

# APPENDIX E

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# 3. Land Surface Zoning for Groundwater Protection

## 3.1 Information and Mapping Requirements for Land Surface Zoning

The groundwater resources protection zone map is a land-use planning map, and therefore is the most useful map for the decision-making process. It is the ultimate or final map as it is obtained by combining the aquifer and vulnerability maps. The aquifer map boundaries, in turn, are based on the bedrock map boundaries and the aquifer categories are obtained from an assessment of the available hydrogeological data. The vulnerability map is based on the subsoils map, together with an assessment of relevant hydrogeological data, in particular indications of permeability and karstification. This is illustrated in Figure 3.

Similarly, the source protection zone maps result from combining vulnerability and source protection area maps. The source protection areas are based largely on assessments of hydrogeological data. This is illustrated in Figure 4.

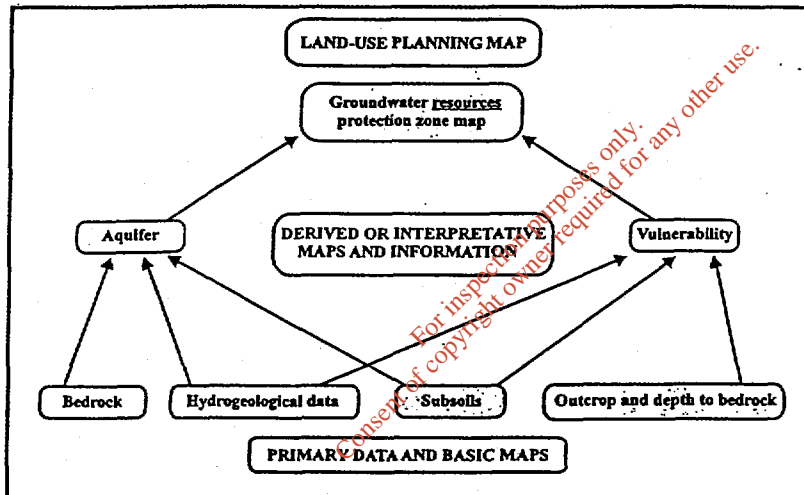


Figure 3. Conceptual framework for production of groundwater resource protection zones, indicating information needs and links

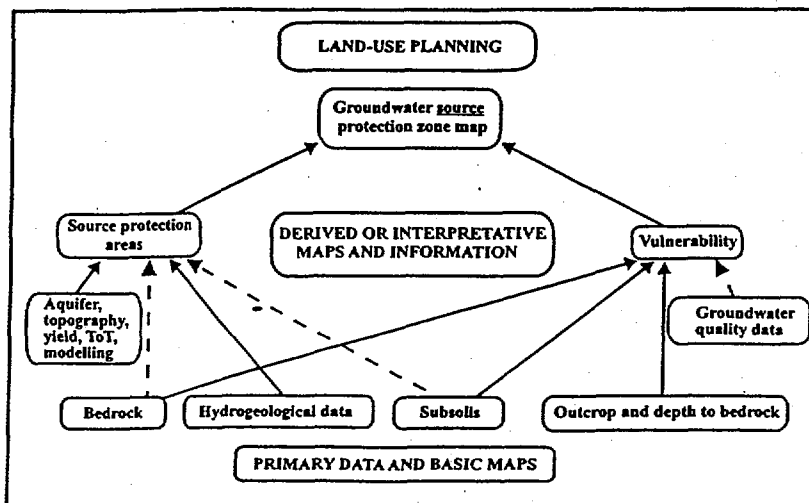


Figure 4. Conceptual framework for production of groundwater source protection zones, indicating information needs and links

## 3.2 Vulnerability Categories

Vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities.

The vulnerability of groundwater depends on: (i) the time of travel of infiltrating water (and contaminants); (ii) the relative quantity of contaminants that can reach the groundwater; and (iii) the contaminant attenuation capacity of the geological materials through which the water and contaminants infiltrate. As all groundwater is hydrologically connected to the land surface, it is the effectiveness of this connection that determines the relative vulnerability to contamination. Groundwater that readily and quickly receives water (and contaminants) from the land surface is considered to be more vulnerable than groundwater that receives water (and contaminants) more slowly and in lower quantities. The travel time, attenuation capacity and quantity of contaminants are a function of the following natural geological and hydrogeological attributes of any area:

- (i) the subsoils that overlie the groundwater;
- (ii) the type of recharge - whether point or diffuse; and
- (iii) the thickness of the unsaturated zone through which the contaminant moves.

In general, little attenuation of contaminants occurs in the bedrock in Ireland because flow is almost wholly via fissures. Consequently, the subsoils (sands, gravels, glacial tills (or boulder clays), peat, lake and alluvial silts and clays), are the single most important natural feature influencing groundwater vulnerability and groundwater contamination prevention. Groundwater is most at risk where the subsoils are absent or thin and, in areas of karstic limestone, where surface streams sink underground at swallow holes.

The geological and hydrogeological characteristics can be examined and mapped, thereby providing a groundwater vulnerability assessment for any area or site. Four groundwater vulnerability categories are used in the scheme - **extreme (E)**, **high (H)**, **moderate (M)** and **low (L)**. The hydrogeological basis for these categories is summarised in Table 1 and further details can be obtained from the GSI. The ratings are based on pragmatic judgements, experience and available technical and scientific information. However, provided the limitations are appreciated, vulnerability assessments are essential when considering the location of potentially polluting activities. As groundwater is considered to be present everywhere in Ireland, the vulnerability concept is applied to the entire land surface. The ranking of vulnerability does not take into consideration the biologically-active soil zone, as contaminants from point sources are usually discharged below this zone, often at depths of at least 1m. However, the groundwater protection responses take account of the point of discharge for each activity.

Vulnerability maps are an important part of groundwater protection schemes and are an essential element in the decision-making on the location of potentially polluting activities. Firstly, the vulnerability rating for an area indicates, and is a measure of, the likelihood of contamination. Secondly, the vulnerability map helps to ensure that a groundwater protection scheme is not unnecessarily restrictive on human economic activity. Thirdly, the vulnerability map helps in the choice of preventative measures and enables developments, which have a significant potential to contaminate, to be located in areas of lower vulnerability.

In summary, the entire land surface is divided into four vulnerability categories - extreme (E), high (H), moderate (M) and low (L) - based on the geological and hydrogeological factors described above. This subdivision is shown on a groundwater vulnerability map. The map shows the vulnerability of the first groundwater encountered (in either sand/gravel aquifers or in bedrock) to contaminants released at depths of 1-2 m below the ground surface. Where contaminants are released at significantly different depths, there will be a need to determine groundwater vulnerability using site-specific data. The characteristics of individual contaminants are not taken into account.

Vulnerability Rating	Hydrogeological Conditions				
	Subsoil Permeability (Type) and Thickness			Unsaturated Zone	Karst Features
	High permeability (sand/gravel)	Moderate permeability (e.g. Sandy subsoil)	Low permeability (e.g. Clayey subsoil, clay, peat)	(Sand/gravel aquifers only)	(<30 m radius)
Extreme (E)	0 - 3.0m	0 - 3.0m	0 - 3.0m	0 - 3.0m	-
High (H)	> 3.0m	3.0 - 10.0m	3.0 - 5.0m	> 3.0m	N/A
Moderate (M)	N/A	> 10.0m	5.0 - 10.0m	N/A	N/A
Low (L)	N/A	N/A	> 10.0m	N/A	N/A

Notes: (1) N/A = not applicable.  
(2) Precise permeability values cannot be given at present.  
(3) Release point of contaminants is assumed to be 1-2 m below ground surface.

Table 1. Vulnerability Mapping Guidelines

### 3.3 Source Protection Zones

Groundwater sources, particularly public, group scheme and industrial supplies, are of critical importance in many regions. Consequently, the objective of source protection zones is to provide protection by placing tighter controls on activities within all or part of the zone of contribution (ZOC) of the source.

There are two main elements to source protection land surface zoning:

- Areas surrounding individual groundwater sources; these are termed source protection areas (SPAs)
- Division of the SPAs on the basis of the vulnerability of the underlying groundwater to contamination.

These elements are integrated to give the source protection zones.

#### 3.3.1 Delineation of Source Protection Areas

Two source protection areas are recommended for delineation:

- Inner Protection Area (SI);
- Outer Protection Area (SO), encompassing the remainder of the source catchment area or ZOC.

In delineating the inner (SI) and outer (SO) protection areas, there are two broad approaches: first, using arbitrary fixed radii, which do not incorporate hydrogeological considerations; and secondly, a scientific approach using hydrogeological information and analysis, in particular the hydrogeological characteristics of the aquifer, the direction of groundwater flow, the pumping rate and the recharge.

Where the hydrogeological information is poor and/or where time and resources are limited, the simple zonation approach using the arbitrary fixed radius method is a good first step that requires little technical expertise. However, it can both over- and under-protect. It usually over-protects on the downgradient side of the source and may under-protect on the upgradient side, particularly in karst areas. It is particularly inappropriate in the case of springs where there is no part of the downgradient side in the ZOC. Also, the lack of a scientific basis reduces its defensibility as a method.

There are several hydrogeological methods for delineating SPAs. They vary in complexity, cost and the level of data and hydrogeological analysis required. Four methods, in order of increasing technical sophistication, are used by the GSI:

- (i) calculated fixed radius;
- (ii) analytical methods;
- (iii) hydrogeological mapping; and
- (iv) numerical modelling.

