

Kildare County Council

Green Infrastructure in three Kildare towns - Kildare

December 2011



Kildare County Council

Green Infrastructure in Kildare, Newbridge and Kilcullen

[Kildare]

14th December 2011

Notice

This report was produced by Atkins Kildare County Council for the specific purpose of mapping Green Infrastructure in Kildare, Newbridge and Kilcullen.

This report may not be used by any person other than the Kildare County Council without the Kildare County Councils express permission. In any event, Atkins accepts no liability for any costs, liabilities or losses arising as a result of the use of or reliance upon the contents of this report by any person other than the Kildare County Council.

Document History

JOB NUMBER: 3049			DOCUMENT REF: 3049Dg03			
0	Draft	ED & POD	POD	POD	JN	14/12/11
Revision	Purpose Description	Originated	Checked	Reviewed	Authorised	Date

Contents

Section	Page
1. Introduction	1
1.1 Background	1
1.2 Objectives and Outputs	7
1.3 Methods	8
2. Kildare Town	9
2.2 Green Infrastructure	9
2.3 Kildare's Green Infrastructure	11
3. Recommendations	15
3.1 Planning	15
3.2 Management	15
3.3 Research	21
3.4 Education	21
4. References	23

Appendices

Appendix A – Scientific Names of Species mentioned in the text	25
Appendix B – Habitat Classification According to Fossitt (2000)	27

List of Figures (at back)

Figure 1.1 – Study area boundary

Figure 1.2 – Designated Sites

Figure 2.1 – Habitat map – Kildare (Derived from Kildare Habitat Mapping Project 2007)

Figure 2.2 – Key Green Infrastructure - Kildare

Figure 2.3 – Key Green Infrastructure - Kildare

List of Plates

Plate 1.1 – The Curragh located on the north-eastern boundary of the Kildare town study area (Photo: M. Tubridy).	1
Plate 1.2 – Treelined walkway within NUI, Maynooth's southern campus (Photo: E. Delaney).	2
Plate 1.3 – Artificial pond within the National Stud (Photo: M. Tubridy).	3
Plate 1.4 – Oak-ash-hazel woodland in Kildare (Photo: M. Tubridy).	4
Plate 1.5 – Scots pine treeline within the grounds of the National stud (Photo: M. Tubridy).	7
Plate 2.1 – Dry calcareous heath located within the Curragh (Photo: M. Tubridy).	9
Plate 2.2 – Wet grassland located nearby the National Stud (Photo: M. Tubridy).	11
Plate 2.3 – Hedgerows situated in agricultural fields on the outer margins of the Kildare study area (Photo: M. Tubridy).	13
Plate 3.1 – Esker ridge supporting calcareous grassland in Kildare (Photo: M. Tubridy).	20
Plate 3.2 – Railway embankment in Kildare (Photo: M. Tubridy).	21

Citation

Delaney, E., O'Donoghue, P. & O'Hora, K. (2011). *Green Infrastructure in Kildare, Newbridge and Kilcullen: Kildare*. Report prepared for the Kildare County Council. Atkins, Dublin.

1. Introduction

1.1 Background

1.1.1 Scope of the Project

The value of natural and semi-natural habitats in Ireland is widely recognised, if not always fully appreciated. Natural areas provide homes for wildlife, trees and wildflowers, but they also provide a wide range of benefits for the humans that live and work in and near them, including opportunities for recreation and relaxation, protection of soil and water quality, flood regulation, carbon sequestration, and sustainable production of food and fuel. Lately, we have come to recognise that habitats in and around urban areas can be just as important in many ways as larger, wilder areas in the country (Miller and Hobbs, 2002; Dearborn and Clark, 2010). Suburban gardens can provide nectar for bees and butterflies, bats can roost in old buildings, and urban trees can clean the air and provide shelter from sun and wind.



Plate 1.1 – The Curragh located on the north-eastern boundary of the Kildare town study area (Photo: M. Tubridy).

In recognition of the importance of urban and suburban habitats Kildare County Council has policies relating to their identification, conservation and management. The Kildare County Development Plan (2011-2017) proposes actions to address biodiversity in County Kildare and to prepare a plan for its management. Policies such as NH1 and NH2 of the Kildare County Development Plan 2011-2017 seek to “*to protect all designated wildlife sites, including any additions or amendments to these from any development that would adversely affect their conservation value*” and “*to identify, protect, conserve, and enhance, wherever possible, wildlife habitats and species of local importance, not otherwise protected by legislation*”. A crucial part of achieving these goals is to gather information on the habitats within County Kildare. Accordingly, in the autumn of 2011, Kildare County Council, commissioned Atkins to identify Green Infrastructure within the towns of Kildare, Newbridge and Kilcullen. Identification of these Green Infrastructure areas was to be based on a previous habitat mapping project completed in 2007 by Tubridy and Associates (2007).

Achieving these aims is necessary if semi-natural habitats are to be managed for the benefit of people, animals and plants. Information on habitat quality and location permits identification of a Green Infrastructure network for County Kildare: i.e. *interconnected green spaces that conserve biodiversity and provide ecosystem services to people*. Understanding the location, extent and characteristics of Green Infrastructure is essential for managing it sustainably. The main mechanisms for doing this are strategic plans, such as Town and County development plans, and practical management plans and strategies that will be developed in the future.

The project study areas are defined by the development boundaries of the Kildare, Newbridge and Kilcullen town development boundaries (Figure 1.1). The current draft document addresses Kildare.

1.1.2 Habitat Surveying

A Guide to Habitats in Ireland (Fossitt, 2000) defines habitats as “....the basic building blocks of the environment that are inhabited by animals and plants, and which are important as units for site description and conservation management”. Habitats are defined by the living things that are found there, mainly plants, and also by environmental conditions, such as geology, water, topography and human management. Furthermore, Fossitt (2000) classifies Irish habitats in a number of types in a hierarchy under a few broad categories, such as grasslands, freshwater bodies, cultivated and built land, peatlands, and woodlands.

Information on the type, location and extent of habitats is collected during a habitat survey. This can be used to prepare a habitat map (completed during a 2007 survey), which can clearly and simply outline the spatial characteristics of habitats in an area, particularly any linkages amongst them.

1.1.3 Habitat Evaluation and Site Designation

One piece of information on habitats that is frequently collected during surveys is the ecological value of a particular habitat. Habitats are evaluated on a number of criteria, including their rarity, the abundance and diversity of species they support, how natural or modified by humans they are, their fragility, and their size. Habitats of greater nature conservation importance should be offered greater protection than those of lesser value.

The EU has identified a number of habitat types that are most important across Europe. Fifty-nine of these internationally valuable habitats are found in Ireland. These habitat types are listed in Annex I of the EU Habitats Directive (92/43/EEC), and the Habitats Directive also requires member states to identify sites that contain representative examples of these habitat types. These are known as Special Areas of Conservation (SACs)¹. For example, Pollardstown Fen candidate Special Area of Conservation (cSAC) is located on the northwestern outskirts of the Newbridge study area (Figure 1.2); site code 000396.

Mouds Bog SAC is located to the north of Newbridge and the R416 (to the west of the railway line); site code 000395.



Plate 1.2 – Treelined walkway within NUI, Maynooth’s southern campus (Photo: E. Delaney).

¹ For further information on SACs see <http://npws.ie/protectedsites/>

At the next level of designation, sites that are of national ecological importance because of the habitats, species or geological features they support are designated as Natural Heritage Areas (NHAs). The Curragh proposed Natural Heritage Area (pNHAs) is located within the Kildare town and on the margins of the Newbridge study area (site code 000392). Both Pollardstown Fen and Mouds Bog are also proposed for designation as NHAs.

A number of other NHAs are located in the surrounding landscape; these include Liffey Valley above Athgarvan pNHA (site code 001396) and Liffey Valley Meander Belt pNHA (site code 000393), both on the River Liffey downstream of Kilcullen. The Grand Canal pNHA (site code 002104) starts to the east of Newbridge and the M7 motorway. Two areas of marsh land are located to the southeast and south of Kilcullen; namely Newtown Marshes pNHA (site code 001759) and Dunlavin Marshes pNHA (site code 001772), respectively.

1.1.4 Green Infrastructure

Ecological Networks

Once habitats have been surveyed and mapped, the next question is how best to manage them. One approach is the establishment of *ecological networks*. Ecological networks are made up of core areas of high biodiversity value connected by corridors or stepping stones. Corridors are more or less linear avenues of habitats that link larger areas of habitats and allow animals, birds and plants to move among them. Examples of corridors could be hedgerows linking areas of woodland or rivers and riverside habitats connecting larger areas of wetlands or natural grasslands. Stepping stones are more isolated habitat patches located in built-up areas or intensive farmland that allow animals and plants



Plate 1.3 – Artificial pond within the National Stud (Photo: M. Tubridy).

to jump between core habitat areas. Stepping stones could include small wetlands or ponds in farmland, grasslands that have developed on abandoned quarries, or even urban parks. The importance of corridors and stepping stones is that it reduces ecological fragmentation in the landscape. Increasing connectivity among habitats gives plants and animals greater access to living space and other resources, allows them to recolonise areas where they may have been lost, and maintains their health by reducing inbreeding.

Under the Article 10 of the Habitats Directive planning and development policies must endeavour to conserve and manage sustainably corridors and stepping stone habitat features essential for the migration, dispersal and genetic exchange of plants and animals. Improving the connectivity and coherence of the network of SACs and SPAs is a particular objective of the Habitats Directive.

Green Infrastructure

The idea of ecological networks has recently been expanded into the concept of *Green Infrastructure*. Rather than focusing solely on biodiversity, Green Infrastructure also takes into account the benefits that green areas can provide for humans. According to the recently published report, *Creating Green Infrastructure for Ireland* (Comhar, 2010): -

Green Infrastructure is a strategically planned and managed network featuring areas with high quality biodiversity (uplands, wetlands, peatlands, rivers and coast), farmed and wooded lands, and other green spaces that conserve ecosystem values which provide essential services to society.



