APPENDICES

APPENDIX 6-1

March 2024

Bat Report

Proposed Plasterboard Manufacturing Plant

On behalf of

GABM Limited

Gorteens, County Kilkenny

MALONE O'REGAN ENVIRONMENTAL

Form ES - 04

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Job Number: E2077

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Checked By: Henry Tennyson **Signed:**

Approved By: Dyfrig Hubble **Signed:**

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Bat Report

Proposed Plasterboard Manufacturing Plant

GABM Limited

Gorteens, County Kilkenny

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1 INTRODUCTION

This Bat Survey Report has been prepared by Malone O'Regan Environmental (MOR) on behalf of GABM Limited ('the Applicant'), to present the findings of bat surveys undertaken at a site for the development of a plasterboard manufacturing plant, a waste plasterboard handling plant, a site access road, infrastructure, and associated works (the 'Proposed Development').

The Proposed Development will be located on a site that is circa (ca.) 11.57 hectares (ha) in size and is located on a greenfield site within the townland of Gorteens, Co. Kilkenny (ITM 665240 614063), ca. 5km northeast of Waterford City and is shown in Figure 1-1 ('the Site').

Figure 1-1: Site Location

1.1 Purpose of the Report

This Bat Survey Report is an Appendix to Chapter 6 – Biodiversity, of the Environmental Impact Assessment Report (EIAR), and should be read in conjunction with the Biodiversity Chapter. The purpose of this report is to outline the methodologies and results of the bat surveys that were undertaken on the Site and to assess the potential impacts of the Proposed Development, as outlined in Chapter 3 of the EIAR.

Full details of the Proposed Development can be found in the EIAR submitted as part of the overall planning application.

1.2 Relevant Legislation

All Irish bat species are protected by law under the Wildlife Act 1976 and its subsequent amendments. They are afforded full protection under this act, which makes it a criminal offence for anyone without a licence to:

- Kill, injure or handle a bat;

- Possess a bat (whether alive or dead);
- Disturb a roosting bat; and,
- Damage, destroy or obstruct access to any place used by bats for shelter, whether they are present or not.

In addition to domestic legislation, bats are also protected under the EU Habitats Directive (92/43/EEC). All Irish bats are listed in Annex IV of the Habitats Directive and the lesser horseshoe bat is further listed under Annex II, which makes it an offence to:

- Deliberately capture, injure, or kill any bat; or,
- Deliberately disturb a bat, in particular, any disturbance which is likely;
    (a) To impair their ability:
        (i) To survive, to breed or reproduce, or to rear or nurture their young; or,
        (ii) To hibernate or migrate.
    (b) To affect significantly the local distribution or abundance of the bat species; or,
- Damage or destroy a breeding site or resting place of a bat.

Therefore, the destruction, alteration or evacuation of a known bat roost is a notifiable action under current legislation and a derogation license must be obtained from the National Parks and Wildlife Service (NPWS) before works can commence.

Furthermore, it should also be noted that any works interfering with bats and especially their roosts, including for instance, the installation of lighting in the vicinity of the latter, may only be carried out under a license to derogate from Regulation 23 of the Habitats Regulations 1997, (which transposed the EU Habitats Directive into Irish law) issued by NPWS.

1.3 Statement of Authority

The bat inspection/surveys and subsequent report were undertaken and prepared by the following MOR personnel: Ms. Stephanie Lonergan, Mr. Henry Tennyson and Mr. Dyfrig Hubble.

Stephanie Lonergan, Environmental Consultant, has a B.A. (Mod) (Hons) in Environmental Science. Stephanie is a qualifying member of the Chartered Institute of Ecology and Environmental Management (CIEEM) with a particular interest in bat ecology and conservation. Stephanie has completed courses on bat ecology, identification, handling, biometrics and mitigation with CIEEM and Bat Conservation Ireland. Stephanie has undertaken training run by Wildlife Acoustics for analysis of bat calls in Kaleidoscope Pro Software and regularly uses this programme within her role at MOR. Stephanie has experience undertaking bat surveys and tree/building assessments and regularly attends events held by local bat groups.

Henry Tennyson, Environmental Consultant, has a B.Agr.Sc in Agri-Environmental Sciences and a M.Sc. in Marine Biology. Henry is a qualifying member of CIEEM and has over three years' of experience in the consultancy sector. Henry has gained extensive experience in undertaking bat surveys and building inspections, and has been successfully involved in obtaining derogation licenses from the NPWS. Henry is qualified to analyse the bat recordings using Kaleidoscope Pro Software and attended the Wildlife Acoustics Kaleidoscope Pro Training Course.

This report was reviewed and approved by Mr. Dyfrig Hubble, Associate Director – Ecologist. Dyfrig has a B.Sc. (Hons) in Tropical Environmental Science and an M.Sc. in Environmental Forestry. Dyfrig is a full member of the CIEEM and has over 18 years' of experience working

in the ecological consultancy sector including habitat appraisals and specialist species-specific surveys. Dyfrig has extensive experience in undertaking a variety of bat surveys including dawn/dusk surveys, transects, static monitoring, harp trapping, and Lesser Horseshoe roost counts. Dyfrig has also worked on numerous projects that have required supervision of building demolition and tree removal works under licence. These projects have included work both in the UK and Ireland.

1.4 Species Background

There are eleven (11No.) recorded bat species in Ireland, nine (9No.) of which are considered resident and two (2No.) which are considered vagrants [1], please see Table 1-1 below.

Table 1-1: Status of Irish Bat Species

Bat Species	Irish status	European Status
Resident Bat Species		
Soprano Pipistrelle *(Pipistrellus pygmaeus)*	Least Concern	Least Concern
Brown Long-eared Bat (*Plecotus auritus)*	Least Concern	Least Concern
Common Pipistrelle (*Pipistrellus pipistrellus)*	Least Concern	Least Concern
Lesser Horseshoe Bat (*Rhinolophus hipposideros)*	Least Concern	Near Threatened
Whiskered Bat *(Myotis mystacinus)*	Least Concern	Least Concern
Daubenton's Bat *(Myotis daubentonii)*	Least Concern	Least Concern
Leisler's bat *(Nyctalus leisleri)*	Least Concern	Least Concern
Nathusius' Pipistrelle *(Pipistrellus nathusii)*	Least Concern	Least Concern
Natterer's Bat *(Myotis nattereri)*	Least Concern	Least Concern
Vagrants		
Brandt's bat (*Myotis brandtii*)	Data Deficient	Least Concern
Greater Horseshoe Bat (Rhinolophus ferrumequinum)	Data Deficient	Near Threatened

1.4.1 Types of Bat Roosts

Bats were originally cave and tree-dwelling animals, but many now use buildings to roost within. Buildings are highly important as roosting sites for all Irish bat species as they use buildings for all roost types. Most significant in terms of roosts in buildings are maternity roosts, but cellars and attics can serve as hibernation sites for bats. Roosts within buildings can far exceed the numbers encountered in trees, bridges, caves or cliffs and roosts of over 1,000 bats have been recorded in buildings [2].

Bats are social animals, and most species congregate in large colonies during the later spring/summer. These colonies consist mostly of females, with some juvenile males from the previous year. Male bats normally roost individually or in small groups meeting up with the females in the late autumn, when it is time to mate. In summer, bats seek warm dry buildings in which they can give birth and suckle their young. In winter, they seek out places with a constant low temperature and high humidity where they can become torpid and hibernate during adverse weather conditions. However, bats do not hibernate continuously during winter

and will awake and hunt during mild nights when there are insects available, and it is energetically advantageous to forage [3].