Each method has limitations. Even with relatively good hydrogeological data, the heterogeneity of Irish aquifers will generally prevent the delineation of definitive SPA boundaries. Consequently, the boundaries must be seen as a guide for decision-making, which can be reappraised in the light of new knowledge or changed circumstances.

#### 3.3.1.1 Inner Protection Area (SI)

This area is designed to protect against the effects of human activities that might have an immediate effect on the source and, in particular, against microbial pollution. The area is defined by a 100-day time of travel (TOT) from any point below the water table to the source. (The TOT varies significantly between regulatory agencies in different countries. The 100-day limit is chosen for Ireland as a relatively conservative limit to allow for the heterogeneous nature of Irish aquifers and to reduce the risk of pollution from bacteria and viruses, which in some circumstances can live longer than 50 days in groundwater.) In karst areas, it will not usually be feasible to delineate 100-day TOT boundaries, as there are large variations in permeability, high flow velocities and a low level of predictability. In these areas, the total catchment area of the source will frequently be classed as SI.

If it is necessary to use the arbitrary fixed radius method, a distance of 300m is normally used. A semi-circular area is used for springs. The distance may be increased for sources in karst aquifers and reduced in granular aquifers and around low yielding sources.

#### 3.3.1.2 Outer Protection Area (SO)

This area covers the remainder of the ZOC (or complete catchment area) of the groundwater source. It is defined as the area needed to support an abstraction from long-term groundwater recharge i.e. the proportion of effective rainfall that infiltrates to the water table. The abstraction rate used in delineating the zone will depend on the views and recommendations of the source owner. A factor of safety can be taken into account whereby the maximum daily abstraction rate is increased (typically by 50%) to allow for possible future increases in abstraction and for expansion of the ZOC in dry periods. In order to take account of the heterogeneity of many Irish aquifers and possible errors in estimating the groundwater flow direction, a variation in the flow direction (typically  $\pm 10-20^\circ$ ) is frequently included as a safety margin in delineating the ZOC.

A conceptual model of the ZOC and the 100-day TOT boundary is given in Figure 5.

If the arbitrary fixed radius method is used, a distance of 1000m is recommended with, in some instances, variations in karst aquifers and around springs and low-yielding wells.

The boundaries of the SPAs are based on the horizontal flow of water to the source and, in the case particularly of the Inner Protection Area, on the time of travel in the aquifer. Consequently, the vertical movement of a water particle or contaminant from the land surface to the water table is not taken into account. This vertical movement is a critical factor in contaminant attenuation, contaminant flow velocities and in dictating the likelihood of contamination. It can be taken into account by mapping the groundwater vulnerability to contamination.

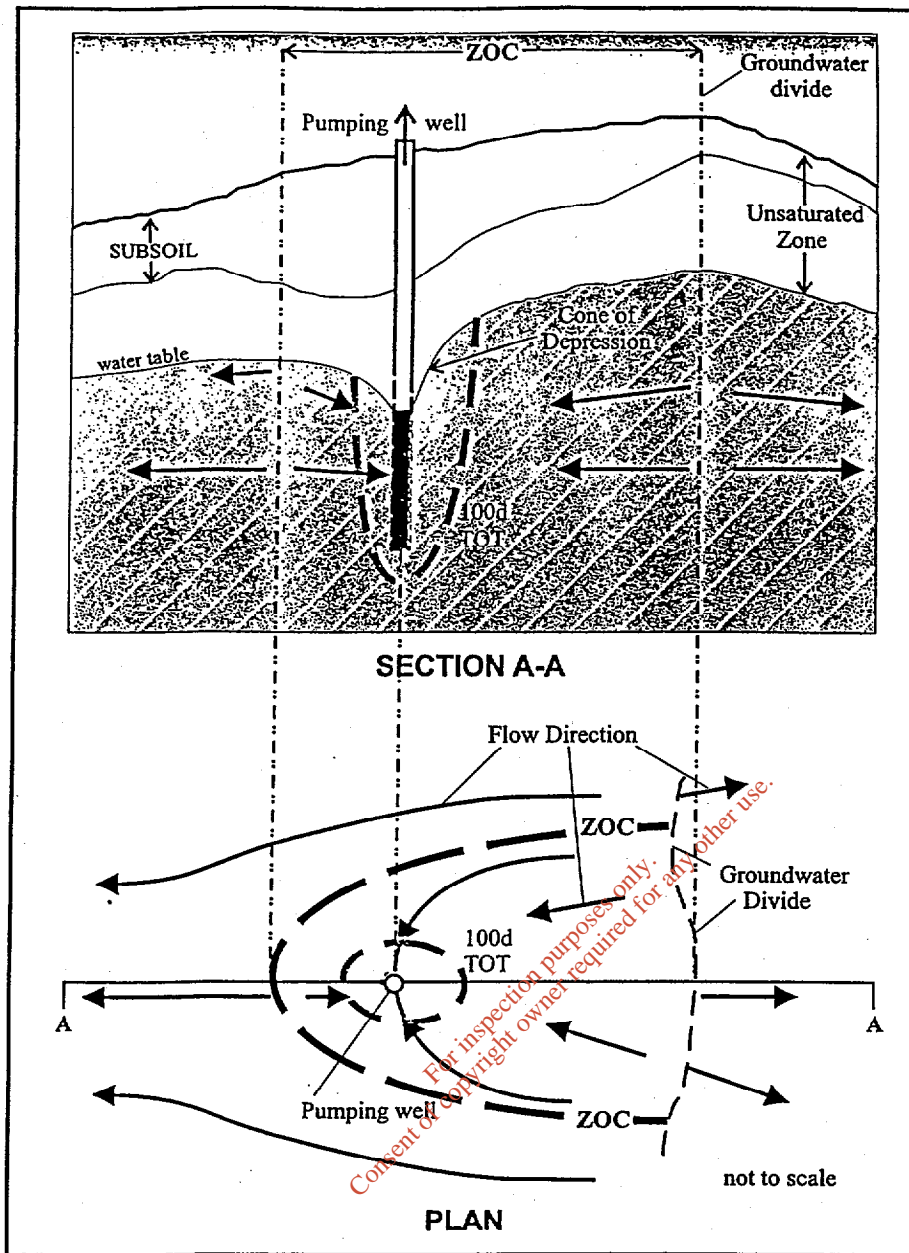


Figure 5. Conceptual Model of the Zone of Contribution (ZOC) at a Pumping Well (adapted from US EPA, 1987)

### 3.3.2 Delineation of Source Protection Zones

The matrix in Table 2 below gives the result of integrating the two elements of land surface zoning (SPAs and vulnerability categories) – a possible total of eight source protection zones. In practice, the source protection zones are obtained by superimposing the vulnerability map on the source protection area map. Each zone is represented by a code e.g. SO/H, which represents an Outer Source Protection area where the groundwater is highly vulnerable to contamination. The recommended map scale is 1:10,560 (or 1:10,000 if available), though a smaller scale may be appropriate for large springs.

VULNERABILITY RATING	SOURCE PROTECTION ZONE	
	Inner (SI)	Outer (SO)
Extreme (E)	SI/E	SO/E
High (H)	SI/H	SO/H
Moderate (M)	SI/M	SO/M
Low (L)	SI/L	SO/L

Table 2. Matrix of Source Protection Zones

All of the hydrogeological settings represented by the zones may not be present around each groundwater source. The integration of the SPAs and the vulnerability ratings is illustrated in Figure 6.