Plate 1.4 – Oak-ash-hazel woodland in Kildare (Photo: M. Tubridy).

The concept of Green Infrastructure highlights both the intrinsic importance of natural habitats and also the ecosystem services they provide to humans. Ecosystem services performed by Green Infrastructure can include a wide range of things, such as: -

- Providing clean water
- Providing food, both directly and also indirectly, such as by supporting populations of bees to pollinate crops
- Controlling surface water and flooding
- Regulating local climate, such as providing shade or shelter from wind, and global climate through carbon sequestration
- Conserving soil and soil nutrients
- Conserving historic landscapes and built and cultural heritage
- Providing spaces for recreation and sport, improving the physical well-being of people
- Improving the mental and spiritual well-being of people, enhancing quality of life and providing a connection between people and nature

The Green Infrastructure concept is primarily a planning tool (see also Box 1). Identifying the location and characteristics of Green Infrastructure is essential if the ecosystem services they provide are to be managed in a sustainable fashion. Key pieces of Green Infrastructure can be identified and taken into account when preparing plans, such as local development plans, biodiversity plans and tourism strategies. Similar to habitat survey and mapping, Green

Infrastructure can be mapped using existing data sources supplemented by field survey where required. In fact, a habitat map is a critical piece of baseline information required for Green Infrastructure mapping.

Box 1: Kildare Plans & Policy on Green Infrastructure and Natural Heritage

The following policies protecting and promoting biodiversity are outlined in the **Kildare County Development Plan 2011-2017**.

NH 1 – To protect all designated wildlife sites, including any additions or amendments to these from any development that would adversely affect their conservation value.

NH 2 - To identify, protect, conserve, and enhance, wherever possible, wildlife habitats and species of local importance, not otherwise protected by legislation such as the bird habitat at Kilwoghan Bog. Such habitats would include woodland, river, grassland areas and field boundaries (hedgerows, stone walls and ditches). Such features form part of a network of habitats and corridors, which allow wildlife to exist and flourish. Once a locally important habitat has been identified it shall be surveyed to establish its significance and a site-specific conservation plan prepared to establish development guidelines for the area.

NH 3 - To have regard to the County Bio-Diversity Plan and integrate the consideration of bio-diversity into all Council actions and work programmes in order to ensure the protection and enhancement of this important aspect of the local environment.

NH 4 - To ensure that any development proposal within the vicinity of or having an effect on a designated site, or adjacent to/within an SAC will provide sufficient detail illustrating how it will limit any possible impact upon the designated site and will include proposals for appropriate amelioration. Any proposed development which has the potential to impact on a Natura Site will be screened for Appropriate Assessment. In all such cases the developer shall consult with the National Parks and Wildlife Section of the DoEHLG.

NH 5 -To protect, by way of Tree Preservation Orders, trees and groups of trees of special amenity value.

NH 6 - Development shall be prohibited where it is likely that damage would be caused either to trees protected by a Tree Preservation Order or, to those which have a particular local amenity or nature conservation value. Development that requires the felling of mature trees of amenity value, conservation value or special interest notwithstanding the fact that they may not be listed in this Plan, will be discouraged.

NH 8 - To conserve and protect the natural habitats in the River Liffey systems.

NH 9 - A suitable buffer zone will be maintained between all water bodies and any development. The extent of the riparian buffer zone should be determined in consultation with a qualified ecologist. In all instances however a buffer of 2.5 metres of vegetation shall be retained along the riverbank to mitigate against pollution risks, reduce flooding potential and maintain habitat. In the event of lighting being proposed along river or canal corridors an Ecological Impact Assessment (and where necessary an Appropriate Assessment) including bat and otter survey shall be conducted by specialists. The recommendations of the specialist studies shall be implemented. No lighting will be installed without prior consultation with NPWS and shall be in line with advances in knowledge into the impact of lighting on bats and other species and also to reflect advances in technology in the lighting industry.

NH 10 - In the event of a proposed development impacting on a site known to be a breeding or resting site of species listed in the Habitats Regulations a derogation license may be required. Applications for a derogation license should be made in writing, including survey results and proposed mitigation measures, to the Species and Regulations Unit, the National Parks and Wildlife Service.

Special Objective F - Open Space and Amenity To protect and provide for recreation, open space and amenity provision. The areas included in this zoning objective cover both private and public open space and are dispersed throughout the town. The aims of this land use-zoning objective are to protect, improve and provide for recreation, open space and amenity provision, to protect, improve and maintain public open space, to preserve private open space and to provide recreational and community facilities.

1.2 Objectives and Outputs

The main objectives of this project were to: -

- Identify, evaluate and map the Green Infrastructure in the study area based on habitat mapping completed in 2007 by Tubridy & Associates;
- Review and validate mapping undertaken in 2007 identifying areas of Green Infrastructure and viable 'Green Corridors' linking Green Infrastructure areas; and
- Propose recommendations for future work.

The outputs of this project include: -

- Colour maps identifying habitats, and separate map(s) identifying key green infrastructure (overlaid on aerial photograph(s)). Production of thematic colour maps, based on an attribute value in the *.shp* or *.tab* file.
- Concise and clearly written report outlining the main Green Infrastructure features associated with each town.



Plate 1.5 – Scots pine treeline within the grounds of the National stud (Photo: M. Tubridy).

1.3 Methods

The methods we used to meet the project objectives are briefly outlined in this section. The first step was to review the findings of a habitat survey completed for each of the three towns in 2007 (Tubridy & Associates, 2007). Once reviewed, we then proceeded to identify viable areas of Green Infrastructure in each town based on the information during the 2007 mapping survey.

After the initial review we undertook site visits to evaluate / validate areas of Green Infrastructure in each town. Habitats in Kildare were validated in the field in December 2011 according to the Heritage Council classification system (Fossitt, 2000). Habitats in Newbridge and Kilcullen will be validated in January 2012.

2. Kildare Town

2.1.1 Overview

Kildare Town is situated in west County Kildare with origins dating from the 5th Century when it was the site of a monastery founded by St. Brigid². Kildare town supports a number of heritage and recreational features such as the National Stud, the Japanese gardens and St Brigid's Cathedral and Round Tower. The town is located within the commuter belt serving the greater Dublin area and like many towns in County Kildare, has seen an increase in residential development in recent years. Nonetheless, like many County Kildare towns, the outer fringes of Kildare are dominated by agricultural pastureland, bounded by hedgerows and treelines. Indeed, improved agricultural grassland is the most dominant habitat in Kildare town reflecting the large tracts of agricultural pastureland associated with the study area. The fields associated with this habitat are of relatively low value for biodiversity. The rural character explains the extent of hedgerows with Kildare supporting 110 km of hedgerows (Tubridy and Associates, 2007).

Habitats of biodiversity value are infrequent, comprising 16% around Kildare (inflated by the presence of the Curragh) (Tubridy and Associates, 2007). These include the array of semi-natural habitats associated with the Curragh proposed Natural Heritage Area (site code: 000392), a pocket of semi-natural woodland (WN) at Silliothill and pockets of highly modified woodland (WD) and wet grassland (GS4) associated with the margins of the Tully River, Japanese Gardens and National Stud. Other areas include the railway corridor / embankment and isolated mesotrophic ponds situated near the north-western boundary of the study area. These are outlined in greater detail below.

2.2 Green Infrastructure

2.2.1 Defining Green Infrastructure in Kildare

Central to the concept of Green Infrastructure is multi-functionality: i.e. the provision of a number of ecosystem services. Not all pieces of Green Infrastructure perform the same functions, however, and not all are of equal value. The grassy strip between a footpath and the road surface provides some water regulation services by providing a green space for excess water to soak into, and it also provides a very limited habitat for plants and insects. On the other hand, a riparian wetland would have a much greater capacity to absorb water and would support a much greater range of biodiversity. In order to be useful, any project identifying Green Infrastructure must recognise these differences in value and distinguish what are the most



Plate 2.1 – Dry calcareous heath located within the Curragh
(Photo: M. Tubridy).

² www.kildaretown.ie

important components. This was our main objective and challenge in preparing this report.

We initially looked at habitats that we evaluated as being of Low Local importance for nature conservation or greater. However, this resulted in too many areas being identified as potential Green Infrastructure to be useful. We then looked at habitats of High Local importance or greater, but this resulted in too few areas identified and also overlooked the other ecosystem services provided by Green Infrastructure. We settled on a phased approach using High Local importance habitats as a starting point and adding other habitats and habitat complexes that provided important ecosystem services or acted as ecological corridors or stepping stones. These areas we identified as key Green Infrastructure, and these are named and discussed in more detail below and are mapped in Figures 2.2 & 2.3.

The criteria we used for identifying key Green Infrastructure were: -

- Habitats of High Local conservation value or greater
- Adjacent habitats of lower conservation value that together form a coherent habitat complex³ or that buffer the higher importance areas
- Habitats of Low Local conservation value that perform another significant ecosystem service, such as amenity, water regulation or carbon sequestration
- Habitat corridors or stepping stones of Low Local conservation value in an area surrounded by and dominated by habitats of negligible ecological value

In addition to the key Green Infrastructure areas, we also mapped two other types of Green Infrastructure that are of less ecological importance; namely agricultural land and amenity grasslands (Figure 2.3). Agricultural land is mapped for its food production value. Amenity grassland can be of significant recreational and passive amenity value and, in urban situations where hard surfaces are abundant, can assist with surface water drainage; it may also be appropriate to manage some amenity grasslands or parts of them to improve their benefits for biodiversity.