One purpose of daytime tree or building inspections is to determine the potential of bat roosts within a Site. Due to the transient nature of bats and their seasonal life cycle, there are several different types of bat roosts. Where possible, one of the objectives of the surveys is to be able to identify the types of roosts present, if any.

Bats in Ireland feed exclusively on insects, and in the summer months (May – September) they generally emerge from their roosts around sunset to feed. Bats are known to use several different foraging sites in the same night and move between them to locate areas of high insect concentrations. They are also known to exhibit site loyalty and will return to the same foraging sites night after night [4].

Table 1-2 below defines the various types of bat roosts and which time of year they are utilised.

Table 1-2: Types of Bat Roosts [3]

Roost Type	Definition	Time of Survey
Day Roost	A place where individual bats or small groups of males, rest or shelter in the daytime but are rarely found by night in the summer.	Anytime of the year
Night Roost	These are roosts which are used as resting places for bats between foraging bouts. They also provide retreats for bats from predators or during inclement weather conditions. They also function as feeding perches and may be important for socialising. May be used by a single bat on occasion or it could be used regularly by the whole colony.	Anytime of the year
Feeding Roost	A place where individual bats or a few bats rest or feed during the night but are rarely present by day.	Anytime of the year
Transitional Roost	A place used by a few individuals or occasionally small groups for generally short periods of time on waking from hibernation or in the period prior to hibernation.	Outside the main maternity and hibernation periods.
Mating Site	Most bat species mate in late summer / autumn but pregnancy does not occur until the following spring. During this time males will take possession of a cavity in a building, tree, bridge, cave or mine and attract females to these sites to establish a harem. Male bats call both from a perch and in flight in much the same manner that male birds sing.	Late Summer into Autumn
Maternity Site	Maternity roosts are the most significant roosts and they are predominantly all female aggregations that are formed from late May onwards and remain as a relatively cohesive unit until late August. Not all female bats give birth annually. These females that do bear young in a given year avail of a suitable roosting site within a building, tree and sometimes cave (or equivalent). The young are flightless for several weeks and hence are vulnerable to dangers such as tree felling and restoration, reinforcement or demolition of structures such as buildings and bridges.	Summer Months
Hibernation Site	Bats have a high metabolic rate and in temperate countries, such as Ireland, flying insects are not available in sufficient numbers during winter to sustain bats. Therefore, bats 'hibernate' during winter. In hibernation sites, bats are often completely inactive for several days and are extremely vulnerable to disturbance by human activities due to the time taken for them to become sufficiently active to allow escape. Hibernation may extend from November to the end of March, during which time bat activity will take place sporadically.	Winter Months in cold weather conditions

Roost Type	Definition	Time of Survey
Satellite Roost	An alternative roost found in close proximity to the main nursery colony and is used by a few individuals throughout the breeding season.	Summer Months

1.5 Purpose of Survey Work

The implication of the legislative policies outlined in Section 1.2 above, is that the Proposed Development needs to take account of the potential effects on bats. Survey work is necessary to establish whether the species are currently present in areas where suitable habitat exists and in areas where bats have previously been recorded. Survey work also enables appropriate mitigation measures to be incorporated into the design of the project and ensures that there are no adverse effects on the conservation status of the species.

Survey work was deemed necessary based on desktop surveys and suitable habitat for roosting, foraging and commuting bats being identified during the initial walkover of the Site.

2 METHODOLOGY

The methodologies used to establish the presence / potential presence of bats are summarised below.

2.1 Desk-Based Studies

A desk-based study was undertaken to identify records of bats within the Site. The following sources of information were reviewed:

- Aerial mapping was reviewed to identify any habitats and features likely to be used by bats. Maps and images of the Site and general landscape within the vicinity of the Site were examined for suitable foraging or commuting habitats including woodlands and forestry, hedgerows, treelines and watercourses;
- The National Parks and Wildlife Service (NPWS) website was consulted to obtain the most up-to-date detail on conservation objectives for the Natura 2000 sites relevant to this assessment [5];
- The National Biodiversity Data Centre (NBDC) website was consulted with regard to bat species distributions and bat habitat suitability index [6]; and,
- The Arboricultural Impact Assessment & Method Statements Report prepared by John Morris Arboricultural Consultancy in February 2024 [7].

2.2 Field Based Studies

The survey design was informed by previous experience and the following publications:

- *Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes* [2];
- *A Conservation Plan for Irish Vesper Bats* Irish Wildlife Manual No. 20 [8];
- *Bat Mitigation Guidelines for Ireland*. Irish Wildlife Manuals, No. 25 [4] a publication by the NPWS; and,
- *Bat Surveys for Professional Ecologists - Good Practice Guidelines* (3rd ed.). London: The Bat Conservation Trust [3].

2.2.1 Walkover and Identification of Bat Habitats

The Site was assessed during the daytime walkover survey on 13th March 2023 in relation to potential bat foraging habitat and potential commuting routes. Bat habitats and commuting routes identified are considered in relation to the wider landscape to determine connectivity for local bat populations through the examination of aerial mapping.

Assessment criteria for evaluating the potential suitability of the Site for bats was done in concurrence with '*Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd ed*)' [3]. It should be noted that while a newer edition of this guidance has since been released ('*Bat Surveys for Professional Ecologists: Good Practice Guidelines - 4th ed*.)', this was published in September 2023, after the active bat survey season for 2023.

Therefore, the guidance and assessment criteria followed during the tree inspection, external building inspection and active bat surveys was the most up to date at the time.