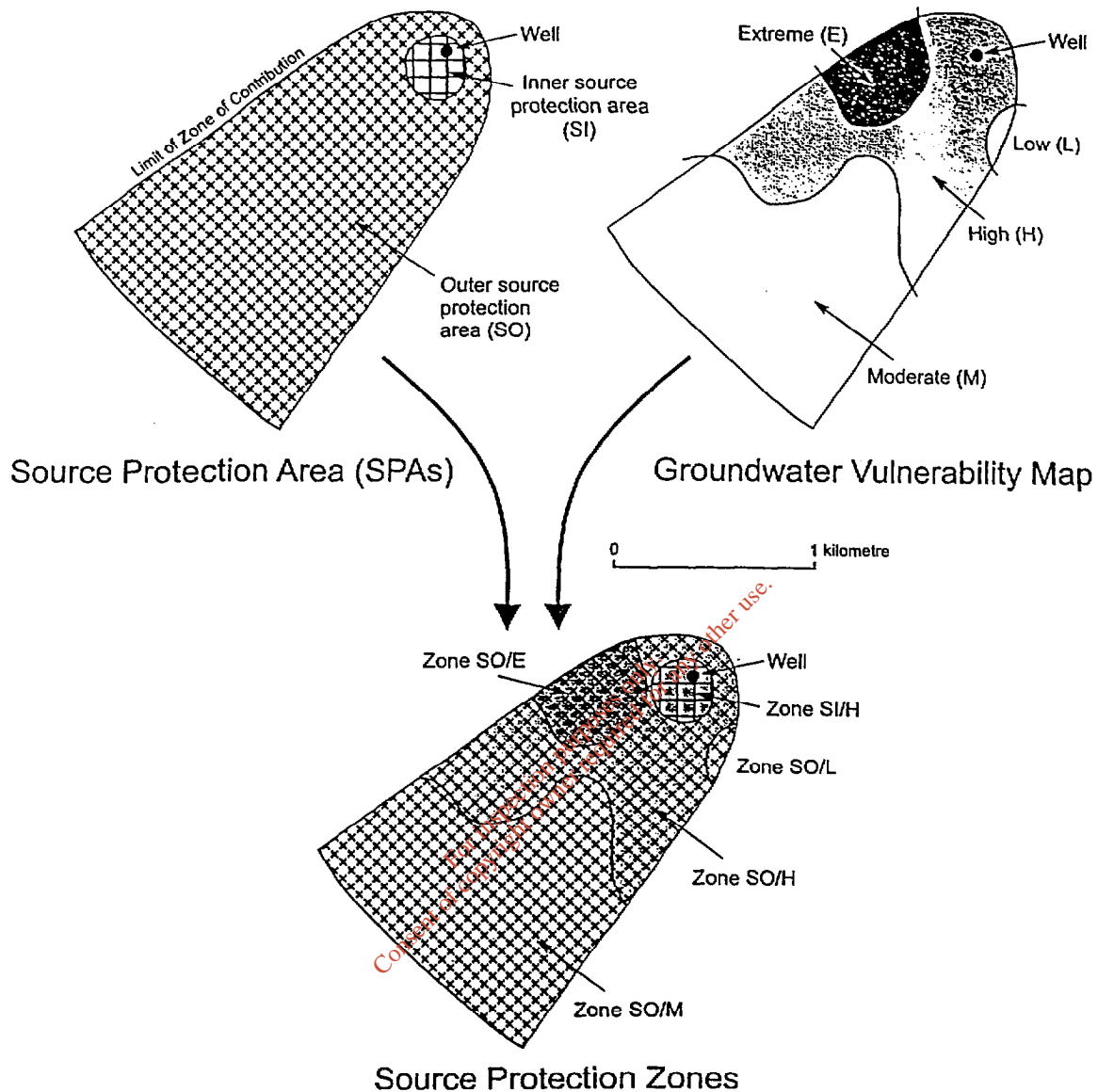


Figure 6. Delineation of source protection zones around a public supply well from the integration of the source protection area map and the vulnerability map.

### 3.4 Resource Protection Zones

For any region, the area outside the SPAs can be subdivided, based on the value of the resource and the hydrogeological characteristics, into eight aquifer categories:

#### Regionally Important (R) Aquifers

- (i) Karstified aquifers (Rk)
- (ii) Fissured bedrock aquifers (Rf)
- (iii) Extensive sand/gravel aquifers (Rg)

### Locally Important (L) Aquifers

- (i) Sand/gravel (Lg)
- (ii) Bedrock which is Generally Moderately Productive (Lm)
- (iii) Bedrock which is Moderately Productive only in Local Zones (L1)

### Poor (P) Aquifers

- (i) Bedrock which is Generally Unproductive except for Local Zones (P1)
- (ii) Bedrock which is Generally Unproductive (Pu)

These aquifer categories are shown on an aquifer map, which can be used not only as an element of a groundwater protection scheme but also for groundwater development purposes.

The matrix in Table 3 below gives the result of integrating the two regional elements of land surface zoning (vulnerability categories and resource protection areas) – a possible total of 24 resource protection zones. In practice this is achieved by superimposing the vulnerability map on the aquifer map. Each zone is represented by a code e.g. Rf/M, which represents areas of regionally important fissured aquifers where the groundwater is moderately vulnerable to contamination. In land surface zoning for groundwater protection purposes, regionally important sand/gravel (Rg) and fissured aquifers (Rf) are zoned together, as are locally important sand/gravel (Lg) and bedrock which is moderately productive (Lm). All of the hydrogeological settings represented by the zones may not be present in each local authority area.

VULNERABILITY RATING	RESOURCE PROTECTION ZONES					
	Regionally Important Aquifers (R)		Locally Important Aquifers (L)		Poor Aquifers (P)	
	Rk	Rf/Rg	Lm/Lg	L1	P1	Pu
Extreme (E)	Rk/E	Rf/E	Lm/E	L1/E	P1/E	Pu/E
High (H)	Rk/H	Rf/H	Lm/H	L1/H	P1/H	Pu/H
Moderate (M)	Rk/M	Rf/M	Lm/M	L1/M	P1/M	Pu/M
Low (L)	Rk/L	Rf/L	Lm/L	L1/L	P1/L	Pu/L

Table 3. Matrix of Resource Protection Zones

## 3.5 Flexibility, Limitations and Uncertainty

The land surface zoning is only as good as the information which is used in its compilation (geological mapping, hydrogeological assessment, etc.) and these are subject to revision as new information is produced. Therefore a scheme must be flexible and allow for regular revision.

Uncertainty is an inherent element in drawing geological boundaries and there is a degree of generalisation because of the map scales used. Therefore the scheme is not intended to give sufficient information for site-specific decisions. Also, where site specific data received by a regulatory body in the future are at variance with the maps, this does not undermine a scheme, but rather provides an opportunity to improve it.



## ATTACHMENT 10

### FLORA & FAUNA SURVEY

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**Assessment of Impact  
on Flora and Fauna  
by Proposed  
Development  
at Carranstown, Co. Meath**

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*Prepared for*

**Project Management Ltd.**

*by*

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**June 2000**

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Figure 1. Habitat and landuse map of survey area

Plates 1-4. Views of site

## **Summary**

A baseline flora and fauna study was carried out at a site at Carranstown, Co. Meath in June 2000. The site comprises an area which has been intensively managed for agricultural purposes and all habitats present are man-modified types. Habitat diversity is low, with pasture grassland, meadow grassland, hedgerows and ditches being the only habitats present. The pasture and meadow grassland habitats are of negligible scientific interest and of practically no conservation value. The hedgerows are considered of limited ecological value due to low species diversity (predominantly hawthorn with some ash) and poor structure. Of some note, however, is the hedge which marks the eastern/northern townland boundary (accompanied by a substantial ditch), the hedgerow or treeline which forms part of the boundary with the road, and the hedgerow or treeline which forms the north-western boundary. All of the other hedgerows have very limited or even negligible value.

The survey area does not appear to support any rare or protected plant species. No animal species of high conservation importance occurs. Of some local interest is that rooks are nesting in an ash tree along one of the western boundary hedgerows.

The areas surrounding the site are also predominantly agricultural lands. There are no features of known ecological interest in the immediate area of the site. No part of the site or its immediate environs is governed by any scientific or conservation designation, with the nearest site of conservation importance being over 2 km away.

The principal impact to be considered by the proposed development is habitat loss. The development will result in the loss of pasture and meadow grassland and some hedgerows. The loss of pasture and meadow grassland is of negligible significance as these habitats have practically no scientific or conservation value. The loss of various sections of hedgerow would vary from negligible to low significance. During the construction phase, there is a possibility that damage could be caused to some of the other hedgerows on the site which are being left in situ. However, serious damage can be avoided with proper care. A further potential impact which requires consideration is possible water pollution which could be caused by contaminated water entering the ditch immediately west of the site (which leads to the nearby stream, a tributary of the River Nanny). The development could directly affect the rookery which exists in one of the ash trees. The significance of this could only be considered as low as the rook is a very common bird species.

Recommendations are made relating to the retention and protection of the hedgerows and to the possibility of enhancing those which will remain in situ. Also, there is an opportunity for the planting of new hedgerows. Suitable landscaping proposals for the development site could enhance the area for wildlife. Recommendations are also made relating to prevention of possible water pollution and to the retention of the rookery.

## 1. Introduction

The proposed development site is situated within the townland of Carranstown in County Meath (site grid reference O 064 708). It is approximately 4 km south-west of Drogheda and 2 km north-east of Duleek. The site is approximately 30 acres in area. The entrance to the site is from the R152 regional road, which skirts the eastern boundary of the site. Ribbon housing development occurs along this road. The Navan to Drogheda railway line runs just west and north of the site. A major cement factory occurs c.500 m to the north-east of the site.

The site comprises agricultural land and this is the main landuse in the surrounding areas. The agriculture in the area is generally intensive and of mixed character (mostly pasture and cereals). The soils are good quality agricultural soils and appear well drained. The general area is drained by the River Nanny, which flows through Duleek and enters the sea at Laytown. There are no streams within the site, the nearest watercourse being a small tributary stream of the Nanny c.100 m to the south of the site.

No part of the site is covered by a conservation designation or a proposed designation, such as an Natural Heritage Area, nor is adjacent to any area with such a designation.

The habitats and vegetation types occurring within the site and surrounding areas are described, as are the vertebrate fauna (i.e. mammals, amphibians, reptiles and birds). The likely impacts of the development on the local flora and fauna are discussed and, where necessary, mitigation measures are recommended.

The general format of this report is in accordance with guidelines recommended by the EPA (1995) *Draft Guidelines on the Information to be contained in Environmental Impact Statements*.

## 2. Survey methodology

The survey was carried out on 11th June 2000. The survey comprised a thorough examination of the entire site. The areas immediately surrounding the site were also examined (though in less detail than the site) in order to put the site in a local context and to determine whether the development would have any impact on these areas.

The survey methodology consisted of systematically walking the site area and recording plant species and vegetation types present. As most of the site comprises intensively managed land, emphasis was placed on the field hedgerow boundaries. Notes were made on bird species present within and around the site. For mammals, the main emphasis was

on search for signs of activity or dwellings. During the survey, particular attention was given to the possible presence of habitats and/or species which are legally protected under Irish or European legislation (e.g. the Flora Protection Order 1999; Wildlife Act 1976; EU Habitats Directive; EU Birds Directive).

The standard literature was checked for reference to the site and locality, as were the listings and maps of sites of conservation importance in Co. Meath held by Duchas the Heritage Service.