³ A coherent habitat complex for the purpose of this study is a group of habitats united by one or more common ecosystem or management features. Examples include: woodland, scrub and hedgerow forming a wooded habitat complex; wet woodland, marsh and wet grassland forming a wetland complex; or scrub, semi-natural grassland and abandoned agricultural grassland forming a complex of habitats with dense vegetation managed under low intensity.

2.3 Kildare's Green Infrastructure

The following describes the Green Infrastructure areas identified from the information gathered as part of County Kildare Habitats Survey (Tubridy & Associates, 2007).

The Curragh

The most important "core area" in the vicinity of Kildare Town is the Curragh. Mapping undertaken during the summer of 2007 (Tubridy and Associates, 2007) reveals that the "core area" is entirely contained within the Natural Heritage Area boundary.

Habitats within the Curragh are dominated by acidic grassland (GS3) and gorse dominated scrub (WS1) both of which are mostly absent in other parts of the Kildare study area (Tubridy and Associates, 2007).

The large areas of acidic grassland support smaller pockets of gorse dominated scrub and dry calcareous heath (HH2). The grassland areas are dominated by creeping bent. Other broadleaved herb species include spear thistle, meadow thistle, creeping thistle, tormentil, self heal, common mouse-ear, white clover, violet, dandelion, nettle, fairy flax, common milkwort, bush vetch, ragwort and slender St. John's-wort. Sedges such as *Carex binervis* and *C. panicea*, field wood-rush and soft rush and several grasses including heath grass, wavy hair-grass, Yorkshire fog, crested dog's tail, common bent, sweet vernal grass, sheep's fescue and perennial rye grass were also recorded (Tubridy and Associates, 2007). Purple moor grass dominated grassland (GS3), occurs in water logged depressions whilst raised mounds within this area support dry calcareous and neutral grassland (GS1). The dry calcareous heath is dominated by ling (Tubridy and Associates, 2007).



Plate 2.2 – Wet grassland located nearby the National Stud (Photo: M. Tubridy).

The most important feature within the site is an excellent example of a dry calcareous grassland habitat (GS1) on a steep sloped esker ridge. This semi-natural grassland is considered to be of regional importance for nature conservation as it supports species typically associated with the priority type calcareous grassland (Tubridy and Associates, 2007).

The grassland at the Curragh corresponds to waxcap or *Hygrocybe* grassland i.e. unimproved grasslands that support high species richness in particular fungal groups i.e. *Hygrocybe* species or waxcaps (Feehan, 1992). *Hygrocybe* grassland, much like the grasslands at the Curragh are defined as agriculturally 'unimproved' supporting relatively high levels of grazing by species such as horses, cattle, sheep and Lagomorphs. These grasslands are generally semi-natural in origin, support high plant species diversity and have no recent history of reseeding or fertilisation.

Semi-natural woodland at Silothill

The woodland at Silothill (WN2) is an important reservoir of plants, birds and invertebrates of regional importance. It has developed around abandoned quarries and has an exceptionally rich woodland flora. The woodland is formed on hazel and hawthorn dominated scrub with mature ash and yew growing in and around 3 disused quarries. Other woody species include elder, spindle,

elm, blackthorn, bramble, sycamore, damson, ivy, raspberry, dog rose and blackcurrant. Ground flora species were dominated by ivy and moss, associated herbaceous species included hart's-tongue fern, soft shield fern, scaly male fern, hard fern, nettle, hogweed, common valerian, bluebell, arum lily, cowslip, primrose, twayblade, yellow pimpernel, germander speedwell, wild strawberry, herb-robert, herb-bennet, common dog violet, hairy violet, enchanter's nightshade and wood dock. The woodland is reasonably undisturbed and supports badger sets and foxes. It is known locally as 'fox hollow'. In spite of the woodlands small size, it is connected to other areas of semi-natural habitats (such as those associated with the Tully River) and the wider study area in general, by a reasonably extensive treeline and hedgerow network (Tubridy and Associates, 2007).

Railway line

The railway line which bisects the northern half of the town is a biodiversity feature of regional interest as it mostly fringed by a range of semi-natural habitats. The main habitat bordering the railway line included hedgerows, however smaller pockets of other semi-natural habitats were also found on its embankments. They included dry neutral and calcareous grassland (GS1), scrub (WS1) and treelines (WL2). Also associated with this network is a field near the railway station which contains mature trees and it is now being invaded by scrub. Dry stone walls bounding the roads adjacent to the railway station also provide a locally important habitat for drought tolerant plants and are good for insects (Tubridy & Associates, 2007).

This railway line and its adjoining habitats provide an important habitat for songbirds, insects and native plants. In addition to this, it provides a suitable corridor for the movement of these species into and out of the town and between adjacent semi-natural habitats (Tubridy & Associates, 2007).

M7 Road Corridor

Given the dominance of agricultural grassland and associated hedges the landscaping along the M7 may provide a lower order permeability ecological corridor for movement of animals, whilst also providing a visual woodland screen to the motorway. A review of Biology.ie on line *Road Kill* database indicated no mortality of species such as badger along the section of road passing south of Kildare. As the screen planting bordering the M7 corridor continues to mature it is likely that they will provide more viable ecosystem and connectivity functions. This is especially the case in those areas that adjoin hedgerows and treelines associated with adjoining agricultural land.

National Stud, Japanese Gardens, Tully Stream and adjoining woodlands

A number of spring fed wetlands in the vicinity of the National Stud and Japanese Gardens form a network of freshwater habitats of local interest. Indeed the entire Kildare study area supports unique groundwater habitats that are integral to various wetland ecosystems. The core areas are springs, streams (FW2) (including the Tully Stream which flows through this area), other artificial ponds and lakes (FL8) and drainage ditches (FW4). Other associated habitats include a relatively diverse wet grassland habitat (GS4) and a small pocket of wet woodland. The diverse wet grassland habitat supports abundant creeping bent, hairy sedge, hard rush and soft rush. Other plants within this wet grassland habitat include jointed rush, creeping clover, silverweed, Yorkshire fog, rye grass, and willowherb species. Bryophyte cover is high (Tubridy & Associates, 2007).

The Tully Stream continues to flow to the south of the Japanese Gardens where it is fringed by riparian woodland (WN5), treelines (WL2) and pockets of conifer plantation (WD4). These habitats are not in of themselves of considerable local or regional importance, but due to their proximity and connectivity with the wetland complex associated with the Japanese Gardens to the north they are included in this area of Green Infrastructure.

Conifer Woodland and wet grassland at Brallistown

The pockets of conifer woodland and adjoining wet grassland and scrub at Brallistown located near the southern boundary are also considered Green Infrastructure areas. This area supports poor draining land that borders the Tully Stream, as it continues to flow to the south. The lack of woodland habitat and semi-natural grassland habitats (in those areas outside of the Curragh complex) results in this area being highlighted as a Green Infrastructure area. The conifer woodland provides cover and shelter in addition to nesting / roosting habitat for bird and bat species in a local landscape that is more or less denuded of woodland cover.

Stepping stones - Isolated ponds located near the north-west of the study area

These are small mesotrophic ponds (FL4) situated within agricultural grassland fields. Some of these ponds have been fenced off in compliance with the Rural Environmental Protection Scheme (REPS). One of these ponds is completely vegetated and supports no visible open water. Plant species composition includes branched bur-reed, common fleabane, gorse, common rush, floating sweet-grass, hawthorn, perennial ryegrass, nettle, deer grass, grey willow, creeping bent, meadowsweet, bulrush, lesser spearwort and willowherbs (Tubridy & Associates, 2007).

These pond habitats, within a landscape characterised by intensively managed grassland provide habitats of considerable local value for wetland species. They provide refugia for a number of wetland plants, birds and invertebrates that otherwise have little or no suitable habitat available in the locality (Tubridy & Associates, 2007).

2.3.1 Ecological Corridors

The study area encompassing Kildare town supports approximately 110 km of hedgerows. These hedgerows provide valuable habitats in of themselves but more importantly provide corridors for wildlife into and out of ecologically important sites such as the Curragh and the woodland at Silliothill (Tubridy & Associates, 2007).

The habitat survey completed in 2007 described a hedgerow habitat that typified those situated on well drained earth banks within the Kildare study area. This hedgerow received little or no management in recent decades and supported ancient hawthorn and blackthorn shrubs with mature ash, elder and bramble. Ground layer species were reduced to species such as wood avens, ivy and creeping thistle (Tubridy & Associates, 2007). Similarly, the habitat surveys carried out in Celbridge and Maynooth during the autumn of 2011 (Delaney *et al.*, 2011) noticed a similar management pattern for the majority of hedgerow habitats within the Celbridge and Maynooth study areas. In most cases these hedgerows were unmanaged in the long term resulting in overgrown and gappy hedgerows.



Plate 2.3 – Hedgerows situated in agricultural fields on the outer margins of the Kildare study area (Photo: M. Tubridy).

The habitat network that borders the improved grassland fields located to the west of the Tully River and its fringing woodland forms connectivity with the wider landscape but most importantly

with the pockets of woodland and scrub at Silliothill that are otherwise isolated in a landscape dominated by improved agricultural pastureland (Figure 2.3).

The hedgerow network located toward the northern boundary of the site provides an extensive and almost continual linear connectivity between the semi-natural habitats of the Curragh and the wider landscape to the north and west (Figure 2.2).

3. Recommendations

Completing the habitat survey and preparing this report and the accompanying GIS database are only the first steps in conserving and enhancing the habitats within the three study areas. Below are recommendations for some next steps that arise from the habitat survey.