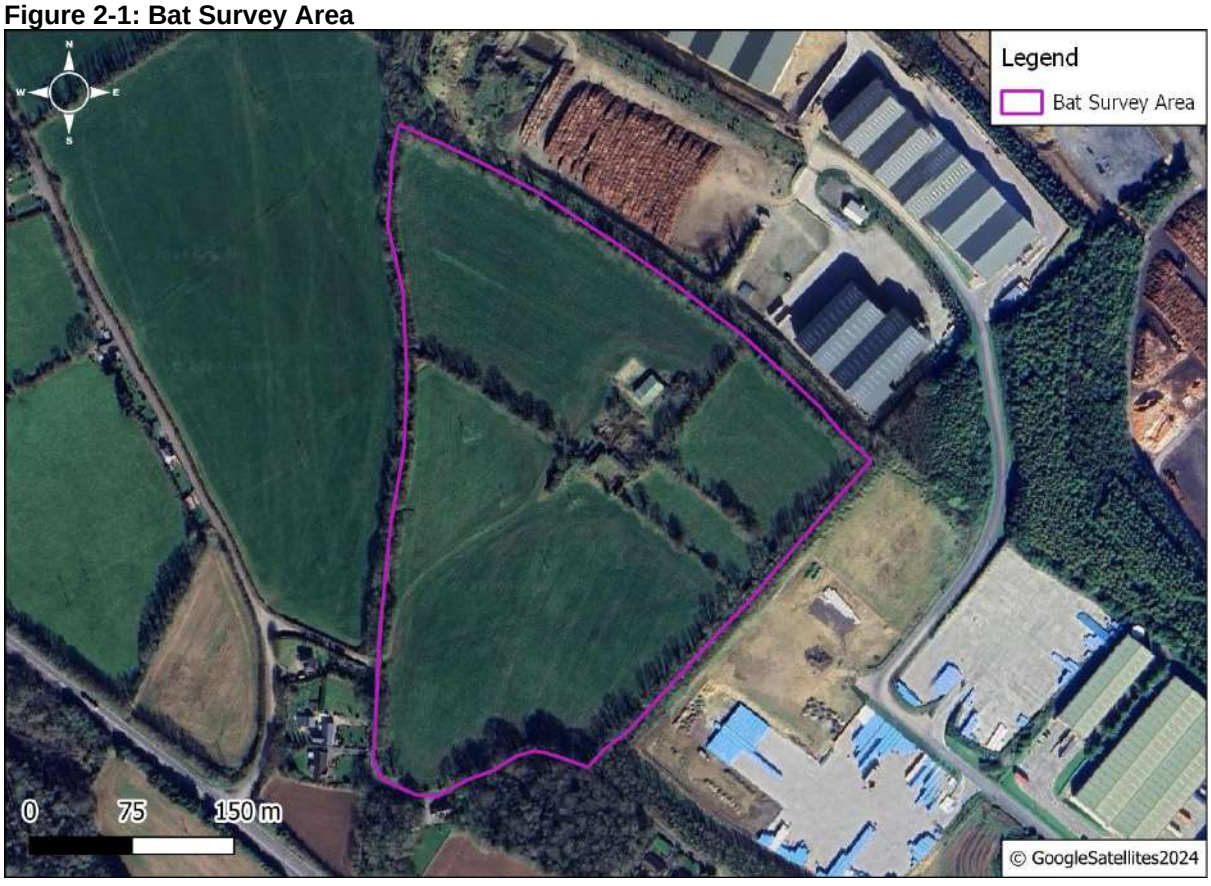
2.2.1.1 Tree Inspection

As part of the walkover, all trees that are due to be impacted by the Proposed Development area were assessed for the presence of features that could be utilised by roosting bats, using close-focusing binoculars. The following criteria were used:

- Presence of natural cavities, splits, cracks, loose bark and rot holes in the trunk or boughs of the tree;
- Presence of dense and woody ivy (*Hedera helix*) growth that could be used by bats for roosting;
- Evidence of bat droppings, which may also be seen as a black streak beneath holes, cracks, branches, etc;
- Presence of smooth edges with dark marks and urine stains at potential entrances to roosts;
- Adjoining habitat which are likely to be important to bats, including the river corridor, and hedge / treelines within the Site and the vicinity of the Site that offer a variety of potential foraging, roosting and commuting opportunities for bats; and,
- Adjoining potential roosts / known roosts identified. This raises the likelihood of a tree being of benefit as bats may move roosts if the roost becomes too hot or cold during roosting and a nearby alternative roost is highly desirable.

Figure 2-1 below details the full extent of the survey area.

Figure 2-1: Bat Survey Area



The treelines within the Site were subject to transect surveys as they were identified as providing landscape connectivity and linear features for foraging and commuting bats (see Figure 2-3 below).

2.2.1.2 External Building Inspection

An external inspection of the buildings on site was undertaken during the initial site walkover. As part of the walkover, all buildings that are due to be impacted by the Proposed Development area were assessed for the presence of features that could be utilised by roosting bats using close-focusing binoculars, a powerful focused-beam light source and an endoscope.

The inspection aimed to assess these buildings for the presence of features suitable for roosting bats. These features include:

- Holes on soffits;
- Gaps under roof tiles; and,
- Cracks and crevices within buildings;
- Signs of roosting bats searched for included;
- Evidence of bat droppings/urine splashes;
- Bat specimens (live or dead);
- Evidence of feeding remains, (insect wings on the floor); and,
- Evidence of fur-oil staining.

Three (3No.) buildings were inspected onsite. Figure 2-2 below details the full extent of the external buildings survey area.

Figure 2-2: External Buildings Inspection Area

2.2.2 Bat Activity Surveys

2.2.2.1 Dusk Emergence Survey

The dusk emergence surveys commenced fifteen (15No.) minutes before sunset and ended two (2No.) hours after sunset, therefore encompassing the typical emergence times of Irish bat species.

The survey was designed to incorporate all aspects of the buildings identified as having PRFs during the building inspection and that will be potentially affected by the proposed works. The buildings were surveyed so that they could be monitored for bat emergence.

Four (4No.) MOR Ecologists surveyed four (4No.) separate locations of the Site at pre-determined vantage points (VPs) on 15th June and 20th July 2023.

A combination of visual observation and listening to ultrasonic bat calls using an Echo Meter Touch2 Pro (Apple IOS) were used throughout the transect survey. Bat calls were recorded using this Echo Meter Touch2 Pro and stored on the EchoMeter App.

2.2.2.2 Dawn Re-Entry Survey

A dawn re-entry survey took place on 3rd August 2023 by four (4No.) MOR Ecologists, with the surveyors at the same pre-determined vantage points as the dusk emergence surveys. The survey commenced 2 hours before sunrise and finished 15 minutes after sunrise.

2.2.2.3 Dusk Transect Surveys

Two (2No.) dusk activity surveys took place at the Site, the first on 5th July 2023 and the second on 15th August 2023. The surveys fifteen (15No.) minutes before sunset and ended two (2No.) hours after sunset. The transects took place for two (2No.) hours and fifteen (15No.) minutes, and were designed to incorporate all treelines, linear features and other areas of the Site that the initial Site visit identified as providing suitable habitats for foraging and commuting bats. The transects aimed to capture bat activity levels within the Site and to determine what areas within the Site are important habitats for bats. The transects also aimed to monitor the trees identified with bat roosting potential for bat emergence. As all transects were short in length (between ca. 364m – 421m), it is considered that the existing trees within the Site covered could be appropriately monitored for emergence.

Four (4No.) MOR Ecologists surveyed separate locations of the Site at pre-determined transects (T)- see Figure 2-3 below for full details of the transects walked during the surveys.

A combination of visual observation and listening to ultrasonic bat calls using an Echo Meter Touch2 Pro (Apple IOS) were used throughout the transect survey. Bat calls were recorded using this Echo Meter Touch2 Pro and stored on the EchoMeter App.

2.2.2.4 Dawn Transect Surveys

One (1No.) dawn transect survey took place at the Site on 4th August 2023. The survey commenced two (2No.) hours before sunrise and ended fifteen (15No.) minutes after sunrise. Four (4No.) surveyors followed the same predetermined transects at the dusk transect surveys.

Figure 2-3: Bat Survey Area, VPs and Transects

2.2.3 Static Monitoring (SM4)

Two (2No.) passive bat detectors, Wildlife Acoustics Song Meter 4 (SM4s), were placed on Two (2No.) of the hedgerow / treelines that traverse the Site (see Figure 2-4 below). The passive static bat monitors were equipped with ultrasonic microphones and were left in specific locations for a specified period of time (fourteen (14No.) nights) from 26th July to 8th August 2023. The SM4s are used as a bat activity data logger, as there is no surveyor present. Bats which pass near enough to SM4 unit are recorded and their calls are stored for analysis post-monitoring period. This results in a far greater sampling effort over a shorter period of time.