## **2.1 Survey limitations**

Seasonality is often a constraint in ecological surveying owing to the growing season of plants and the migratory or hibernating behaviour of some animals. The present study was carried out in summer, the optimum period for surveying plants. The timing of the survey is also considered good for surveying mammals and breeding birds. Birds which occur only in winter (winter migrants) would obviously not be present. While this is a survey limitation, it is considered unlikely that any rare or scarce bird species would occur in the survey area during winter owing to the low diversity and intense management of the habitats present. Overall, no significant difficulties were encountered in compiling information on the flora and fauna of the study area.

## **3. Baseline environment**

### **3.1 Habitats, vegetation and flora**

The site comprises three agricultural fields and about two-thirds of a further field (which backs onto the railway line). All of the fields are in grassland, mostly meadow grass which has not been grazed in recent times. Hedgerows and/or treelines form the field boundaries, though most of these have not been well maintained and are not stock proof. Ditches accompany some of the hedgerows. There are no natural or semi-natural habitats, such as woodlands, marshes, streams or rock outcrops, within the site. The main ecological interest at this site lies in the hedgerows.

The vegetation types or habitats which were identified are described below with reference to the accompanying map (Fig. 1). Both English and scientific names are given for plant species (after Scannell & Synnott 1987). For tree species, scientific names are given only after their first mention.

### ***Improved grassland - meadow and pasture***

Meadow grassland is the principal habitat type at the site (see plates 1 and 4), occurring in all of the fields apart from part of field 1 and most of field 2 where grazed pasture occurs (see map). The sward is approximately 50 cm to 70 cm high. It is dominated by common agricultural grass species, including rye grass (*Lolium perenne*), creeping bent (*Agrostis stolonifera*), cock's foot (*Dactylis glomerata*) and Yorkshire fog (*Holcus lanatus*). Common perennial herb species include meadow buttercup (*Ranunculus acris*), creeping buttercup (*Ranunculus repens*), red clover (*Trifolium repens*), common mouse-ear (*Cerastium fontanum*), daisy (*Bellis perennis*), ribwort plantain (*Plantago lanceolata*) and speedwell (*Veronica serpyllifolia*). Thistles (*Cirsium vulgare* and *C. arvense*) and nettles (*Urtica dioica*) are frequent in parts, especially towards the field margins.

A corridor of pasture running east to west through fields 1 and 2 is fenced off by barbed-wire. This is a low sward of grazed pasture which has been reseeded in the past and is heavily poached by cattle in places. Pasture also occurs in these fields between the fenced off area and the road (see plate 2). The pasture in field 2 is particularly weedy and there is a large amount of manure stored alongside the south-western boundary of this field.

### ***Hedgerows or hedgerows / treelines***

Hedgerows of varying quality form the field boundaries within the site. Nine separate hedgerows are identified and these are shown on the accompanying map. They are almost entirely of hawthorn (*Crataegus monogyna*), with ash (*Fraxinus excelsior*) occurring as the main tall tree species. Apart from that along the road frontage, the hedgerows have not been maintained in recent times, and most are not stock proof. Indeed, some of the hedges have very significant gaps where cattle can pass freely through. Many of the hedgerows have poor structural development, with no noticeable understorey or ground layer. Where an understorey does occur it is usually dominated by brambles (*Rubus fruticosus*), along with species such as nettles (*Urtica dioica*), thistles (*Cirsium* sp.) and hogweed (*Heracleum sphondylium*). A feature of some of the hedgerows is that the hawthorn trees are very mature, with some up to 15m high. These older trees often have a heavy ivy cover. The hedgerow which marks the townland boundary is accompanied by a substantial ditch, as is one of the internal hedgerows (H4 as shown on the map). Two sections of hedge are dominated by tall ash and are more aptly termed treelines.

Overall, the hedgerows are considered of limited ecological value due to the low species diversity and the poor structure. They do, however, provide some value to local wildlife in this generally intensive agricultural landscape. There follows a brief description of each hedgerow (see corresponding numbers on map).

#### Hedgerow 1 (boundary with road)

This is a well maintained, low hedge (c.2 m) which forms the boundary between field 1 and the public road. It appears to be entirely of hawthorn (*Crataegus monogyna*). The hedge is fully stock proof. Of limited ecological value.

#### Hedgerow 2 (townland boundary)

This hedgerow marks the townland boundary along the northern and north-eastern part of site (see plate 1). The hedgerow is mostly intact though has not been managed in the last few years. It is on average about 5-6 m high and there are no tall trees. It is accompanied by a wide ditch (c.2 m width in places) and in parts the ditch has been planted on both sides. At the time of survey the ditch was damp in places. Some typical shade species such as lords and ladies (*Arum maculatum*) and hart's-tongue fern (*Phyllitis scolopendrium*) were noted within the ditch. Of some ecological value.

#### Hedgerow 3 (between fields 3 and 4)

This hedgerow is intact along its eastern end but rather gappy towards the west end where two tall ash occur. Otherwise the hedge is of hawthorn, some of the specimens being rather tall. Of limited ecological value.

#### Hedgerow 4 (central internal between fields 1, 2 and 3)

This hedgerow is of poor quality, being variable in height and with regular areas having only a bramble covering. The most intact section is at the eastern end. A wide ditch, dry at time of survey, accompanies hedge. Of limited ecological value.

#### Hedgerow 5 (between fields 1 and 2)

This hedge is of very poor quality, comprising mainly a line of hawthorns with little or no understorey. The central section has been removed. Of negligible ecological value.

#### Hedgerow / treeline 6 (along road frontage)

This comprises a treeline of ash trees, with hawthorn as a secondary species (see plate 3). There are c.20 ash trees, most being between 15 and 20 m high. Of some ecological value.

#### Hedgerow 7 (west boundary of field 2)

This hedgerow is of very poor quality, comprising a line of hawthorns with little or no understorey (see plate 2). Cattle roam freely through it. Some of the hawthorns are quite old and have fallen or broken branches. Of negligible ecological value.

#### Hedgerow 8 (west boundary of field 3)

This hedgerow comprises a line of hawthorns, with a tall ash in the central section and one at the north end. It has little or no understorey and is not stock proof. Of very limited ecological value.



### Hedgerow / treeline 9 (west boundary of field 4)

This comprises a treeline of tall ash, with some hawthorn in between (see plate 4). It is not stock proof. There are c.10 ash trees, mostly well grown and of a height of c.15 to 20 m. Of some ecological value.

#### **3.1.1 Likelihood of rare plant species occurring at site**

No rare, threatened or legally protected plant species, as listed in the Irish Red Data Book (Curtis & McGough 1988), were found at the site nor have been known to occur in the general area in the past. Based on an appraisal of the habitats present, i.e. mostly intensively managed agricultural land, it is considered unlikely that any rare or scarce plant would occur within the site.

### **3.2 Fauna**

#### **3.2.1 Mammals, amphibians and reptiles**

The low habitat diversity within the site results in the mammalian fauna being represented only by a few common species. Rabbits (*Oryctolagus cuniculus*) were observed within the site and signs of foxes (*Vulpes vulpes*) and brown rats (*Rattus norvegicus*) (i.e. droppings and burrows respectively) were noted at several locations within the hedgerows and ditches. Other ubiquitous Irish mammals which occur in agricultural habitats and are likely at the site would be hedgehog (*Erinaceus europaeus*), pygmy shrew (*Sorex minutus*) and long-tailed field mouse (*Apodemus sylvaticus*). Whilst bat species may hunt along the hedgerows, there are no potential bat roosts, i.e. buildings, caves or old mature trees, within the site.

Particular search was made for badgers (*Meles meles*) - while no signs were found the very dense vegetation within some of the hedgerows at the time of survey made full search impossible. It is considered that there is some chance that a badger sett could occur within the ditch system associated with hedgerows no. 2 and 4 (see map).

The habitats at the site are not considered suitable for the common frog (*Rana temporaria*) or the common lizard (*Lacerta vivipara*).

#### **3.2.2 Birds**

A limited number of bird species occurs at the site owing to the low diversity of habitats. The species which are present are all typical species of agricultural areas with hedgerows. Woodpigeons (*Columba palumbus*) were common within the hedgerows, along with small birds such as blackbird (*Turdus merula*), chaffinch (*Fringilla coelebs*), robin (*Erithacus rubecula*), wren (*Troglodytes troglodytes*), blue tit (*Parus caeruleus*), coal tit (*Parus ater*) and chiffchaff (*Phylloscopus collybita*). Most of these species would probably nest.

There is a rookery (i.e. a colony of nesting rooks *Corvus frugilegus*), in an ash tree in hedgerow no. 8 (nine nests counted) and further nests (eight nests) in ash trees just west of the site. The location of these trees is shown on the accompanying map.

### 3.3 Habitats and landuse around site

All of the fields around the site are in pasture or meadow grassland. East of the site, to the other side of the R152 road, there are cereal fields. A drainage ditch, with a substantial amount of water, occurs immediately west of the site and this links into a tributary of the River Nanny which occurs c.100 m west of the site. Hedgerows in surrounding fields appear of similar composition to those within the site, being dominated by hawthorn and ash.

A railway line runs north of the site and this typically has embankments and hedgerows along its margins. As already noted, a cement works occurs a little to the north of the site and is clearly visible from the site.

### 3.4 Designated or proposed areas of scientific interest in area

No part of the site or its immediate surroundings is covered by a scientific or conservation designation or proposed designation as recognised by Duchas the Heritage Service.