3.1 Planning

The concept of Green Infrastructure should be further integrated into all levels of the planning process. As noted above (Box 1), the thinking behind Green Infrastructure is already incorporated into the Kildare County Development Plan 2011-2017. Future strategic planning should build on this and identify different types and grades of Green Infrastructure for conservation and enhancement. The key Green Infrastructure areas identified in this report should be used as a baseline. As these have been identified with biodiversity as the primary concern, additional or overlapping Green Infrastructure areas may need to be identified to fully encompass the ecosystem services provided. Recent work by Comhar (2010) and by UCD Urban Institute Ireland may be helpful in this.

Where appropriate, strategic planning should aim for synergies among ecosystem services provided by the same Green Infrastructure areas. This multi-functional approach is central to the Green Infrastructure concept and will help maximise the benefits provided by a given area. From a natural heritage perspective, a goal in strategic planning should be to reinforce and strengthen where necessary the biodiversity value of Green Infrastructure. For example, this can include improving the ecological value of public parks and other amenity areas or promoting biodiversity conservation in agricultural lands.

Ecological value should be an explicit criterion in the zoning of lands for Green Infrastructure, recreation or similar in strategic planning.

3.1.1 **Strengthen Green Infrastructure Links to the main watercourses and consolidated areas of semi-natural habitat and the Curragh**

It is recommended to strengthen and reinforce links to the larger and contiguous areas of Green Infrastructure (such as watercourses and semi-natural areas such as the Curragh). Ecological linkage from other habitats to these linear habitats is, in some areas, fragmented through the positioning of residential areas. Strategic planning should aim to strengthen the ecological linkages with these watercourses where possible. This may include reinforcing habitats along the tributaries of larger watercourses or the planting of continuous green corridors such as hedges and treelines within particular locations of the built up residential areas.

3.2 Management

Management recommendations for the Curragh and the remaining Kildare study area are discussed separately below. This is due to the sensitivity of the habitats on the Curragh and the unique interconnectivity between the sites hydrological, ecological and archaeological features. Due to its sensitivity, this area requires detailed and site specific management recommendations and is exempted from the majority of the recommendations outlined below.

3.2.1 **The Curragh**

It is not recommended to enhance or establish habitats in any part of the Curragh Green Infrastructure area. The open and expansive character of the Curragh should be maintained as

this unbounded grassland system resembles the early Irish Gaelic farming system which relied on large communal, unbounded grassland / grazing areas. Specific management recommendations for the Curragh include the following;

- Undertake a holistic environmental survey of the Curragh with consideration given to features such as the areas biodiversity, geology and hydrogeology;
- Implementation of a monitoring regime evaluating scrub encroachment onto areas of semi-natural grassland;
- Monitor grazing levels (especially south of the Curragh camp where scrub is rapidly spreading onto the grassland habitat) with recommendations on increases / decreases in grazing as necessary.

3.2.2 Promote Best Practice in Conservation Management

Conservation management should follow best practice. There is a wealth of easily accessible information on conservation management available on the internet, in published books and magazines, from NGOs and from conservation professionals. Inappropriate conservation management can waste valuable resources and can impede progress towards meeting objectives.

Community groups have a strong role to play in managing Green Infrastructure. They should be consulted at an early stage and integrated fully into the planning and management processes. They have the advantage of being on the ground, close to the action, which facilitates monitoring progress and identifying problems at an early stage.

Some general guidance on conservation management that arises from field observations and consultations during the habitat survey includes: -

- Planting native species of native genetic stock as part of landscaping developments and public lands and as part of private gardens should be encouraged.
- Old stone walls should not be indiscriminately cleared of vegetation, as most plants growing in walls do not damage the fabric. Clearance of ivy or other dense growth should be carried out in September or October when the potential for damaging nesting birds and bats is lowest.
- A bat specialist should be consulted prior to repointing stone walls to ensure there are no bats located inside crevices. Erecting bat boxes or bat bricks can compensate for loss of roosting space.
- Semi-natural grasslands⁴ should be mowed once or twice a year as a rule of thumb. More frequent mowing enriches the soil by increasing recycling of organic matter and leads to changes in species. Autumn mowing should take place after flowering and seed set. If required, grasslands can be cut a second time in early spring prior to flowering.
- Use of “wildflower” seed mixes should be avoided, as these often contain non-native species or non-native genetic stock. When introducing wildflowers, native seed and autumn cuttings, preferably from a known local source, should be used (in compliance with the Wildlife Act).

⁴ This exempts those semi-natural grasslands associated with the Curragh. Management recommendations pertaining to grasslands on the Curragh are outlined separately.

3.2.3 Enhancing Amenity Grasslands

Amenity grassland accounts for 7.2% cover in Maynooth, 6.1% in Kilcullen and 4.02% within the Kildare study areas without accounting for those areas associated with private dwellings. This represents a significant resource of green space, much of which could be improved for biodiversity without losing recreational amenity value. Possible measures for enhancing amenity grassland for biodiversity include: -

- Planting native trees or areas of dense shrubs;
- Establishing flowerbeds with a diverse range of flowering species to provide nectar and pollen at different times of year for a wide range of insects;
- Establishing wildflower meadows;
- Allowing areas to develop tall, grassy meadows;
- Creating wildlife ponds or wetlands;
- Planting low management intensity vegetable and herb gardens and leaving some space for weeds;
- Supplementing the above with bird or bat boxes or building dens or hibernation areas for small animals, such as hedgehogs;

Not all of the options above will be suitable for all areas, and some, such as wildflower meadows or wetlands, will require long-term management. In developed estates, more aesthetic options may be preferable, and public safety will be a greater concern, which may rule out ponds, for example. Native species should be used to enhance or replace amenity grassland areas whenever possible, as these tend to support a greater range of native insects and birds. While non-native flowering plants and shrubs can have some biodiversity value, the emphasis where possible should be placed on creating semi-natural wildlife habitats. A focus on “prettification” alone will have limited ecological benefits.

3.2.4 Tree & Hedges

A policy of replacement planting should be investigated for mature trees within and adjoining the study areas; including stand alone trees; treelines; trees within hedges and trees in natural and mixed woodland. Otherwise in years to come, as specimen trees progress from mature to over-mature; there is an increasing risk of loss of specimen trees to storms.

Appropriate protection should be carried out for as many hedgerows and treelines as possible where they come under future development pressure. However, the protection and isolation of small sections of hedges in the landscape often does not achieve the intended aim of protecting biodiversity as these isolated fragments tend to lose species richness and quality over time; in many cases they ultimately end up being removed. We would instead encourage consideration of the protection of a more meaningful set or network of hedges when site layouts are considered; a developer should be required to seek the advice of an ecologist and / or appropriately qualified landscape architect when making these decisions and consideration be given to hedgerow quality, opportunities for habitat compensation / biodiversity gain, habitat connectivity etc. Furthermore, we would encourage where possible that retained hedges should be the focus for the planting of small areas of woodland (using e.g. quick growing species such as alder, birch, ash, willow, hazel etc. as appropriate to the site), or areas of wet grassland / wetland as appropriate. The objective should be to create habitat patches / stepping stones within the landscape; to maximise the type

and diversity of habitats and to allow proper connectivity between urban and peri-urban parks and the surrounding rural landscape. Further studies should be completed to rank and evaluate local hedgerows whilst providing recommendations on the future management and planting regimes associated with hedgerows.

3.2.5 Farmland Management

The outskirts of Kildare town are dominated by agricultural lands. We would strongly encourage Kildare County Council and local wildlife groups to engage with the local farming community (through e.g. the local Irish Farmers Association branches) to find ways in which biodiversity could be enhanced on lands adjoining the urban and peri-urban fringe of Kildare. For example, the retention of narrow (1-2m) buffers of vegetation along hedges; retention of headlands in the corner of fields; protection of areas of scrub, ponds, ditches or other areas of semi-natural habitat etc. could enhance biodiversity with minimal costs.

3.2.6 Wetlands / Surface Water Management

Wetland loss has been a significant feature of biodiversity loss in Ireland. When attenuating or treating surface water runoff, consideration should be given to adopting soft engineering Sustainable Urban Drainage Systems (SuDS) and Integrated Constructed Wetlands (ICW). When designed, built and operated appropriately these can represent valuable additions to biodiversity in an area while also assisting in the delivery of good status in all our rivers in Ireland as required by the Water Framework Directive. The need to protect and safeguard surface and groundwater quality within the Kildare area is particularly pertinent. The many diverse semi-natural wetland habitats located within the localised area (e.g. Pollardstown Fen) are perpetuated by the intricate surface and groundwater features associated with the study area. Point source or more extensive impacts to watercourses in these areas have the potential to result in considerable changes to the diversity and the overall integrity associated with these wetlands areas.

3.2.7 Bats & Birds

The study area incorporates a mix of historic built structures; newer urban buildings and open agricultural habitats which would indicate that these are could be of low to moderate value for bat species. In general there is an absence of good quality bat habitat within the Kildare study areas. The relatively paucity of woodland cover and the lack of significant riverine corridors suggests that bat activity is restricted to the hedgerow and treeline networks bordering the agricultural pastureland located on the periphery of the study area. We would encourage the following: -

- a) Include consideration of bats when considering developments that might impact on potential roost, foraging and commuting sites;
- b) To this end consult with Bat Conservation Ireland, NPWS etc. as to the current understanding of bat diversity, numbers and distribution in each of the study areas and their environs;
- c) Depending on the findings of the above either commission bat surveys or liaise with voluntary groups in order to assist them with the delivery of such as survey.
- d) Use the findings of the above to inform decision on e.g. landscape planting at new developments; vegetation management; decide on locations for bat boxes etc.