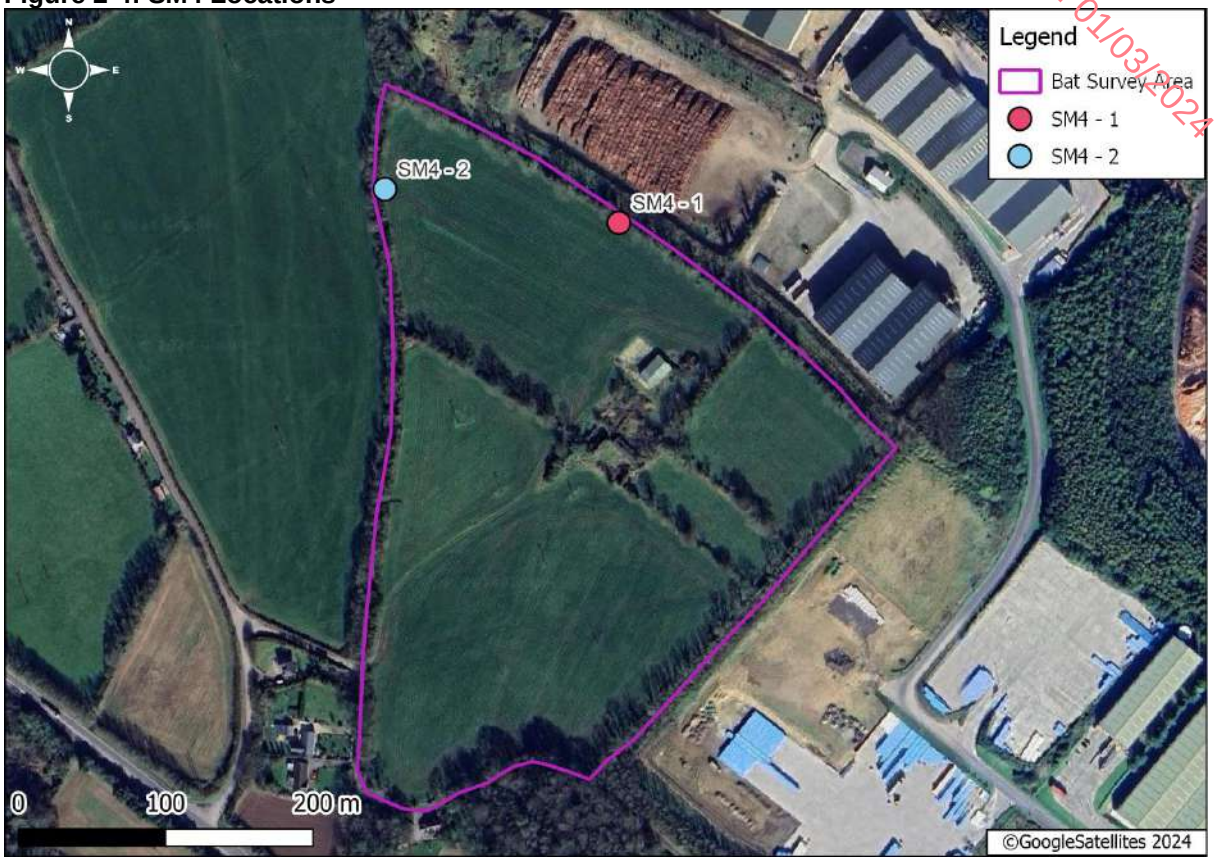
The SM4s and the ultrasonic microphones were positioned away from any close objects or thick vegetation so there would be no interference during the monitoring period. The SM4 bat loggers use real-time recording as a technique to record bat echolocation calls and using specific software, the bat calls are identified. It is these sonograms of the bat calls (2-D sound graphs) that are digitally stored in the SD cards within the SM4s that are then downloaded for analysis.

These results are depicted in a table showing the number of bat passes per species / per hour/night. Each bat pass does not correlate to an individual bat but is representative of the bat activity levels within the area. For example, some species of bats such as pipistrelles will continuously fly around a habitat and therefore it is likely that a series of bat passes within a similar timeframe could be the same pipistrelle bat. However, other bat species, such as Leisler's bats, tend to travel through an area quickly and therefore an individual bat pass is more indicative of the actual number of individual bats.

All sound file data downloaded from the SM4s is analysed using Kaleidoscope Pro Software. This software can automatically sort sound files that contain only noise ('non-bat') from sound files that contain bat passes. The software can also identify each call with a potential species identification. This approach allows identification of bats to genus level for *Myotis* species, and

to species level for other bats found in Ireland. Separation of *Myotis* species is complicated by the high degree of overlap between call characteristics.

Figure 2-4: SM4 Locations



2.2.4 Data Analysis

The bat recordings taken during the surveys were analysed using the software KaleidoscopePro to aid in the identification of bat species present. A combination of the visual observations taken during the survey and the number of bat passes[1] identified on the recordings were used to determine bat activity levels within the area.

2.3 Survey Limitations

Bat surveys are a snapshot of the bat activity within an area at the time of surveying. It is therefore important that bat surveys are comprised of a number of surveys designed to provide as much information on bat usage of the area. Therefore, a combination of surveys was used to determine the importance of the Site on local bat populations.

All survey work was conducted in accordance with current best practice guidelines. All of the surveys were undertaken when there was no rain or wind, and the temperature was above 10°C (see Table 2-1). In these weather conditions, bats will not have been deterred from flying and no survey limitations were encountered.

[1] It is important to acknowledge that bat calls provide a measure of bat activity rather than the number of individuals in a population. In practice, bat activity (as, for example, represented by 100 recordings) could be from 100No. bats passing the detector or one bat passing 100No. times [3].

Table 2-1: Bat Survey Metadata

Date	Survey Type	Sunset / Sunrise	Survey Times (Start-End)	Weather	Temperature (°C) Start - End
15/06/2023	Dusk	21:52	21:37-23:52	Dry, gentle breeze	16°C-14°C
05/07/2023	Dusk	21:51	21:36-23:51	Dry, gentle breeze	13°C-13°C
20/07/2023	Dusk	21:37	21:25-23:40	Dry, light breeze	15°C-12°C
03/08/2023	Dawn	05:15	03:15-05:30	Dry, light breeze	13°C-14°C
04/08/2023	Dawn	05:16	03:16-05:31	Dry, light breeze	13°C-11°C
15/08/2023	Dusk	20:53	20:38-22:53	Dry, no breeze	16°C-14°C

During the first detailed ecological survey undertaken at the Site in March 2023, it was noted that two sections of hedgerows had been recently removed. This included a section of hedgerow ca. 125m in length that separated three (3No.) fields in the northern section of the Site and also a section of hedgerow/treeline, ca. 30m in length along the western Site boundary. MOR was advised by the Applicant that these hedgerows had been removed by the landowner in February 2023. These two (2No.) sections of hedgerows/treelines were unable to be surveyed as part of the bat surveys.

Given that these had been cleared in advance of the bat surveys, assumptions have been made with regard to the habitat type that may have been present based on aerial imagery. However, it is not possible to fully assess the impacts on bats that may have been utilising these habitats.

Additionally, the area in the west of the Site boundary outside of the mainland parcel was added after the initial Site visit, tree inspection, external building inspection, active bat surveys and SM4 surveys had taken place. Therefore, this area was not surveyed for bat emergence or bat activity levels.

No other survey limitations were identified.

2.4 Evaluation of the Importance of the Site for Bat Species

The value of the importance of the Site for bat species was evaluated using the ecological evaluation guidance given in the National Roads Authority (NRA) guidance on assessment of ecological impacts of National Road Schemes [9]. This guidance provides ratings for resources based primarily on geographic context and allows for resources at the following levels:

- International Importance;
- National Importance;
- County Importance (or vice-county in the case of plant or insect species);
- Local Importance (Higher Value); and,
- Local Importance (Lower Value).

3 RESULTS

3.1 Desk-Based Results

Prior to conducting the field surveys, a desk-based review of information sources was completed.

According to the NBDC one of the nine (9No.) bat species have been recorded within a 2km radius of the Site within the past 10 years (Grid Codes: S61L, S61M, S61R, S61S) [6].

Table 3-1 provides details of the habitat suitability index for the Site [6]. The habitat suitability index identifies the geographical areas that are suitable for individual species. The index ranges from 0 to 100, with 100 being the most favourable to bats. The index presented is for all species combined, in addition to the individual species indices within the Site.

From the indices, it can be established that the Site has an overall very high habitat suitability index range of 36-58. All of the Irish bat species have a very high habitat suitability index for the area, with the exception of the lesser horseshoe bat and Nathusius' pipistrelle, which have a very low and moderate habitat suitability respectively. Therefore, all of the other listed species are likely to occur within the area.