The nearest site of conservation importance is the Duleek Commons proposed Natural Heritage Area (site no. 1578) located over 2 km to the south-west. This pNHA is a calcareous marsh and fen system. Two further sites of conservation importance are located on the River Boyne, c.5 km to the north-west of the site. These are the Boyne River Islands (site no. 1862) and Dowth Wetlands (site no. 1861). Both of these are proposed Natural Heritage Areas, while the Boyne River Islands is also a proposed Special Area of Conservation (pSAC).

### 3.5 Overall assessment of scientific importance of site

This site represents an area which has for a long period been intensively managed for agricultural purposes. The only habitats present are grassland, both meadow and pasture, and hedgerows and ditches. All of these are wholly man-modified habitats.

The pasture and meadow grassland habitats are of negligible scientific interest and of practically no conservation value.

While the hedgerows are generally of relatively low interest due to low species diversity and poor structure, some have ecological value in a local context. These are hedgerow no. 2 (accompanied by a wide ditch) which forms the eastern/northern townland boundary, hedgerow or treeline no. 6 which forms part of the boundary with the road, and hedgerow or treeline no. 9 which forms the western boundary to field no. 4. All of the other hedgerows have very limited or even negligible value.

The survey area does not appear to support, nor has been known to in the past, any rare or protected plant species. No animal species of high conservation importance occurs. Of some local interest is that a rookery occurs in one of the ash trees within hedgerow no.8.

The areas surrounding the site are also predominantly agricultural lands. There are no features of known ecological interest in the immediate area of the site. No part of the site or its immediate environs is governed by a scientific or conservation designation, with the nearest site of conservation importance being over 2 km away.

In summary, this site represents fairly typical intensively managed agricultural land which has negligible to minor scientific interests. The main ecological interest lies in some of the better developed hedgerows or treelines.

## **4. Impacts of proposed development on flora and fauna**

### **4.1 Characteristics of the proposal**

The proposed development is an industrial development. This will be situated in the western half of the site. For the purpose of impact assessment it is assumed that all of the western part of site will be developed. Entrance to the site will be from the present public road.

While the proposed site is set in a mainly agricultural landscape, it is close to Drogheda town and is close to a major industrial complex (cement works). The ecological interests of the vicinity have already been greatly interfered with and altered, with no significant areas of natural or semi-natural habitats remaining in the immediate area. The character of this proposed development could not, therefore, be considered as being incompatible with the present landuse of the area.

### **4.2 Predicted and potential impacts by the proposal**

The principal impact to be considered by the proposed development is habitat loss. In addition, there may be damage or disturbance caused to hedgerows elsewhere on site during

construction works. A further potential impact which requires consideration is possible water pollution which could be caused by contaminated water entering the ditch immediately west of the site (which leads to the nearby stream). The development could directly affect the rookery which exists in one of the ash trees.

#### 4.2.1 Loss of habitats

The development will result in the loss of pasture and meadow grassland and some hedgerows.

The loss of pasture and meadow grassland is of negligible significance as these habitats have practically no scientific or conservation value.

The hedgerow along the road (H1, H6) will be removed to accommodate the site entrance and road widening but the remainder of the site boundary hedgerows (H2, H7, H8, H9) will be kept intact as much as possible.

Hedgerow no. 1 is of limited ecological value as it is a low, well maintained hedgerow. The loss of this will be of minor significance.

Hedgerow no. 2, which marks the townland boundary, is considered of some ecological value. The loss of part of this would be of some significance but only in a local context.

Hedgerow no. 6 is of some value as it comprises a well grown ash treeline. The loss of this hedgerow will be of minor significance, but only in a local context.

Hedgerow no 7 is of very low value and its loss would be of negligible significance.

Hedgerow no. 8 is generally of low value but has two fine ash trees (one which has a rookery). The loss of this hedge would be of only minor significance.

Hedgerow no. 9 is of some ecological value as it has a line of tall ash trees. The loss of some of these ash trees would be of some significance but again only in a local context..

All of the internal hedgerows (H3, H4, H5) will be removed. Hedgerows nos. 4 and 5 are of very low ecological value and their loss would be of negligible significance. Hedgerow no. 3 is of limited ecological value and its loss would be of only minor significance.

Overall, the loss of the various sections of hedgerow would vary from negligible to low significance.

#### **4.2.2 Possible damage to hedgerows by construction works**

During the construction phase, there is a possibility that damage could be caused to some of the hedgerows outside the main development area by construction traffic, machinery, storage of bulk materials etc. Any damage to the hedgerow (H2) along the townland boundary would be of some local significance as this is one of the better formed hedgerows in the area and is considered as of some ecological value. Damage to this hedgerow can be avoided with proper care (see recommendations section).

#### **4.2.3 Potential for water pollution**

As already noted, the possibility exists for contaminated water to enter the drainage ditch immediately west of the site and which leads to a tributary of the River Nanny. Potentially polluting substances could include suspended solids, wash down cement products, fuels, lubricants etc. If such substances were to enter the watercourses in significant amounts they could cause serious damage to the aquatic flora and fauna

#### **4.2.4 Impacts on rookery**

The rookery which exists in the ash tree in hedgerow no. 8 may be directly affected if this tree is removed. The significance of this could only be considered as low as the rook is a very common bird species. Nevertheless, efforts should be made to retain this tree.

### **5. Mitigation measures and recommendations**

The following measures relate to retention and protection of the hedgerows and to the possibility of enhancing those which will remain in situ. Also, there is an opportunity for the planting of new hedgerows. Suitable landscaping proposals for the development site could enhance the area for wildlife. Recommendations are also made relating to prevention of possible water pollution and to retention of the rookery.

#### **5.1 Retention, protection and enhancement of hedgerows**

Efforts should be taken to reduce the loss of hedgerows to a minimum. In particular the sections of hedgerow containing tall ash trees (H9) should be retained as far as is possible, along with the two single ash trees in hedgerow no. 8.

As discussed above, the loss of the hedgerow (H6) will be of minor significance in a local context. This will be mitigated by the extensive landscaping proposals, involving the planting of native species of trees along the boundary and on site.

During the construction phase, measures should be taken to avoid damage to the hedgerows elsewhere on site and especially that along the townland boundary (H2). Care should be taken while machinery is operating in the area, and building materials should not be stored within about 10 m of the hedgerows. Accidental damage which might be caused to the hedgerows should be repaired using the same tree and shrub species as already present (i.e. ash, hawthorn).

Note that an opportunity exists to lay a new hedgerow along the north-west boundary of the site (parallel to the railway line) and possibly along the eastern boundary of the development area. This would partly compensate for the loss of hedgerows elsewhere on site. Appropriate species would be ash and hawthorn. Also, if some of the hedgerows along the western boundary are to be retained, these could be improved by replanting the various gaps.

### **5.2 Prevention of water pollution**

Appropriate engineering practices will be required to prevent water polluting substances from entering the drain leading to the tributary stream of the River Nanny.

### **5.3 Retention of rookery**

If possible, the ash tree in hedgerow no. 8 which contains rook's nests should be retained. If this has to be removed, the tree should be felled during the period when the birds are not nesting (i.e. from late July to early March).

### **5.4 Landscaping**

An opportunity exists to enhance the wildlife value of the site by planting species which are useful to wildlife as part of the landscaping proposals. Preference should be given to the planting of native tree and shrub species (see list below), most of which would already be established in the general vicinity. If space is available, it is more useful to plant trees in small groups or copses rather than as scattered individuals.

Recommended species to plant include low to medium sized trees such as hawthorn (*Crataegus monogyna*), blackthorn (*Prunus spinosa*), alder (*Alnus glutinosa*), willow (*Salix* spp.), birch (*Betula* spp.), holly (*Ilex aquifolium*) and rowan (*Sorbus aucuparia*). Native oak (*Quercus petraea* or *Q. robur*) would also be a useful addition and would blend in well with the surrounding landscape. Useful shrubs include guelder rose (*Viburnum opulus*), wild current (*Ribes rubrum*), dogwood (*Cornus sanguinea*) and roses which produce hips (e.g. dog rose *Rosa canina*). The various cultivated species of cotoneasters and pyracanthas are all useful for providing berries for birds. Cultivated varieties of crab apple, such as yellow hornet, are both attractive and useful for wildlife.

## 6. References

Anonymous (1999) *Proposed Natural Heritage Areas and Special Areas of Conservation in County Meath - listings and maps*. Duchas, the Heritage Service, Dublin.

Scannell, M.J. & Synnott, D.M. (1987) *Census Catalogue of the Flora of Ireland*. Stationery Office, Dublin.