This should then provide the Council with baseline data to inform forward planning decisions. Useful documents include: -

- NRA *Best Guidelines for the Conservation of Bats* - <http://www.nra.ie/Publications/DownloadableDocumentation/Environment/file,3487,en.pdf>
- NPWS *Bat Mitigation Guidelines for Ireland. Irish Wildlife manual No. 25.* - <http://npws.ie/publications/irishwildlifemanuals/>
- Heritage Council – the Heritage Council have published a range of documents including *Bat Survey Guidelines for Heritage Buildings; Bats, Birds and You* which can all be downloaded from the Heritage Council webpage at - <http://www.heritagecouncil.ie>
- JNCC – *Habitat Management for Bats* - http://jncc.defra.gov.uk/pdf/habitat_management_for_bats.pdf

With respect to birds we would recommend liaison with BirdWatch Ireland Kildare Branch (<http://www.birdwatchkildare.com/>) when formulating habitat creation or landscaping proposals in order to integrate plans for erecting bird boxes and to determine which species would benefit most; e.g. Swift (*Apus apus*) are very vulnerable to loss of nest sites during building repair works (details of nest boxes can be found online). The Kildare Branch of BirdWatch Ireland has recently undertaken the construction and installation of a number of bird boxes varying in size and dimensions⁵. While many nest box programmes target high profile species, such as Kestrel (*Falco tinnunculus*) and Barn Owl (*Tyto alba*), we would also encourage installation of boxes for species such as House Sparrow (*Passer domesticus*). In all case you must ensure suitable foraging habitat is present nearby. Nest box programmes can also be operated in co-operation with local schools and play an important role in biodiversity education.

3.2.8 Invasive Species

The findings of the 2007 habitat survey indicated that non-native invasive species such as Japanese knotweed and Giant Rhubarb do not appear to be a significant issue within Kildare town. Nonetheless the presence, establishment and spread of invasive plant species should be closely monitored as control costs for (e.g. Japanese knotweed) can become prohibitive once the species has become both abundant and widely distributed. Nonetheless, initiatives should be put into practice whereby Kildare County Council staff can be instructed on how to identify such invasive species and modify work practices accordingly around such species.

⁵ http://www.birdwatchkildare.com/nestbox2011/Nest_Box_Scheme_photos.html

3.2.9 Managing Key Green Infrastructure

Management plans should be developed for key pieces of Green Infrastructure identified in this report, particularly those in public ownership. Drafting management plans should also be explored with other landowners, where appropriate. For many sites, appropriate management is required to conserve and enhance their biodiversity value; otherwise this value will be lost through neglect. Some sites will require removal of exotic species, and some will require regular management in the form of mowing or vegetation control. More detailed site-by-site advice is beyond the scope of this report, however. As noted above, management should follow best practice and should include community groups at all stages.



Plate 3.1 – Esker ridge supporting calcareous grassland in Kildare (Photo: M. Tubridy).

3.2.10 Mitigation Banking

Quiet often local authorities adopt the principle of mitigation banking “where the loss of habitats and features of the wider countryside is unavoidable as part of a development, to ensure that appropriate mitigation and/or compensatory measures are put in place, to conserve and enhance biodiversity and landscape character”. In some cases, it may be more effective to carry out mitigation or compensatory measures in another location than where the development is taking place. For example, there may be insufficient scope for adequate compensation or the outcomes of mitigation may be uncertain. There may also be cases where off-site habitat creation or enhancement work may be more effective or beneficial for biodiversity than on-site works. Options for incorporating such a “mitigation banking” strategy should be explored and incorporated into planning. Where appropriate, off-site mitigation banking can be used to contribute to enhancing ecological Green Infrastructure in strategic locations both locally and at a County level.

3.3 Research

3.3.1 Green Infrastructure

Where required to inform management, more detailed ecological surveys of key Green Infrastructure should be carried out. Habitat surveys completed in 2007 (Tubridy & Associates, 2007) provided the first steps towards a biodiversity inventory; however, more precise information on the species that occupy or use Green Infrastructure will help to increase the biodiversity benefits of management. For example, some areas may support sensitive species that require particular management measures. For other Green Infrastructure areas, their full biodiversity value may not be fully appreciated. In particular, invertebrates are a group that is poorly known throughout Ireland, and invertebrate surveys of Green Infrastructure areas may produce surprising results and inform targeted measures to increase invertebrate biodiversity.



Plate 3.2 – Railway embankment in Kildare (Photo: M. Tubridy).

3.3.2 Ecological Corridors

The true value of different habitat types as ecological corridors and stepping stones for different groups of species is not fully understood. Some types of habitat may be good corridors for some species, but not for others. Such research would be applicable across Ireland and abroad, and is not strictly related to Kildare. However, such research efforts should be supported at a local level where possible.

3.4 Education

3.4.1 Public Awareness and Education

Public awareness of the natural heritage within Kildare has been raised by this project and others in the recent past. Public education on natural heritage has also been enhanced by such activities as Heritage Week. This work should continue and should also emphasise links between built and cultural heritage and natural heritage, where appropriate.

The results of this habitat survey should be disseminated widely and made available in easily accessible formats, such as on the internet and in the form of a user-friendly brochure or other publication.

3.4.2 Conservation Management

Programmes to educate the general public on gardening and small-scale habitat creation to enhance biodiversity should be supported and promoted. These should be as practical and

hands-on as possible and could perhaps be linked with ongoing biodiversity enhancement of public Green Infrastructure.

4. References

- Comhar (2010). Creating Green Infrastructure for Ireland. Enhancing Natural Capital for Human Wellbeing. Accessible online at:
<http://www.comharsdc.ie/files/Comhar%20Green%20infrastructure%20report%20final.pdf>
- Curtis, T.G.F. and McGough, H.N. (1988). *The Irish Red Data Book. 1. Vascular Plants*. Stationery Office, Dublin.
- Dearborn, D.C. and Kark, S. (2010). Motivations for conserving urban biodiversity. *Conservation Biology* **24**, 432-440.
- Delaney, E., O'Hora, K., and O'Donoghue, P. (2011). Habitat Survey and Mapping of Maynooth: Habitat Survey Report. Report prepared for the Kildare County Council. Atkins, Dublin.
- Feehan, J (1992) The Curragh of Kildare as a Hygrocybe Grassland. *Irish Naturalists Journal* **24**, 13-17.
- Fossitt, J.A. (2000). *A Guide to Habitats in Ireland*. Heritage Council, Kilkenny.
- Kildare County Council. (2011). Kildare County Development Plan 2011-2017.
- Kildare County Council. (2005). Kildare County Heritage Plan 2005-2011
- Miller, J.R. and Hobbs, R.J. (2002). Conservation where people live and work. *Conservation Biology* **16**, 330-337.
- National Roads Authority (NRA) (2006 / 2009). *Guidelines for Assessment of Ecological Impacts of National Roads Schemes*. National Roads Authority, Dublin.
- Turbidy & Associates (2007) County Kildare Habitats Survey 2007. Report prepared for the Kildare Heritage Forum: An action of the Kildare Heritage Plan .

Appendices

Appendix A – Scientific Names of Species mentioned in the text

Common Name	Species Name
Vascular Plants	
Arum lily	<i>Zantedeschia aethiopica</i>
Ash	<i>Fraxinus excelsior</i>
Blackcurrant	<i>Ribes nigrum</i>
Blackthorn	<i>Prunus spinosa</i>
Bluebell	<i>Hyacinthoides non-scripta</i>
Bramble	<i>Rubus fruticosus agg.</i>
Branched bur-reed	<i>Sparganium erectum</i>
Bulrush	<i>Typha latifolia</i>
Bush vetch	<i>Vicia sepium</i>
Carnation sedge	<i>Carex panicea</i>
Common bent	<i>Agrostis capillaris</i>
Common dog violet	<i>Viola riviniana</i>
Common fleabane	<i>Pulicaria dysenterica</i>
Common milkwort	<i>Polygala vulgaris</i>
Common mouse-ear	<i>Cerastium fontanum</i>
Common valerian	<i>Valeriana officinalis</i>
Cowslip	<i>Primula veris</i>
Creeping bent	<i>Agrostis stolonifera</i>
Creeping thistle	<i>Cirsium arvense</i>
Crested dog's tail	<i>Cynosurus cristatus</i>
Damson	<i>Prunus domestica subsp. insititia</i>
Dandelion	<i>Taraxacum officinale agg.</i>
Deer grass	<i>Trichophorum cespitosum</i>
Dog rose	<i>Rosa canina</i>
Elder	<i>Sambucus nigra</i>
Elm	<i>Ulmus sp.</i>
Enchanter's nightshade	<i>Circaea lutetiana</i>
Fairy flax	<i>Linum catharticum</i>
Field wood rush	<i>Luzula campestris</i>
Floating sweet grass	<i>Glyceria fluitans</i>
Germander speedwell	<i>Veronica chamaedrys</i>
Gorse	<i>Ulex europaeus</i>

Common Name	Species Name
Green ribbed sedge	<i>Carex binervis</i>
Grey willow	<i>Salix cinerea</i>
Hairy sedge	<i>Carex hirta</i>
Hairy violet	<i>Viola hirta</i>
Hard fern	<i>Blechnum spicant</i>
Hard rush	<i>Juncus inflexus</i>
Hart's tongue fern	<i>Phyllitis scolopendrium</i>
Hawthorn	<i>Crataegus monogyna</i>
Hazel	<i>Corylus avellana</i>
Heath grass	<i>Danthonia decumbens</i>
Herb bennett	<i>Geum urbanum</i>
Herb Robert	<i>Geranium robertianum</i>
Hogweed	<i>Heracleum sphondylium</i>
Ivy	<i>Hedera helix</i>
Jointed rush	<i>Juncus articulatus</i>
Lesser spearwort	<i>Ranunculus scleratus</i>
Ling	<i>Calluna vulgaris</i>
Meadow thistle	<i>Cirsium dissectum</i>
Meadowsweet	<i>Filipendula ulmaria</i>
Nettle	<i>Urtica dioica</i>
Perennial rye grass	<i>Lolium perenne</i>
Primrose	<i>Primula vulgaris</i>
Ragwort	<i>Senecio jacobea</i>
Raspberry	<i>Rubus idaeus</i>
Scaly male fern	<i>Dryopteris affinis</i>
Self-heal	<i>Prunella vulgaris</i>
Sheep's fescue	<i>Festuca ovina</i>
Silverweed	<i>Potentilla anserina</i>
Slender St John's wort	<i>Hypericum pulchrum</i>
Soft (common rush)	<i>Juncus effusus</i>
Soft shield fern	<i>Polystichum setiferum</i>
Spear thistle	<i>Cirsium vulgare</i>
Spindle	<i>Euonymus europaeus</i>