Table 3-1: Habitat Suitability Index

Bat Species	Suitability Index Range	Suitability Index Level
All Bat Species	36-58	Very High
Soprano Pipistrelle *(Pipistrellus pygmaeus)*	46-64	Very High
Brown Long-eared Bat (*Plecotus auritus)*	50-79	Very High
Common Pipistrelle (*Pipistrellus pipistrellus)*	48-72	Very High
Lesser Horseshoe Bat (*Rhinolophus hipposideros)*	0-4	Very Low
Whiskered Bat *(Myotis mystacinus)*	45-69	Very High
Daubenton's Bat *(Myotis daubentonii)*	39-59	Very High
Leisler's Bat *(Nyctalus leisleri)*	47-71	Very High
Nathusius' Pipistrelle *(Pipistrellus nathusii)*	16-29	Moderate
Natterer's Bat *(Myotis nattereri)*	49-75	Very High

3.2 Field Based Results

The initial Site assessment identified a number of mature treelines that have the potential to support commuting and foraging bat species. Additionally, the buildings onsite were considered to provide suitable potential roosting habitat for bats along with some of the mature trees within the Site boundary, see below.

3.2.1 Tree Inspection

The tree inspection survey identified nine (9No.) trees with features suitable for potential roosting bats (Figure 3-1 below). These trees were all determined to have low bat roosting potential, however as a precautionary approach, these trees were monitored for emergence / re-entry during the transect surveys.

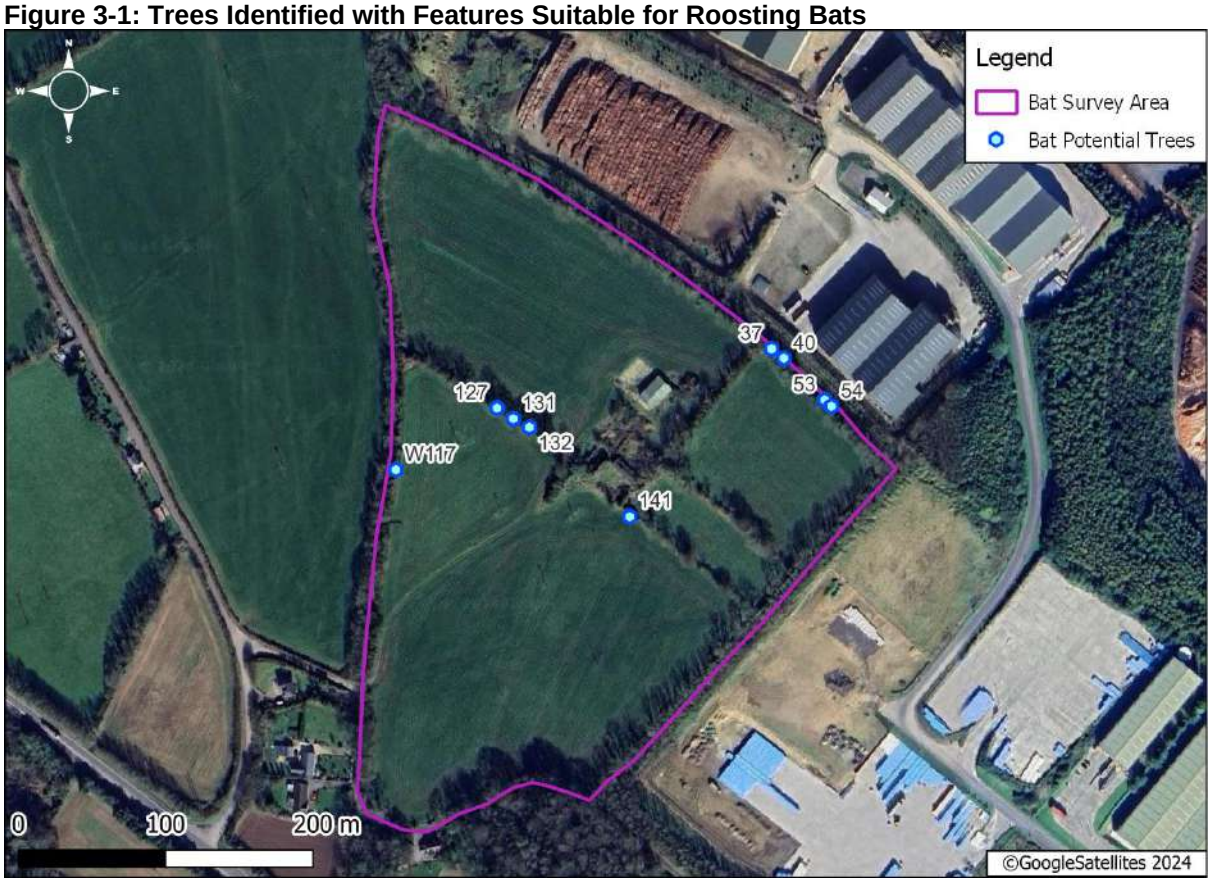
It should also be noted that all trees identified with low bat roosting potential will be retained and protected during the construction and operational phases of the Proposed Development.

Table 3-2 provides details of the results of the tree survey onsite. Please note that the tree numbers correspond with the numbers presented in the Arboricultural Impact Assessment Report [7].

Table 3-2: Tree Survey Results

Tree No.	Species	Bat Potential	Ivy	Knotholes	Loose Bark	Cracks and Crevices
37	Ash (*Fraxinus excelsior*)	√	√	X	X	X
40	Ash (*Fraxinus excelsior*)	√	√	X	X	X
53	Ash (*Fraxinus excelsior*)	√	√	X	X	√
54	Ash (*Fraxinus excelsior*)	√	√	X	X	√
W117	Beech (*Fagus sylvatica*) (as part of the mixed species woodland)	√	X	X	X	√
127	Turkey Oak (*Quercus cerris*)	√	√	X	X	√
131	Beech (*Fagus sylvatica*)	√	√	X	X	X
132	Beech (*Fagus sylvatica*)	√	√	X	X	X
141	Ash (*Fraxinus excelsior*)	√	√	X	X	X

Figure 3-1: Trees Identified with Features Suitable for Roosting Bats



3.2.2 External Building Inspection

There were three (3No.) buildings located within the Site boundary – two (2No.) derelict houses and one (1No.) agricultural shed. The two (2No.) derelict houses were not in use and were overgrown with ivy and in poor condition. The roof of the eastern building had been removed prior to the initial Site visit, while the roof of the western building was still in place with a number of holes and loose tiles / falling tiles. It was determined that the agricultural shed had no bat potential, but the two (2No.) derelict houses had the potential to provide roosting habitats for bats.

The external building inspection identified multiple features and entry points into these two (2No.) that could be utilised by roosting bats, including loose roof tiles and access through the gable roof structure (see Plates 3-1 and 3-2). However, there was no visual evidence that bats were using these potential access points, such as droppings on the building walls or urine splashes / fur-oil staining. It should also be noted that these buildings could not be internally inspected due to the unstable nature of the buildings.

Plate 3-1: Building on-site with features suitable for roosting bats

Plate 3-2: Building on-site with features suitable for roosting bats

3.2.3 Dusk Emergence, Dawn Re-entry and Transect Survey Results

No bats were observed emerging from or re-entering any of the buildings or trees surveyed. The surveyors identified bats foraging and commuting along the hedgerow / treelines onsite, predominantly the hedgerow / treelines that border the Site. Bats were also observed commuting throughout and over the buildings during the VP surveys and foraging over the trees near these buildings (see Figure 3-2).