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Surveyed 1909 - 1993  
 Revised 1974  
 Levelled 1910 - 1991

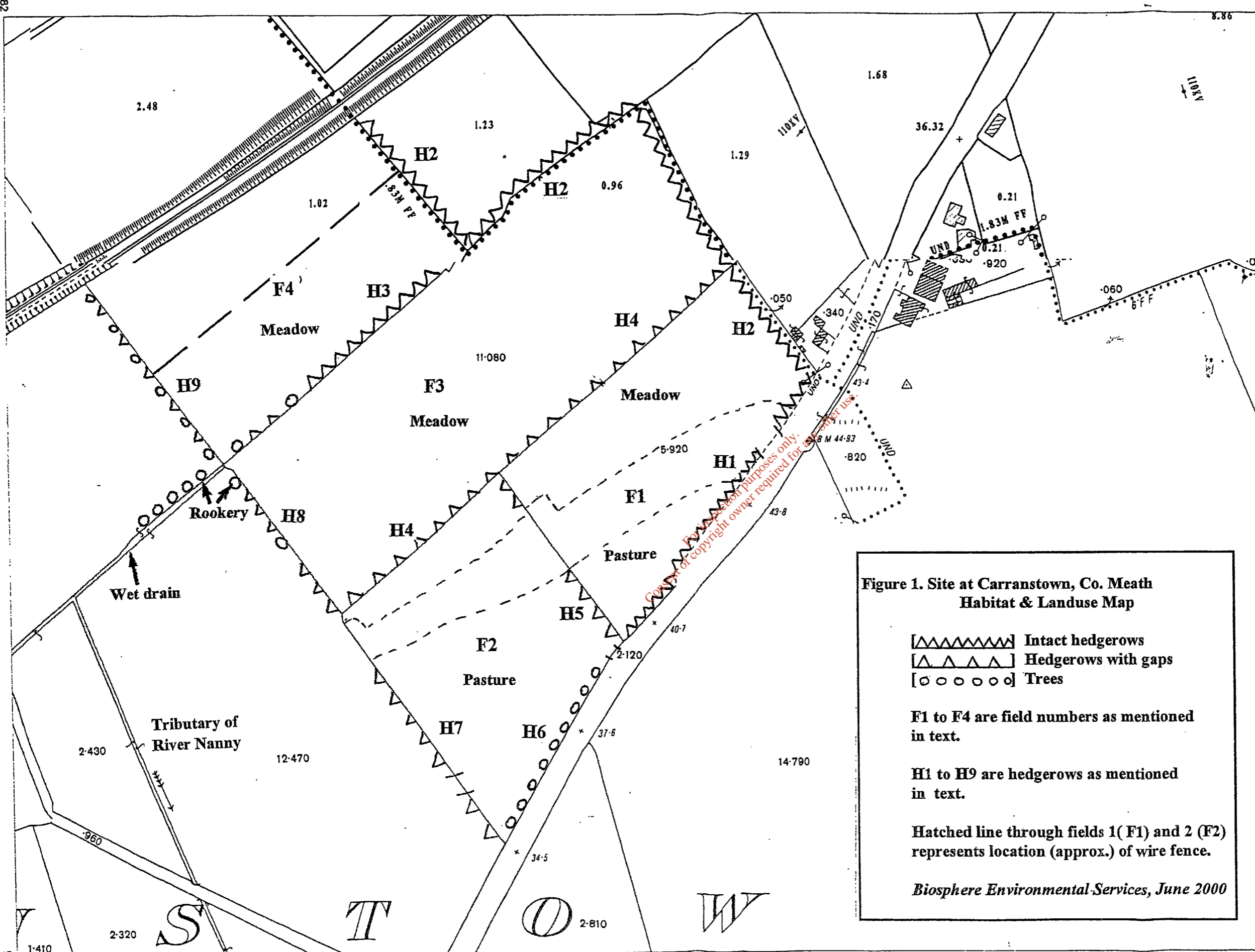
# Rural PLACE Map



**DESCRIPTION**

**MAP SCALES**

1:2500  
 2381-D  
 25inch  
 MH027-02



**Figure 1. Site at Carranstown, Co. Meath  
 Habitat & Landuse Map**

[▲▲▲▲▲▲] Intact hedgerows  
 [△△△△△] Hedgerows with gaps  
 [○○○○○] Trees

**F1 to F4 are field numbers as mentioned in text.**

**H1 to H9 are hedgerows as mentioned in text.**

**Hatched line through fields 1 (F1) and 2 (F2) represents location (approx.) of wire fence.**

*Biosphere Environmental Services, June 2000*



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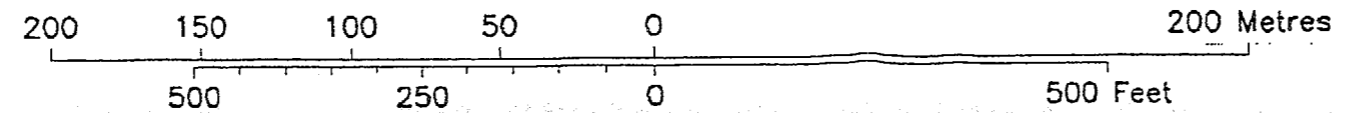
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 Scála: - 1:2500

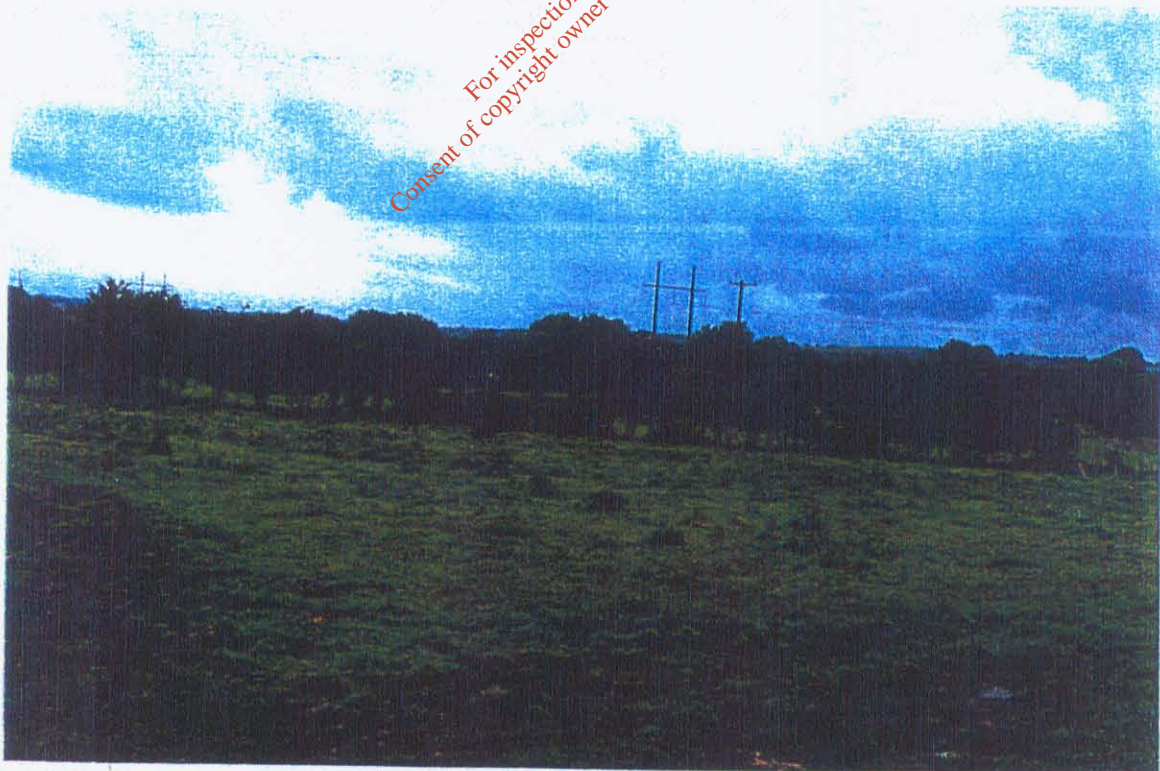


Plot Ref. No. 140562\_1\_1  
 Plot Date 09-MAY-2000





**Plate 1.** View of field no. 1 looking northwards. Meadow grassland is the dominant habitat at the site. The hedgerow on the right hand side marks the townland boundary. The cement works is visible in the photograph.



**Plate 2.** View from field no. 2 looking westwards. Pasture quality is poor. Many of the hedgerows on site, including the one in the photograph (H7), are not stock-proof and generally of poor quality as regards species and structural diversity.



**Plate 3.** An ash treeline forms the boundary with the road in field no. 2. This is of some ecological value.

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**Plate 4.** View of western hedgerow (H9) in field no. 4. This includes a line of tall ash trees. As with other hedgerows on site, it is not stock-proof.

## ATTACHMENT 11

### ARCHAEOLOGICAL SURVEY

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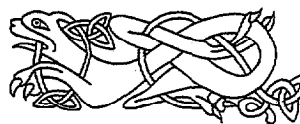
Archaeological Impact  
Assessment  
of a Proposed Development at  
Carranstown,  
Co. Meath.

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*By*  
Christina Keogh  
&  
James Eogan

*Client*  
**Project Management Ltd.**

May 2000



Archaeological  
Development Services Limited

**Archaeological Impact Study of  
Proposed Development at  
Carranstown, Co. Meath.**

*Author:* Christina Keogh &  
James Eogan

*Client:* Project Management  
Group

*Date:* May 2000

**1. Introduction**

The proposed development is located in the townland of Carranstown, County Meath. The site is bounded to the south by the R152, the main Drogheda-Duleek road, and to the north by the Drogheda-Navan railway-line (fig.1). There are no archaeological sites in the close vicinity.

Application is being made to Meath County Council for planning permission for an industrial development. An Archaeological Impact Assessment of the site was requested for inclusion in an Environmental Impact Statement, to be submitted as additional information with the planning application. This study is based on field walking and desk-based research. The aim of the study is to address the potential archaeological impact of the industrial development in order to address in advance any archaeological matters that might arise in the course of the development.

**2. Methodology**

This study was carried out under the following headings:

- Field inspection
- Journal & documentary research
- Cartographic research

### *Field 3*

This is a long field, oriented SW-NE; it slopes from the south to the north. There is a marked break of slope ca, 20m north of the southern field boundary. No evidence of any archaeological features or remains was found.