Common Name	Species Name
Sweet vernal grass	<i>Anthoxanthum odoratum</i>
Sycamore	<i>Acer pseudoplatanus</i>
Tormentil	<i>Potentilla erecta</i>
Twayblade	<i>Listera ovata</i>
Violet	<i>Viola sp.</i>
Wavy hair grass	<i>Deschampsia flexuosa</i>
White clover	<i>Trifolium repens</i>
Wild strawberry	<i>Fragaria vesca</i>
Willowherbs	<i>Epilobium spp</i>
Wood avens	<i>Geum urbanum</i>
Wood dock	<i>Rumex sanguineus</i>
Yellow pimpernell	<i>Lysimachia nemorum</i>
Yew	<i>Taxus baccata</i>
Yorkshire fog	<i>Holcus lanatus</i>
Fauna	
Badger	<i>Meles meles</i>
Fox	<i>Vulpes vulpes</i>

Appendix B – Habitat Classification According to Fossitt (2000)

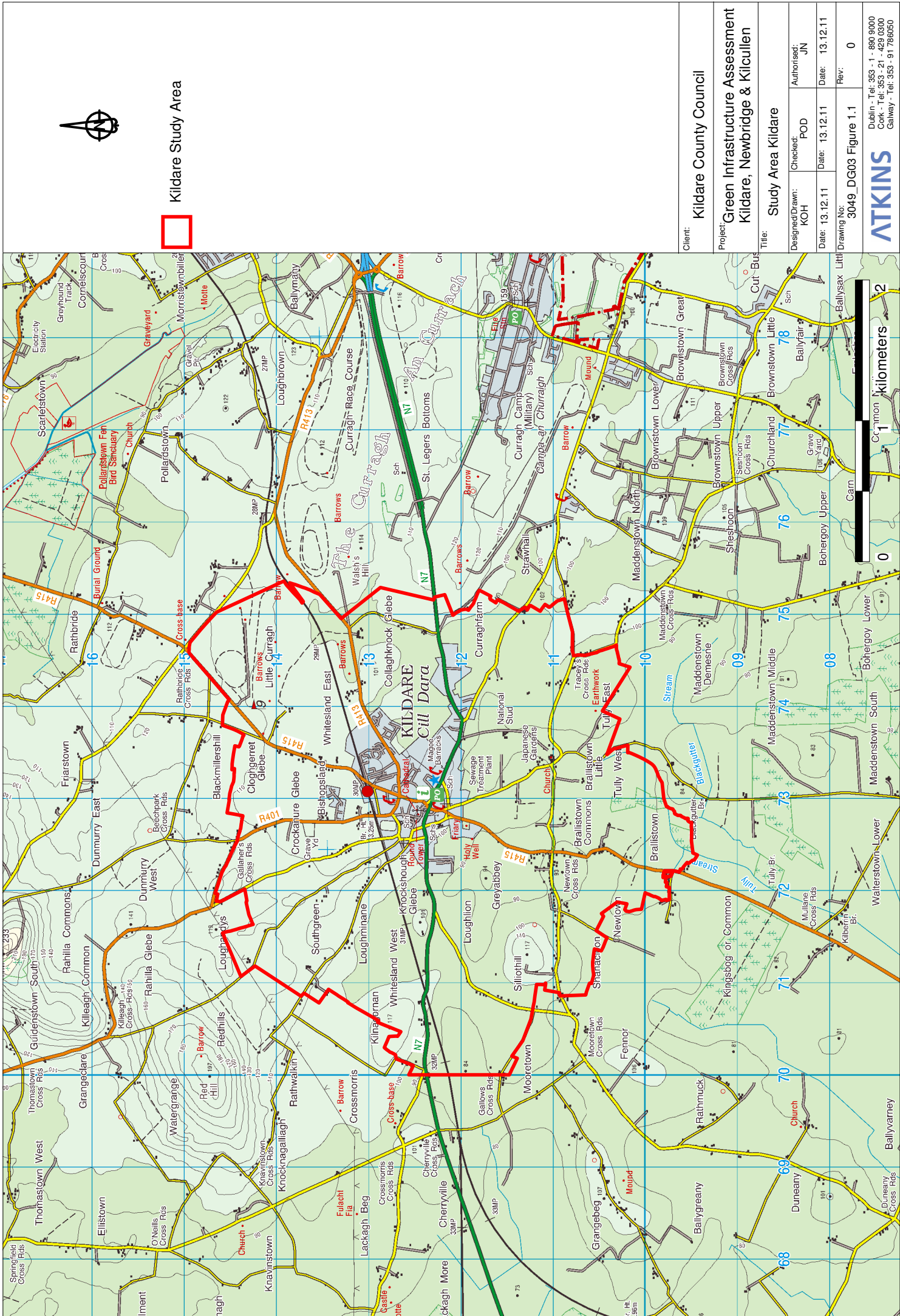
The table below outlines the classification of terrestrial and freshwater habitats according to the Heritage Council classification system (Fossitt, 2000). Level 1 of the hierarchy is indicated by a single-letter code, level 2 is indicated by a two-letter code, and level 3 is indicated by a three-character alphanumeric code.

Table B.1 – Heritage Council habitat classification system (Fossitt, 2000).

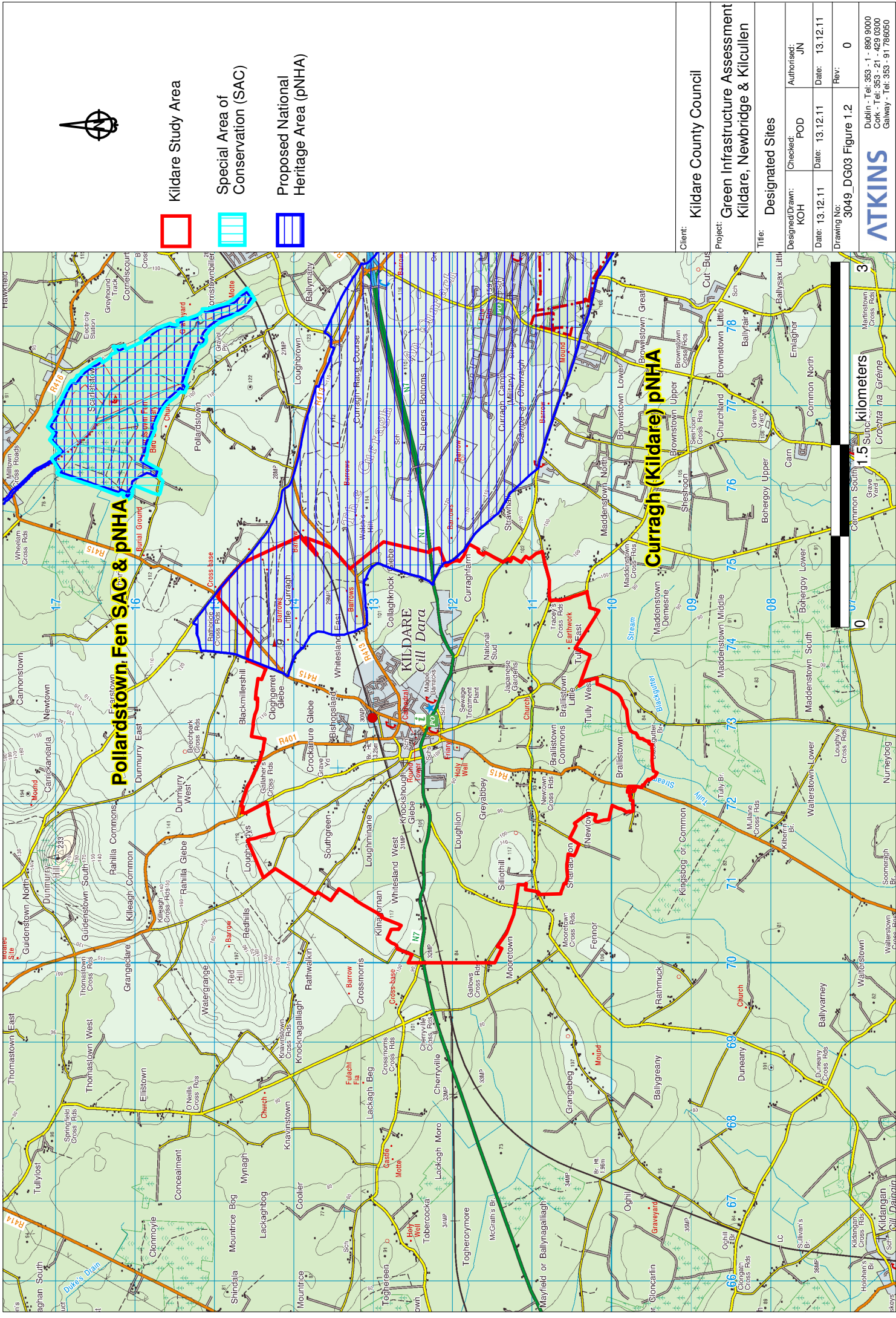
F FRESHWATER	
FL Lakes and Ponds	FL1 Dystrophic lakes
	FL2 Acid oligotrophic lakes
	FL3 Limestone/marl lakes
	FL4 Mesotrophic lakes
	FL5 Eutrophic lakes
	FL6 Turloughs
	FL7 Reservoirs
	FL8 Other artificial lakes and ponds
FW Watercourses	FW1 Eroding/upland rivers
	FW2 Depositing/lowland rivers
	FW3 Canals
	FW4 Drainage ditches
FP Springs	FP1 Calcareous springs
	FP2 Non-Calcareous springs
FS Swamps	FS1 Reed and large sedge swamps
	FS2 Tall herb swamps
G GRASSLAND AND MARSH	
GA Improved grassland	GA1 Improved agricultural grassland
	GA2 Amenity grassland (improved)
GS Semi-natural grassland	GS1 Dry calcareous and neutral grassland
	GS2 Dry meadows and grassy verges
	GS3 Dry-humid acid grassland
	GS4 Wet grassland
GM Freshwater marsh	GM1 Marsh
H HEATH AND DENSE BRACKEN	
HH Heath	HH1 Dry siliceous heath
	HH2 Dry calcareous heath
	HH3 Wet heath
	HH4 Montane heath
HD Dense bracken	HD1 Dense bracken

