocking with soil and then hard blocked after a further monitoring period.

Because breeding setts (i.e. S3) will not be impacted, there is no longer a requirement to construct and alternative sett.

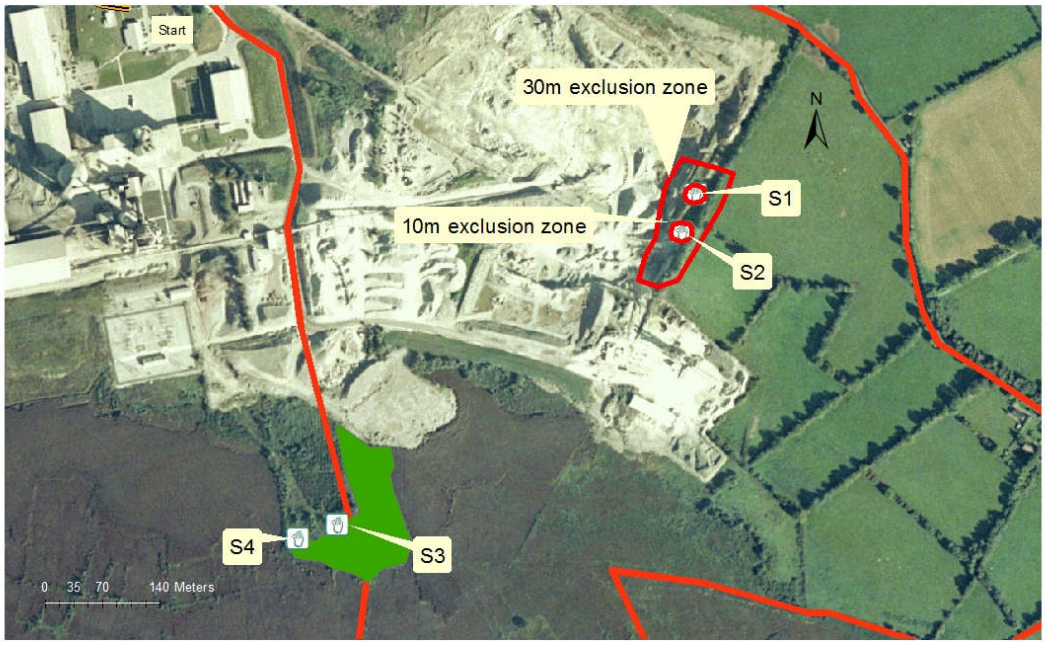

Figure 16 – Location of badger setts within the site boundary

Action 9 – Site restoration

Timescale:	Post quarry operations.
Scope:	This should cover the worked out areas of quarry and include the 46 ha that are currently under production as well as the approximately 66 ha that are to be developed.
Target:	To ensure that there is long-term compensation of habitat for biodiversity in general and specifically species of conservation importance (bats, Irish hare, common frog, pygmy shrew and skylark).
Mechanism:	The site recovery plan should have a strong emphasis on creation of habitat for biodiversity. In many cases this is less onerous than recreating agricultural farmland. Flooded areas may attract wildlife while a light covering of soil elsewhere is normally sufficient to kick-start the development of habitats suitable for the species mentioned. In certain areas trees should be planted to create corridors that will attract insects, plants and bats.

Conclusion

The Lagan Cement site shows that heavy quarrying activities is not only compatible with the interests of biodiversity but can go far beyond this to provide valuable resources for a wide variety of threatened and/or protected species.

By commissioning this plan, the company has already taken an important step in raising awareness of conservation on the site and is a recognition of the vital role of maintaining biodiversity in building a sustainable future. The actions set out in the plan seek to build on this commitment and will result in material improvements, for both people and wildlife, while being cost effective. Through implementing the plan Lagan Cement is leading the way in integrating all aspects of the environment into its everyday operations.

Figure 16 – the caterpillar of the cinnabar moth is synonymous with common ragwort, a common plant of fields and waste places

Appendix 1 – Plant species and their associated habitats in the study area

Nomenclature for flora is taken from *An Irish Flora* (Webb et al., Dungalgean Press, 1996) for scientific names and *Census Catalogue of the Flora of Ireland* (Scannell & Synnott, Stationary Office, 1987) for common names. Those indicated with '*' are species that have been introduced by man, while those indicated with '§' are possibly introduced.