A small field drain runs along the western boundary of Fields 2 and 3.

### *Field 4*

Only the southern half of this field comes within the boundary of the proposed development. It slopes very slightly from NW-SE. No evidence of any archaeological features or remains was found.

## **4. Journal & documentary research**

Various published sources and artefact corpora were consulted (see appendix 1). These did not reveal anything of archaeological significance relating to the proposed development site.

## **5. Cartographic research**

### **5.1 *1st edition Ordnance Survey (1837). County Meath, (sheet 27/1). Scale 6" to 1 mile (Fig.3)***

Fields 1 and 2 in the site are recorded as having originally been one large field. Field 3 appears to have retained the boundaries it had in 1837. Limestone deposits were noted between the railway line and the road. No other features were recorded in the area.

### **5.2 *RMR Constraint Map (1996). County Meath, (sheets 27 & 20). (Fig.2)***

Apart from the division of the field into 1 and 2, the field boundaries appear to have remained the same since the 1837 edition.

For this study the SMR (lists and constraint maps) was consulted for each site. Where any archaeological site occurred all details were noted.

### 3. Record of Monuments & Places (RMP)

This is a list of known archaeological sites compiled by the Archaeological Survey of Ireland, from their files and from site visits carried out by their archaeologists. The RMP consists of a numbered list, organised by county and subdivided by 6" map sheets, and sets of constraint maps for each county at a scale of 1:12,000, showing the locations of these sites.

The lists and maps are distributed to local authority planning departments as an aid to decision making in the planning process.

The RMP was set up under statute in 1994 (Amendment to the National Monuments Act); the provisions of that act protect sites marked on the RMP. The provisions of that act protect owners of sites marked on the RMP. Owners of sites marked on the RMP are required to give a minimum of 2 months written notice to the Minister of Arts, Heritage, Gaeltacht & the Islands of any intention to carry out works at such sites.

For this study the RMP (lists and constraint maps) was consulted for each site. Where any archaeological site occurred all details were noted.

There are no known archaeological monuments recorded on the proposed development site in the Sites and Monuments Records.

However there are four recorded monuments in the vicinity. The following information was compiled from the Sites and Monuments Record and The Archaeological Survey of Co. Meath.

2. SMR ME027-002 (fig. 2)  
 Townland Cruicerath  
 Class Earthwork  
 Nat. Grid co-ords 30450 / 27161  
 Description Situated on a rock outcrop (diam. c. 29m). The site has been quarried to the west. There is high embankment (2.5m high, 1.5m wide) with a shallow fosse (2m wide, 0.5m deep) to the east of the base. A possible entrance is located to the ESE on an outcropping ridge.

3. SMR ME027-03 (fig. 2)  
 Townland Platin  
 Class Castle (site of) / Church  
 Nat. Grid co-ords 30626 / 27203  
 Description 'Platin Hall', now demolished was built on the site of an earlier castle. The house was of brick, three storeys high with a nine bay front, built c. 1700 and possibly designed by Sir William Robinson. The castle was said to have been a D'Arcy castle Dalton John, *History of Drogheda, II 1844.* (462 – 463, p.390).

Church: St. Patrick is said to have founded a church in Blaitine, now Platin, in east Meath<sup>1</sup>. The church has an undivided nave and chancel (int. L 11.3m, int. W 5.2m) with opposing doors toward the west end. A double light window with belfry above is located in the west wall and a triple light window in the east wall. Three double light windows are located in the south wall and two single light windows, made of sandstone reused from an older foundation, are in the north wall. A fragment of a cross dated c. 1600 featuring foliage and figure sculpture is cemented to the east window<sup>2</sup>. A disc-headed cross is located in the church.

<sup>1</sup> Brady, Rev. John, 1958. R.M.A.H.S

<sup>2</sup> PRIA 1984, 101



*Description* Length: 11.75cm; max. width of head: 1.5cm; max. thickness of stem: 0.35cm. The pin was part of a penannular brooch, dating from the Early Christian Period.

*Townland* Newtown

*Barony* Duleek Lower

*County* Meath

*NMI reg.* L1934: 7-8 (RIA)

*Habitat* Store C12:19

*Nature of site* Found in the vicinity of White Rock, a local landmark, in 1920's.

*Finds* Stone battle axe

Stone hammer

*Description* Battle axe: Dimensions: 15cm x 10cm. Made of black basalt, a shaft hole pierces through the axe. Two depressions are marked by a raised circumference

Hammer: Dimensions: 6cm x 9cm. Highly polished with central perforation.

## 9. Characteristics of the proposed development

The site is currently in use for pasture (plate 1 & 2). While final plans for the development were not available for inspection at the time of compiling this report, its construction will involve extensive ground works.

## 10. Predicted impact of the development

On the basis of this study there is no evidence of clearly defined archaeological activity on the proposed development site. However construction of the proposed development will have a negative impact on any archaeological features which may survive below ground.

## Appendix 1:

## General archaeological corpora consulted for study:

Author	Date	Title
Barry, T.B.	1987	<i>The Archaeology of Medieval Ireland</i> , University Press, Cambridge
Bourke, E,	1994	Glass vessels of the first nine centuries AD in Ireland, <i>J Royal Soc. Antiq. Ir</i> , 124, 163-209
Burgess, C & S Gerloff	1981	The Dirks and rapiers of Great Britain and Ireland, <i>Praehistorische Bronzefunde</i> , IV.7. Meunchen: CH Beck
Clarke, DL,	1970	<i>Beaker pottery of Great Britain and Ireland</i> . Cambridge: University Press
Collins, AEP,	1994	The flint javelin heads of Ireland, in D Ó Corráin (ed.) <i>Irish antiquity</i> , 111-33. Dublin: Four Courts Press
Earwood, C,	1994	<i>Domestic wooden artefacts in Britain and Ireland from Neolithic to Viking times</i> . Exeter: University of Exeter Press
Eogan, G,	1965	<i>Catalogue of Irish bronze swords</i> . Dublin: The Stationary Office
Eogan, G,	1974	Pins of the Irish Late Bronze Age, <i>J Roy Soc Antiq Ir</i> , 104, 74-119
Eogan, G,	1983	<i>The hoards of the Irish Later Bronze Age</i> . Dublin: University College Dublin
Eogan, G,	1994	<i>The accomplished art. Gold and gold working in Britain and Ireland during the Bronze Age (c. 2,300-650 BC)</i> . Oxford: Oxbow Books Ltd.
Harbison, P,	1976	Bracers and V-perforated buttons in the Beaker and Food Vessel Cultures of Ireland, <i>Archaeologia Atlantica Research Report</i> , 1
Harbison, P,	1969a	The axes of the Early Bronze Age in Ireland. <i>Praehistorische Bronzefunde</i> , IX.1. Muenchen: CH Beck

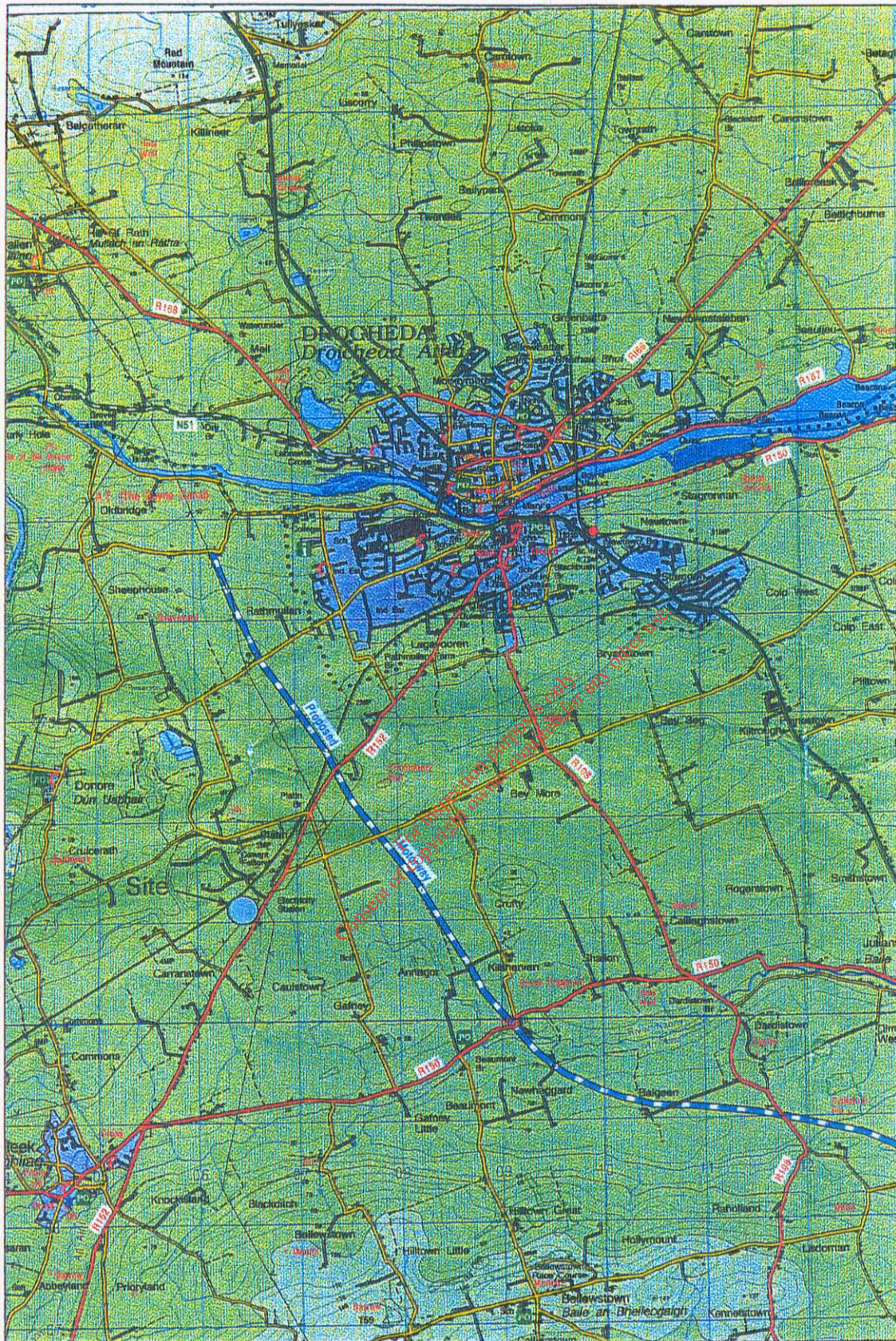


Fig.1 Site location map.