Moderate to high activity was recorded at both dusk emergence surveys, while there was low activity at all VPs during the dawn re-entry survey. There was moderate to high activity at all transects during the transect surveys.

The following bats were recorded as a result of the dusk emergence, dawn re-entry and activity surveys:

- Common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle and brown long-eared bats were recorded foraging and commuting within the Site. The most frequently encountered species of these were common pipistrelle, followed by soprano pipistrelle and Leisler's bats. Very low numbers of Nathusius' pipistrelle and brown long-eared bats were recorded;
- The SM4 surveys identified more bat activity along the hedgerow / treeline in the north of the Site. Common pipistrelle were the most frequently recorded species at both SM4s, followed by soprano pipistrelle and then Leisler's bats. There were low to zero recordings from Nathusius' pipistrelle, brown long-eared bats and *Myotis* species from both SM4s.
- No bats were identified to be roosting within the buildings or trees in the Site; and,
- Bats were recorded soon after dusk during the emergence survey and just before and after sunrise during the dawn re-entry survey, indicating that bat roosts are likely to be present within the local area. The survey recorded bats commuting and foraging along the hedgerow / treelines that border the Site, and also commuting through the Site over the buildings and grassland (Figure 3-2.)

Further details from the surveys are provided below.

3.2.3.1 Dusk Emergence 15/06/23

Sunset was at 21:52. VP2 had the highest levels of bat activity. No bats were observed emerging from the buildings in the Site.

VP1

The first bat recorded at this VP was a Leisler's at 22:11 (nineteen (19No.) minutes after sunset), but not seen by the surveyor. The first bat observed was a Nathusius' pipistrelle at 22:17, seen commuting east over the buildings onsite. A soprano pipistrelle was then observed at 22:21, 22:27, 22:51 and 23:10- all times seen commuting east. Common pipistrelle were also seen foraging in the grassland to the north of the VP. Soprano pipistrelle were also frequently seen commuting towards the trees to the southwest of VP1. The last bat recorded and observed was at 23:26.

Overall, there was moderate activity at this VP, with ca. twelve (12No.) bat passes recorded per hour. Leisler's bats had ca. three (3No.) passes per hour, common pipistrelle had ca. four (4No.) passes per hour, soprano pipistrelle had ca. ten (10No.) passes per hour and Nathusius' pipistrelle had ca. one (1No.) pass per hour.

VP2

The first bat recorded at this VP was a Leisler's at 22:11 (nineteen (19No.) minutes after sunset), but not observed by the surveyor. The first bat seen at the VP was a Nathusius pipistrelle at 22:18, commuting through the gap between the two buildings and towards the southeast. Shortly afterwards at 22:20, three (3No.) bats were observed commuting towards the trees to the west of the building, and also to the trees to the east of the second building. Recordings taken during this time identified calls from common pipistrelle and Nathusius' pipistrelle, so the bats observed were likely a combination of these species. Bats were constantly seen commuting and foraging in the gap between the buildings surveyed until 23:18. A common pipistrelle and soprano pipistrelle were also seen flying into the ivy on the roof of the western building at 22:32 and 22:52 respectively. The last bat seen was at 23:18 and the last bat recorded was at 23:51.

Overall, there was high activity at this VP, with ca. fifty-one (51No.) bat passes recorded per hour. Leisler's bats had ca. eight (8No.) passes per hour, common pipistrelle had ca. twenty-seven (27No.) passes per hour, soprano pipistrelle had ca. thirteen (13No.) passes per hour and Nathusius' pipistrelle had ca. three (3No.) passes per hour.

VP3

The first bat recorded at this VP was a Leisler's bat at 22:11 (nineteen (19No.) minutes after sunset) but was not seen by the surveyor. The next bat recorded and seen was a common pipistrelle at 22:17, observed commuting southwest through the gap in between the buildings. Shortly after at 22:19, a Nathusius' pipistrelle was seen commuting back through this gap to the northwest. A Nathusius' pipistrelle was also seen at 22:21 commuting out of the trees to the south of the Site towards the west of the Site. Similar bats and levels of activity were seen at this VP and VP2, with bats observed commuting through the gap in between the buildings on site and foraging over the grassland in front of the buildings. The last bat observed was at 23:20 and the last bat was recorded at 23:51.

Overall, there was high activity recorded at this VP, with ca. thirty-eight (38No.) bat passes recorded per hour. Leisler's had ca. eight (8No.) passes per hour, common pipistrelle had ca. twenty (20No.) passes per hour, soprano pipistrelle had ca. nine (9No.) passes per hour, Nathusius' pipistrelle had ca. three (3No.) passes per hour and brown long-eared bats had ca. one (1No.) pass per hour.

VP4

The first bat observed at this VP was a Nathusius' pipistrelle at 22:20 (twenty-eight (28No.) minutes after sunset), seen commuting southwest over the buildings onsite. A soprano pipistrelle was then seen at 22:23 foraging to the north of VP4. Common pipistrelle and Leisler's were also seen foraging over the trees to the north and northeast of VP4. A common pipistrelle was also seen commuting through the eastern building that has no roof at 22:28. However, no bats were seen emerging from this building and it is not considered that bats are roosting in this building. The last bat seen was at 22:53 and the last bat recorded was at 23:53.

Overall, there was high bat activity recorded at this VP with ca. forty-one (41No.) bat passes recorded per hour. Leisler's had ca. fourteen (14No.) passes per hour, common pipistrelle had ca. twenty-five (25No.) passes per hour, soprano pipistrelle had ca. two (2No.) passes per hour, Nathusius' pipistrelle had ca. one (1No.) pass per hour and brown long-eared bats had ca. one (1No.) pass per hour.

3.2.3.2 Dusk Transects 05/07/23

Sunset was at 21:51. T2 and T3 had the highest amounts of activity.

T1

The first bat recorded at this transect was a soprano pipistrelle at 21:56 (five (5No.) minutes after sunset), but not observed by the surveyor. The first bats seen were two (2No.) soprano pipistrelles observed foraging over the northeastern treeline from 22:15-22:20. Further common pipistrelle and soprano pipistrelle were recorded at 22:44 and 22:53 respectively, but not observed by the surveyor. A common pipistrelle was observed flying southeast over the northeastern treeline at 22:56. Leisler's and common pipistrelle were recorded between 22:58 and 23:15, until one (1No.) common pipistrelle was observed at 23:17, 23:20 and 23:32. This bat was observed foraging and commuting along the boundary hedgerow/treelines. The last bat seen was at 23:32 and the last bat recorded was at 23:48.

T2

The first bat observed at this transect was a common pipistrelle passing between 22:07–22:13 (16-22No. minutes after sunset) and seen foraging over the western treeline before commuting south over this treeline. The next bat seen was a Leisler's at 22:16, commuting north along the western treeline. A common pipistrelle was then seen between 22:34–22:40 commuting and foraging over the same western treeline. A Leisler's bat was also seen in the same location at this time. A common pipistrelle also had multiple passes between 22:55–22:59 while commuting over the western hedgerow, and between 23:12–23:20 at the same location. A common pipistrelle was also seen commuting from the east towards this hedgerow/treeline at 23:22. The last bat seen on this transect was a common pipistrelle between 23:35-23:40, commuting along the western hedgerow/treeline. The last bat recorded was at 23:47, and soprano pipistrelle were also recorded throughout the survey but not observed.

Overall, there was high activity at this transect with ca. fifty-eight (58No.) bat passes recorded per hour. Leisler's bats had ca. nine (9No.) passes per hour, common pipistrelle had ca. forty-eight (48No.) passes per hour and soprano pipistrelle had ca. two (2No.) passes per hour.