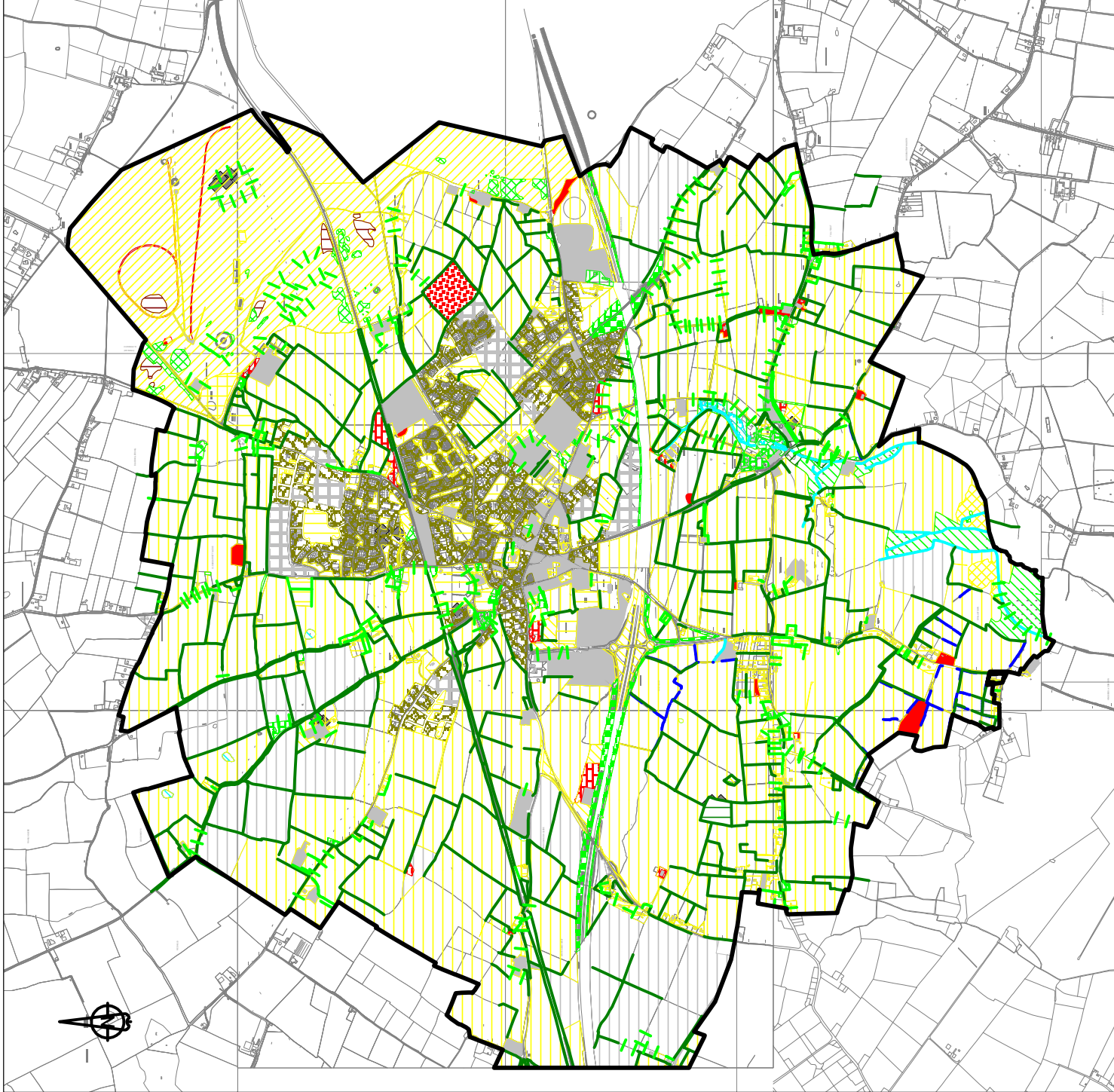
P PEATLANDS	
PB Bogs	PB1 Raised bogs
	PB2 Upland blanket bog
	PB3 Lowland blanket bog
	PB4 Cutover bog
	PB5 Eroding blanket bog
PF Fens and Flushes	PF1 Rich fen and flush
	PF2 Poor fen and flush
	PF3 Transition mire and quaking bog
W WOODLAND AND SCRUB	
WN Semi-natural woodland	WN1 Oak-birch-holly woodland
	WN2 Oak-ash-hazel woodland
	WN3 Yew woodland
	WN4 Wet pedunculate oak-ash woodland
	WN5 Riparian woodland
	WN6 Wet willow-alder-ash woodland
	WN7 Bog woodland
WD Highly modified/non-native woodland	WD1 (Mixed) broadleaved woodland
	WD2 Mixed broadleaved/conifer woodland
	WD3 Yew woodland
	WD4 Conifer plantation
	WD5 Scattered trees and parkland
WS Scrub/transitional woodland	WS1 Scrub
	WS2 Immature woodland
	WS3 Ornamental/non-native shrub
	WS4 Short rotation coppice
	WS5 Recently-felled woodland
WL Linear woodland/scrub	WL1 Hedgerows
	WL2 Treelines
E EXPOSED ROCK AND DISTURBED GROUND	
ER Exposed rock	ER1 Exposed siliceous rock
	ER2 Exposed calcareous rock
	ER3 Siliceous scree and loose rock
	ER4 Calcareous scree and loose rock
EU Underground rock and caves	EU1 Non-marine caves
	EU2 Artificial underground habitats
ED Disturbed ground	ED1 Exposed sand, gravel or till
	ED2 Spoil and bare ground
	ED3 Recolonising bare ground
	ED4 Active quarries and mines
	ED5 Refuse and other waste

B CULTIVATED AND BUILT LAND	
BC Cultivated land	BC1 Arable crops
	BC2 Horticultural land
	BC3 Tilled land
	BC4 Flower beds and borders
BL Built land	BL1 Stone walls and other stonework
	BL2 Earth banks
	BL3 Buildings and artificial surfaces



Client:	Kildare County Council		
Project:	Green Infrastructure Assessment Kildare, Newbridge & Kilcullen		
Title:	Study Area Kildare		
Designed/Drawn:	KOH	Checked:	POD
Date:	13.12.11	Date:	13.12.11
Drawing No:	3049_DG03 Figure 1.1	Rev:	0
ATKINS			
Dublin - Tel: 353 - 1 - 890 9000 Cork - Tel: 353 - 21 - 429 0300 Galway - Tel: 353 - 91 786050			





- | | | | |
|-----|------|-----|-------|
| FP1 | WS3A | WD5 | FL5 |
| WL2 | WL1 | WD4 | FL4 |
| FW4 | FW3 | WD2 | ED6 |
| FW2 | BL1A | wd1 | ED5 |
| | WS4 | PF1 | ED3 |
| | WS3B | HH2 | ED2 |
| | WS2 | GS4 | ED1 |
| | WS1 | GS3 | BL3D |
| | WN6 | GS2 | BL3_3 |
| | WN5 | GS1 | BL3_2 |
| | WN4 | GM1 | BL3_1 |
| | WN2 | GA2 | BL3 |
| | | GA1 | BL1B |
| | | FS2 | BC3 |
| | | FS1 | BC2 |
| | | FL8 | BC1 |