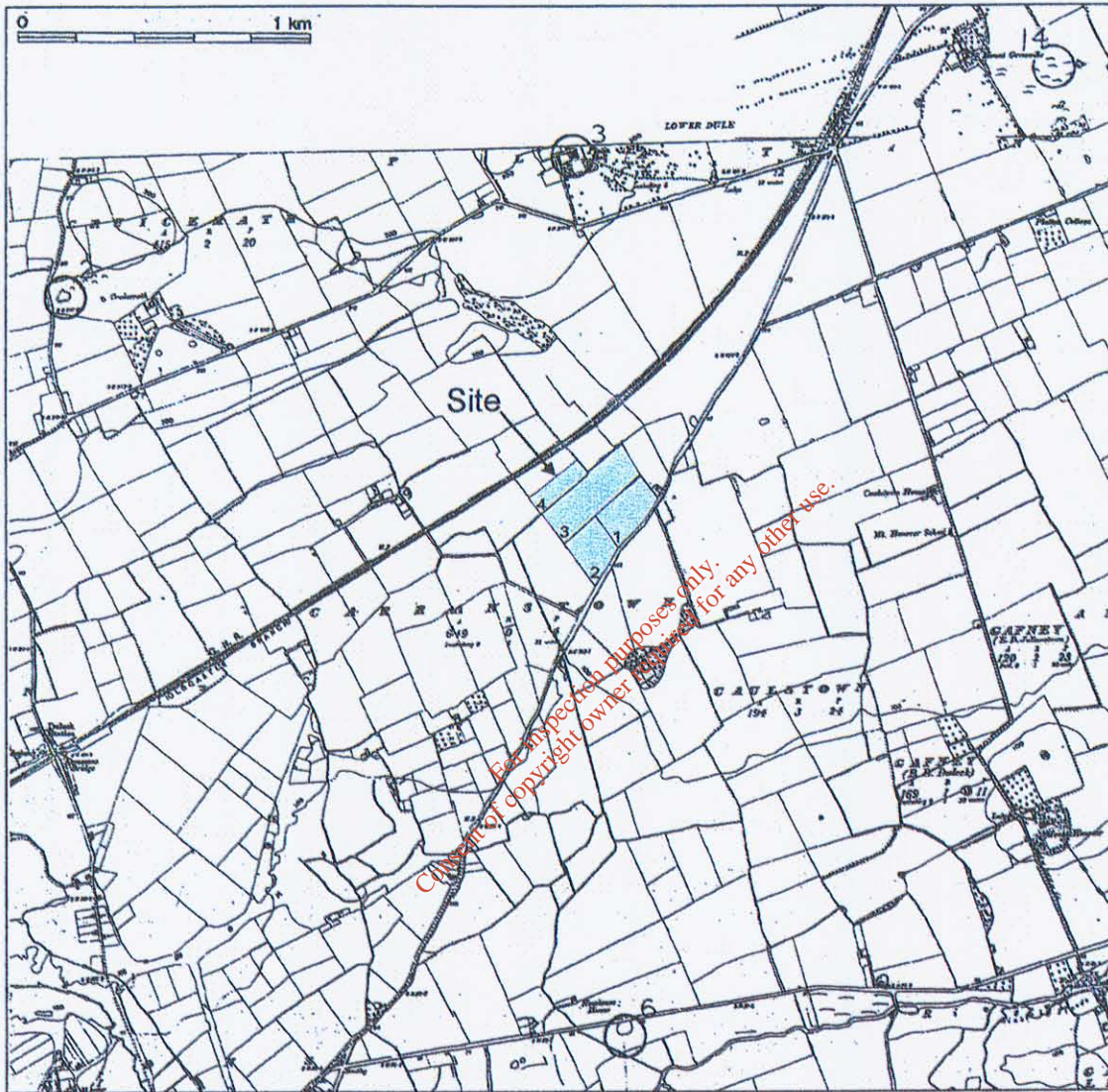
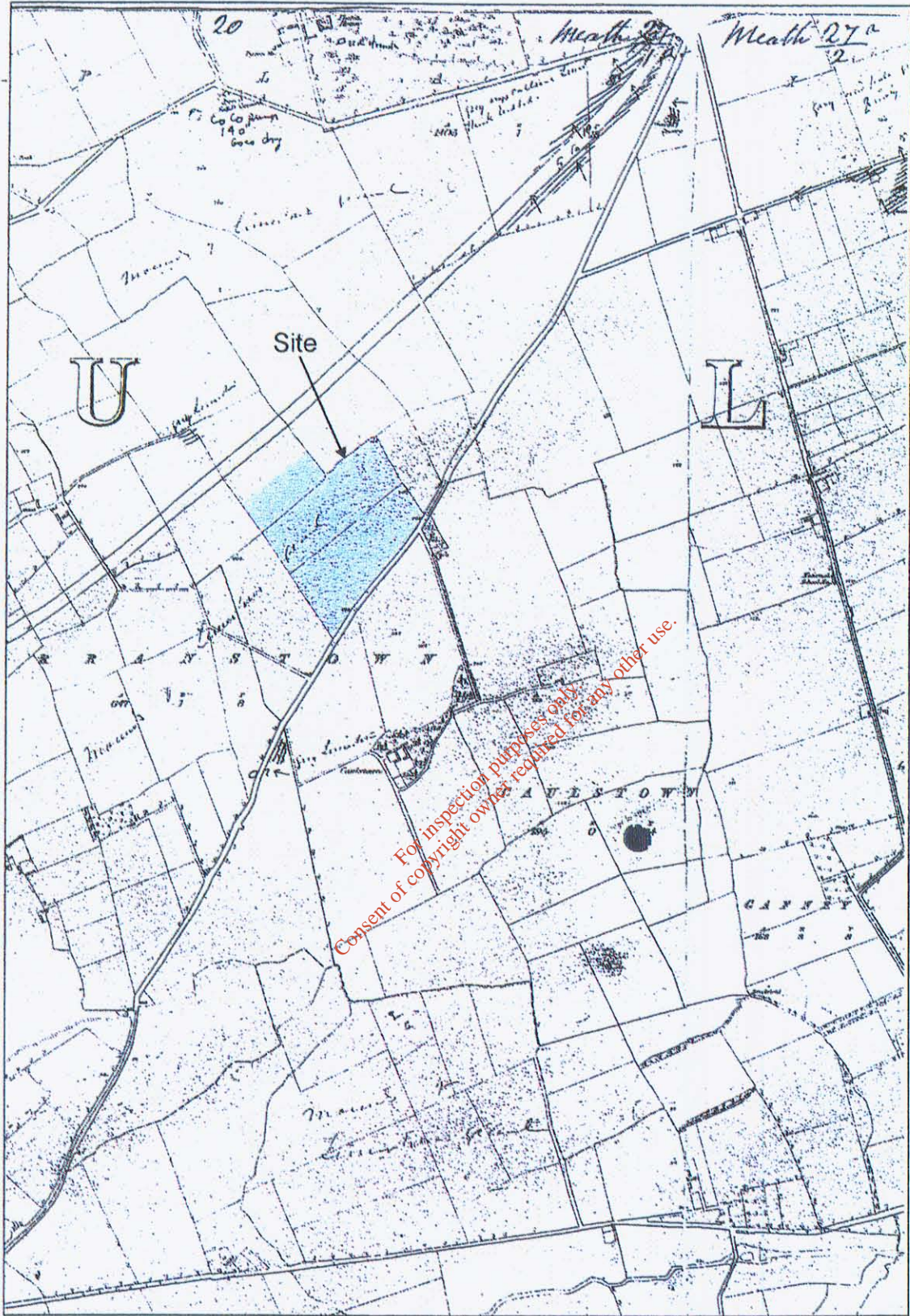


Fig. 2 Extract from RMP Constraint Map of Co. Meath, Sheets 27 & 20. Date of issue: 1996.



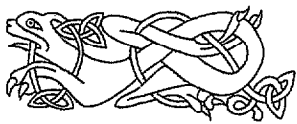
**Fig. 3** First edition Ordnance Survey map, Co. Meath, sheet 27a/1 & /2. Surveyed 1837. Scale 1:10,560



**Plate 1** General view of site from southern side of field 1.

- Project Management
- Environmental Impact Assessments
  - Desk Based Assessments
- Aerial Photography Interpretation
  - Site Assessments
- Archaeological Monitoring
- Excavation and Post-Excavation
  - Artefact & Ecofact Analysis
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