Artificial lakes and ponds - FL8	
Cladophora sp.	Green algae
Juncus acutiflorus	Sharp-flowered rush
Juncus effusus	Soft rush
Salix sp.	Willow
Scirpus lacustris	Common club-rush
Typha sp.	Bulrush

Improved agricultural grassland - GA1	
Agrostis canina	Velvet bent
Arrhenatherum elatius	False oat-grass
Carex otrubae	False fox-sedge
Cirsium vulgare	Spear thistle
Dactylis glomerata	Cock's-foot
Elymus repens	Common couch
Epilobium angustifolium	Rosebay willowherb
Equisetum sp.	Horsetail
Filipendula ulmaria	Meadowsweet
Galium aparine	Cleavers
Hypericum perforatum	Perforate St. John's-wort
Juncus effusus	Soft rush
Phleum pratense	Timothy
Potentilla anserina	Silverweed
Scrophularia nodosa	Common figwort
Sonchus arvensis	Perennial sow-thistle
Stachys palustris	Marsh woundwort
Taraxacum sp.	Dandelion
Ulex Europaeus	Gorse
Urtica dioica	Common nettle

Depositing/Lowland rivers - FW2 and Drainage ditches - FW4	
Agrostis capillaris	Common bent
Angelica sylvestris	Wild angelica
Arctium minus	Lesser burdock
Cirsium palustre	Marsh thistle
Cladophora sp.	Green algae
Equisetum sp.	Horsetail
Filipendula ulmaria	Meadowsweet
Holcus lanatus	Yorkshire-fog
Juncus acutiflorus	Sharp-flowered rush
Juncus inflexus	Hard rush
Lythrum salicaria	Purple-loosestrife
Mentha aquatica	Water mint

Nasturtium officinale	Water-cress
Phalaris arundinacea	Reed canary-grass
Potamogeton sp.	Pondweed
Potentilla anserina	Silverweed
Potentilla reptans	Creeping cinquefoil
Ranunculs sp.	Water-crowfoot
Ranunculus repens	Creeping buttercup
Salix sp.	Willow
Scirpus lacustris	Common club-rush
Sparganium erectum	Branched bur-reed
Typha sp.	Bulrush
Veronica beccabunga	Brooklime

Treeline - WL2	
*Acer pseudoplatanus**	Sycamore
Alnus glutinosa	Alder
Brachypodium sylvaticum	False brome
Corylus avellana	Hazel
Crataegus monogyna	Hawthorn
Euonymus europaeus	Spindle
*Fagus sylvatica**	Beech
Fraxinus excelsior	Ash
Geranium robertianum	Herb-Robert
Hedera helix	Ivy
Malus sylvestris	Crab apple
Pinus sylvestris	Scots pine
Prunus avium	Wild cherry
Prunus spinosa	Blackthorn
Quercus sp.	Oak
Rosa canina	Dog rose
Rubus fruticosus	Bramble
Salix sp.	Willow
Sambucus nigra	Elder
Ulmus glabra	Wych elm

Scrub - WS1	
Agrostis canina	Velvet bent
Cirsium vulgare	Spear thistle
Dactylis glomerata	Cock's-foot
Filipendula ulmaria	Meadowsweet
Galium aparine	Cleavers
Geranium robertianum	Herb-Robert
Hypericum perforatum	Perforate St. John's-wort
Juncus acutiflorus	Sharp-flowered rush
Juncus inflexus	Hard rush
Phyllitis scolopendrium	Hart's tongue
Potentilla anserina	Silverweed
Potentilla reptans	Creeping cinquefoil
Salix sp.	Willow
Sambucus nigra	Elder

Taraxacum sp.	Dandelion
Trifolium pratense	Red clover
Tussilago farafara	Colt's-food
Ulex Europaeus	Gorse
Urtica dioica	Common nettle

Recolonising bare ground - ED3 and Exposed sand - ED1	
Achillea millefolium Yarrow	Yarrow
Atriplex patula§	Common orache
Capsella bursa-pastoris	Shepard's-purse
Carex flacca	Glaucous sedge
Carex otrubae	False fox-sedge
Centaurium erythraea	Common centaury
Cynosurus cristatus	Crested dog's-tail
Daucus carota	Wild carrot
Epilobium hirsutum	Great willowherb
Epilobium montanum	Broad-leaved willowherb
Equisetum sp.	Horsetail
Holcus lanatus	Yorkshire-fog
Hypochoeris radicata	Cat's-ear
Juncus acutiflorus	Sharp-flowered rush
Juncus articulatus	Jointed rush
Lathyrus pratensis	Meadow vetchling
Lysimachia nemorum	Yellow pimpernel
Medicago lupulina	Black medick
Odontites vernus	Red bartsia
Polygonum aviculare	Knotgrass
Polygonum persicaria	Redshank
Potamogeton sp.	Pondweed
Primula vulgaris	Primrose
Rumex crispus	Curled dock
Salix sp.	Willow
Senecio jacobaea	Common ragwort
Stachys palustris	Marsh woundwort
Stellaria media	Common chick-weed
Trifolium pratense	Red clover
Tussilago farafara	Colt's-food
Typha sp.	Bulrush
Ulex Europaeus	Gorse
Veronica chamaedrys	Germander speedwell