T3

The first bat recorded at this transect was a common pipistrelle at 22:11 (twenty (20No.) minutes after sunset), but not observed by the surveyor. Shortly afterwards two bats were seen at 22:15 in the northwest corner of the treeline and commuting north and northwest. The analysis of the recordings at this time detected calls from soprano pipistrelle and Leisler's. A common pipistrelle was also observed in this same location at 22:16. The next bats seen were a Leisler's and common pipistrelle at 22:27, foraging over a tree in the south of the western treeline. A common pipistrelle was also seen at 22:31, commuting south over the grassland. The next bat seen was a common pipistrelle between 23:11–23:16, seen commuting south and foraging over the centre of the western treeline. At 23:16 a second common pipistrelle

was seen flying in and out of the hedgerow / treeline to the west of the transect. These were the last bats seen on the transect, and the last bat recorded was at 23:51.

Overall, there was high bat activity at this transect, with ca. fifty-seven (57No.) bat passes recorded per hour. Leisler's bats had ca. twelve (12No.) passes per hour, common pipistrelle had ca. forty-five (45No.) passes per hour, soprano pipistrelle had ca. five (5No.) passes per hour and brown long-eared bats had ca. two (2No.) passes per hour.

T4

The first bat recorded and observed at this transect was a soprano pipistrelle at 22:09 (eighteen (18No.) minutes after sunset), seen commuting north towards T1. Shortly after at 22:11 a Nathusius' pipistrelle was seen commuting west along the transect. At 22:19 six (6No.) bats were observed foraging in between the trees in the eastern treelines. Analysis of the recordings taken at this time identified calls from soprano and common pipistrelles, so it is likely that the bats seen were a mixture of these species. Leisler's bats and brown long-eared bats were also recorded later on at this transect but were not seen. The last bat seen was at 23.46 and the last bat recorded was at 23.52.

Overall, there was moderate activity at this transect, with ca. twenty-three (23No.) bat passes recorded per hour. Leisler's bats had ca. two (2No.) passes per hour, common pipistrelle had ca. sixteen (16No.) passes per hour, soprano pipistrelle had ca. three (3No.) passes per hour, brown long-eared bats had ca. one (1No.) pass per hour and Nathusius' pipistrelle had ca. one (1No.) pass per hour.

3.2.3.3 Dusk Emergence 20/07/23

Sunset was at 21:37. No bats were observed roosting in the buildings onsite. VP2 recorded the highest amount of bat activity.

VP1

The first bat recorded and observed at this VP was a common pipistrelle at 22:03 (twenty-six (26No.) minutes after sunset), seen commuting north. Shortly afterwards, a Leisler's bat was seen from 22:04–22:10 commuting throughout the Site. Common pipistrelle and Leisler's continued to be recorded foraging around the vegetation adjacent to the buildings surveyed and commuting through the gap between the two (2No.) buildings onsite. One (1No.) singular soprano pipistrelle was recorded onsite at 23:25, which was the last bat recorded during the survey.

Overall, there was moderate activity at this VP, with ca. eighteen (18No.) bat passes recorded per hour. Leisler's bats had ca. five (5No.) passes per hour, common pipistrelle had ca. twelve (12No.) passes per hour and soprano pipistrelle had ca. one (1No.) pass per hour.

VP2

The first bat seen at this VP was a soprano pipistrelle at 22:07 (thirty (30No.) minutes after sunset), observed commuting from north to south between the two (2No.) buildings onsite, and then commuted back towards the southeast. Shortly after at 22:08 a common pipistrelle was also seen commuting from south to north and then commuting southeast. A common pipistrelle was again observed passing multiple times between 22:11–22:15, seen foraging over the grassland and buildings onsite. The next bat seen at this VP was a common pipistrelle at 22:58, observed foraging above the grassland and commuting south back towards the grassland. A common pipistrelle also passed multiple times between 23:03–23:06 and was observed commuting south to north through the buildings and then foraging over the grassland to the south of the buildings. This was the last bat observed at this VP. Other species recorded but not seen at this VP included Leisler's, soprano pipistrelles and brown long-eared bats. The last bat recorded was at 23:38.

Overall, there was high activity at this VP with ca. thirty-six (36No.) bat passes recorded per hour. Leisler's bats had ca. six (6No.) passes per hour, common pipistrelle had ca. twenty-eight (28No.) passes per hour, soprano pipistrelle had ca. two (2No.) passes per hour and brown long-eared bats had ca. two (2No.) passes per hour.

VP3

The first bat recorded at this VP was a Leisler's bat at 22:04 (twenty-seven (27No.) minutes after sunset), but not observed by the surveyor. The first bat observed at this VP was a common pipistrelle at 22:07, seen coming from the north and commuting east from VP3. Shortly afterwards at 22:10 another common pipistrelle was observed also commuting towards the east. Common pipistrelle continued to be observed commuting though the gap between the two (2No.) buildings onsite, and over the building at VP3 towards the south and north of the building. Common pipistrelles were also observed foraging over the greenery to the south and southwest of the buildings surveyed. The last bat seen was at 22:58 and the last bat recorded was at 23:38.

Overall, there was moderate activity at this VP, with ca. twenty (20No.) bat passes recorded per hour. Leisler's bats had ca. three (3No.) passes per hour and common pipistrelles had ca. seventeen (17No.) passes per hour.

VP4

The first bat seen at this VP was a soprano pipistrelle at 21:37 (sunset), observed flying under the ivy on the eastern building. This bat was seen emerging from the ivy again at 21:47. The next bat seen was a common pipistrelle at 22:31, observed commuting east to west into the roof of the eastern building. A common pipistrelle was also seen at 22:34 flying into the roof of the building. One (1No.) common pipistrelle was also seen flying into the roof of this building at 22:57, 22:59 and 23:25. The only other species observed was a Leisler's at 22:41, commuting north to south over the eastern building. The last bat recorded was at 23:35.

It should be noted that that the building surveyed at this VP had no roof tiles on the roof. Therefore, it is reasonable to conclude that the common pipistrelle observed flying into the roof of this building were commuting through it and not roosting within.

Overall, there was moderate activity at this VP with ca. eighteen (18No.) bat passes recorded per hour. Leisler's bats had ca. six (6No.) passes per hour, common pipistrelle had ca. ten (10No.) passes per hour and soprano pipistrelle had ca. three (3No.) passes per hour.

3.2.3.4 Dawn Re-entry 03/08/23

Sunrise was at 05:15. Low activity was recorded across all VPs.

VP1

No bats were observed at this VP. The recordings taken during this survey recorded calls from common pipistrelle, soprano pipistrelle and Leisler's.

Overall, there was low activity at this VP with ca. five (5No.) bat passes recorded per hour.

VP2

No bats were observed at this VP. The recordings taken during this survey recorded calls from common pipistrelle, soprano pipistrelle and Leisler's.

Overall, there was low activity at this VP with ca. five (5No.) bat passes recorded per hour.

VP3

No bats were observed at this VP. The recordings taken during this survey recorded calls from common pipistrelle, soprano pipistrelle and Leisler's.

Overall, there was low activity at this VP with ca. eight (8No.) bat passes recorded per hour.

VP4

The first bat observed at this VP was a common pipistrelle at 03:25. This bat was observed commuting from north to south over the eastern building. The next bat seen was a soprano pipistrelle at 03:43, observed commuting from southeast to northwest over the same building. The final bat observed at this VP was a soprano pipistrelle at 03:54, seen commuting from east to west over the building. Other species recorded during this survey include common pipistrelle and Leisler's bats.

Overall, there was low activity at this VP, with ca. seven (7No.) bat passes recorded per hour. Common pipistrelle, soprano pipistrelle and Leisler's were the only species recorded.