Client: Kildare County Council

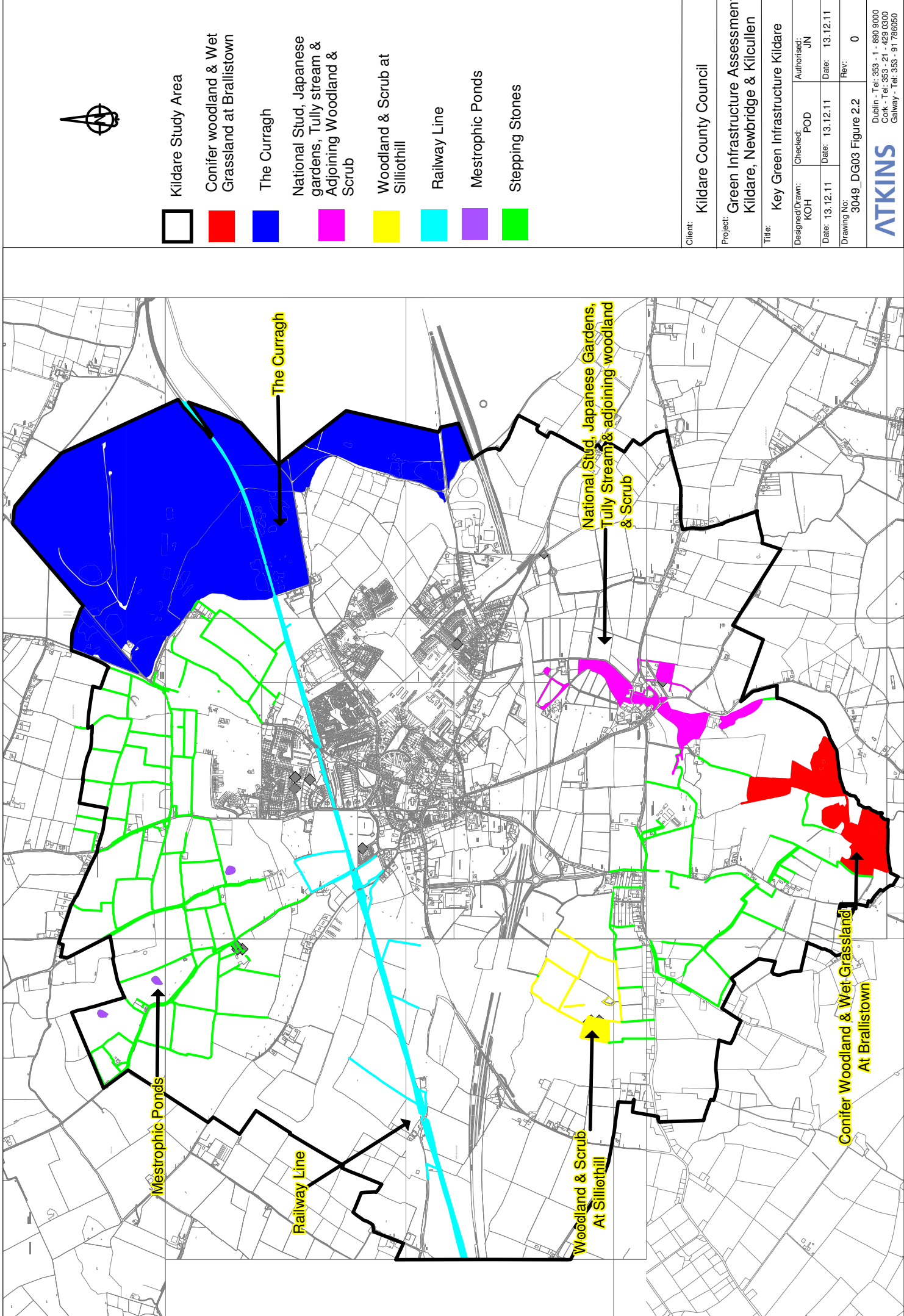
Project: Green Infrastructure Assessment Kildare, Newbridge & Kilcullen

Title: Habitat Map - Mary Tubridy (2007)


Designed/Drawn:	KOH	Checked:	POD	Authorised:	JN
Date:	13.12.11	Date:	13.12.11	Date:	13.12.11
Drawing No:	3049_DG03 Figure 2.1	Rev:	0		

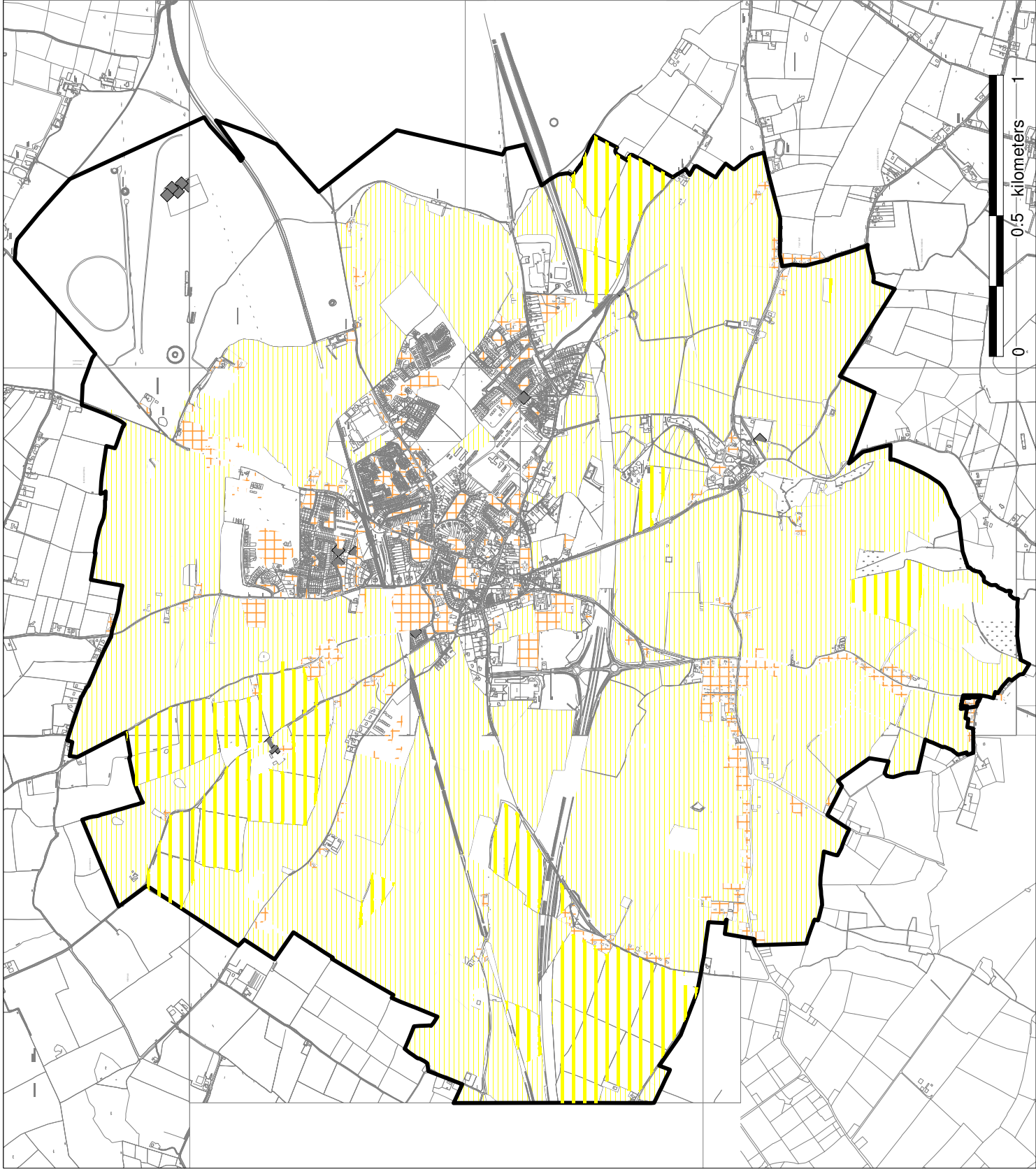
Dublin - Tel: 353 - 1 - 890 9000
Cork - Tel: 353 - 21 - 429 0300
Galway - Tel: 353 - 91 786050





- Kildare Study Area
- Conifer woodland & Wet Grassland at Brallistown
- The Curragh
- National Stud, Japanese gardens, Tully stream & Adjoining Woodland & Scrub
- Woodland & Scrub at Silliothill
- Railway Line
- Mestrophic Ponds
- Stepping Stones

Client:	Kildare County Council				
Project:	Green Infrastructure Assessment Kildare, Newbridge & Kilcullen				
Title:	Key Green Infrastructure Kildare				
Designed/Drawn: KOH	Checked: POD	Authorised: JN			
Date: 13.12.11	Date: 13.12.11	Date: 13.12.11			
Drawing No: 3049_DG03 Figure 2.2	Rev: 0				
			Dublin - Tel: 353 - 1 - 880 9000 Cork - Tel: 353 - 21 - 429 0300 Galway - Tel: 353 - 91 786050		
					



-  Kildare Study Area
-  Intensive Agriculture
-  Amenity Grassland

Client:

Kildare County Council

Project: Green Infrastructure Assessment
Kildare, Newbridge & Kilcullen

Title: Green Infrastructure Kildare - Amenity
Grassland & Intensive agriculture

Designed/Drawn: KOH

Checked: POD

Authorised: JN

Date: 13.12.11

Date: 13.12.11

Date: 13.12.11

Drawing No: 3049_DG03 Figure 2.3

Rev: 0

ATKINS

Dublin - Tel: 353 - 1 - 880 9000
Cork - Tel: 353 - 21 - 429 0300
Galway - Tel: 353 - 91 786050

Atkins is one of the world's leading providers of professional, technology based consultancy services. With over 15,600 staff worldwide, Atkins has expanded in recent years from its historical base in traditional engineering into related technological consultancy services. In Ireland, Atkins can deliver the full range of services to clients in both the public and private sector.

Our clients are varied and include governments, local and regional authorities, funding agencies and commercial and industrial enterprises. We help our clients to realise their objectives by developing and delivering practical solutions, adding value to their businesses through the application of our experience, innovative thinking and state-of-the-art technology. Atkins in Ireland is an integral part of WS Atkins plc and employs over 115 staff at its offices in Dublin, Cork and Galway. In addition, it is able to draw on the expertise of other Atkins divisions in the UK to provide appropriate staff on a project by project basis.

Atkins in Ireland provides a wide range of engineering, architectural, technical support and management services in the following key areas:-

- Roads (Highways & Bridges)
- Transportation & Planning Services
- Rail
- Water
- Architecture & Design
- Engineering
- Environment & Landscape
- Cost Management and Quantity Surveying

Atkins House
150-155 Airside Business Park
Swords, Co Dublin
Telephone +353 1 890 9000
Fax +353 1 890 9001

Unit 2B
2200 Cork Airport Business Park
Cork
Telephone +353 21 4290300
Fax +353 21 4290360

2nd Floor
Technology House
Parkmore Technology Park
Galway, Ireland
Telephone +353 91 786050
Fax +353 91 779830

www.atkinsireland.ie
email: info.ie@atkinsglobal.com