3.2.3.5 Dawn Transects 04/08/23

Sunrise was at 05:16. Activity was moderate to high across all transects. The most activity was recorded along T1 and T4.

T1

The first bat recorded at this transect was a common pipistrelle passing multiple times between 03:23–03:27. This bat was not seen but the surveyor was walking along the hedgerow / treeline to the north of T1 when the recording was taken. Further calls of common pipistrelles, soprano pipistrelles and Leisler's bats were recorded along this northern hedgerow / treeline for the rest of the transect survey. Common pipistrelle and soprano pipistrelle were also recorded but not seen along the hedgerow / treeline to the east of T1. The first bat seen at this transect was a common pipistrelle at 05:07, observed flying southeast adjacent to the hedgerow / treeline. At 05:19 a soprano pipistrelle was observed foraging under the eastern hedgerow / treeline. Shortly after this at 05:20, two (2No.) bats were observed foraging over the grassland in the northeast of the Site. The recordings taken at this time identified calls from soprano pipistrelles and brown long-eared bats, so it is likely that that the two bats seen were these species. The final bat seen at this transect was a soprano pipistrelle foraging over the eastern treeline at 05:21 (five (5No.) minutes after sunrise).

Overall, there was high activity at T1, with ca. forty-four (44No.) bat passes recorded per hour. Leisler's bats had ca. seven (7No.) passes per hour, common pipistrelle had ca. twenty-four (24No.) passes per hour, soprano pipistrelle had ca. fourteen (14No.) passes per hour and brown long-eared bats had ca. one (1No.) pass per hour.

T2

The first bat recorded at this transect was a common pipistrelle at 03:17, but not observed by the surveyor. Common pipistrelle, soprano pipistrelle and Leisler's bats were all recorded when the surveyor was walking along the hedgerow / treeline to the north of T2. Common pipistrelles were also recorded along the hedgerow / treeline to west of T2. The first bat observed at this transect was a common pipistrelle at 03:59, commuting from south to north along the western hedgerow / treeline. A common pipistrelle was also observed between 04:46–04:49 commuting through the hedgerow / treeline to the west of the Site. A common pipistrelle was again observed between 04:55 – 04:58 foraging over the trees and commuting over the western hedgerow / treeline. At 05:01 both Leisler's and brown long-eared bats were recorded, and one bat was observed commuting to the west along the northern hedgerow. A common pipistrelle was observed shortly after at 05:02 and foraging in the same location. The last bat observed at T2 was a common pipistrelle at 05:06, commuting southwest across the grassland. As this was observed ten (10No.) minutes before sunrise, this may indicate that bat roosts are present within the vicinity of the Site to the southwest. The last bat recording from T2 was a Leisler's and brown long-eared bat at 05:09 (seven (7No) minutes before sunrise).

Overall, there was high activity at T2, with ca. thirty-two (32No.) bat passes recorded per hour. Leisler's bats had ca. six (6No.) passes per hour, common pipistrelle had ca. twenty-two

(22No.) passes per hour, soprano pipistrelle had ca. four (4No.) passes per hour and brown long-eared bats had ca. one (1No.) pass per hour.

T3

No bats were observed by the surveyor at this transect. The first bat recorded was a common pipistrelle at 03:15 when the surveyor was walking along the hedgerow / treeline to the north of T3. Common pipistrelle were recorded frequently along the western hedgerow / treeline of T3. Soprano pipistrelle, Leisler's bats and brown long-eared bats were also recorded along this hedgerow / treeline.

Overall, there was moderate activity at T2 with ca. sixteen (16No.) bat passes recorded per hour. Leisler's bats had ca. two (2No.) passes per hour, common pipistrelle had ca. ten (10No.) passes per hour, soprano pipistrelle had ca. four (4No.) passes per hour and brown long-eared bats had one (1No.) pass per hour.

T4

The first bat recorded at this transect was a common pipistrelle passing multiple times between 03:23–03:29. This bat was not seen, but the surveyor was walking along the hedgerow / treeline to the north of T4 and to the south of T4 when these calls were recorded. A common pipistrelle was also recorded but not seen between 03:39-03:42 when the surveyor was along the northern hedgerow / treeline. Further soprano pipistrelle calls were recorded when the surveyor was again walking along the southern transect at 04:10, 04:50 and 05:03-05:09. At 04:24 a common pipistrelle was observed foraging over the trees in the hedgerow / treeline to the north of T4. At 04:36 a common pipistrelle was observed commuting over the eastern treeline at T4. The last bat seen was a soprano pipistrelle at 05:11 (five (5No.) minutes before sunset), seen foraging over the trees on the eastern hedgerow / treeline and then commuting west.

Overall, there was high activity at T4 during this survey with ca. forty-four (44No.) bat passes recorded per hour. Leisler's bats had ca. five (5No.) passes per hour, common pipistrelle had ca. twenty-six (26No.) passes per hour and soprano pipistrelle had ca. thirteen (13No.) passes per hour.

3.2.3.6 Dusk Transects 15/08/23

Sunset was at 20:53. Activity was low to moderate across all transects. The most activity was recorded along T4.

T1

The first bat recordings at T1 were from Leisler's at 21:07 and 21:15 (fourteen (14No.) minutes and twenty-two (22No.) minutes after sunset), but no bats were observed by the surveyor. A Leisler's bat was again recorded from 21:22-21:25 and observed by the surveyor commuting from the west along the hedgerow / treeline to the north of T1. This bat was also seen foraging over the grassland in the northeast of the Site. More Leisler's passes were recorded until 21:31 but not observed by the surveyor. A soprano pipistrelle was observed at 21:32 commuting from the south and foraging over the same grassland area mentioned above, before commuting towards the treeline to the north of T1. More Leisler's and common pipistrelle calls were recorded between 21:33 and 21:48 but not observed. The final bat observed at T1 was a common pipistrelle at 21:52 seen commuting from south to north over the hedgerow / treeline that traverses the Site. Further Leisler's, common pipistrelle and soprano pipistrelle were recorded at T1 until the last bat was recorded at 22:48.

Overall, there was moderate activity at T1, with ca. eighteen (18No.) bat passes recorded per hour. Leisler's bats had ca. nine (9No.) passes per hour, common pipistrelle ca. seven (7No.) passes per hour and soprano pipistrelle ca. four (4No.) passes per hour.

T2

The first bat recorded and observed at T2 was a common pipistrelle at 21:35 (forty-two (42No.) minutes after sunset) seen commuting through a gap in the hedgerow / treeline to the south of T2. Soprano pipistrelle and Leisler's calls were also recorded at this time, but not seen by the surveyor. No other bats were observed by the surveyor at this transect, but Leisler's, common pipistrelle and soprano pipistrelle calls were recorded along the hedgerow / treeline to the north of the Site. Soprano pipistrelle calls were also recorded along the hedgerow / treeline to the south of T2.

Overall, there was low activity at T2 with ca. five (5No.) bat passes recorded per hour. Low levels of Leisler's bats, common pipistrelle and soprano pipistrelle were recorded at this transect.

T3

The first bat recorded at T3 was a Leisler's at 21:19 (twenty-six (26No.) minutes after sunset), but not observed by the surveyor. More Leisler's passes were recorded between 21:20 and 21:35. Common pipistrelle calls were also recorded at 21:35. The first bat observed was a common pipistrelle at 21:48 seen commuting west over the hedgerow / treeline to the west of T3. The next and final bat seen was a soprano pipistrelle at 22:40 seen foraging over the western treeline. Leisler's common pipistrelles and soprano pipistrelles were recorded in low amounts throughout the survey. One individual recording of a brown long-eared bat was also recorded at this transect.

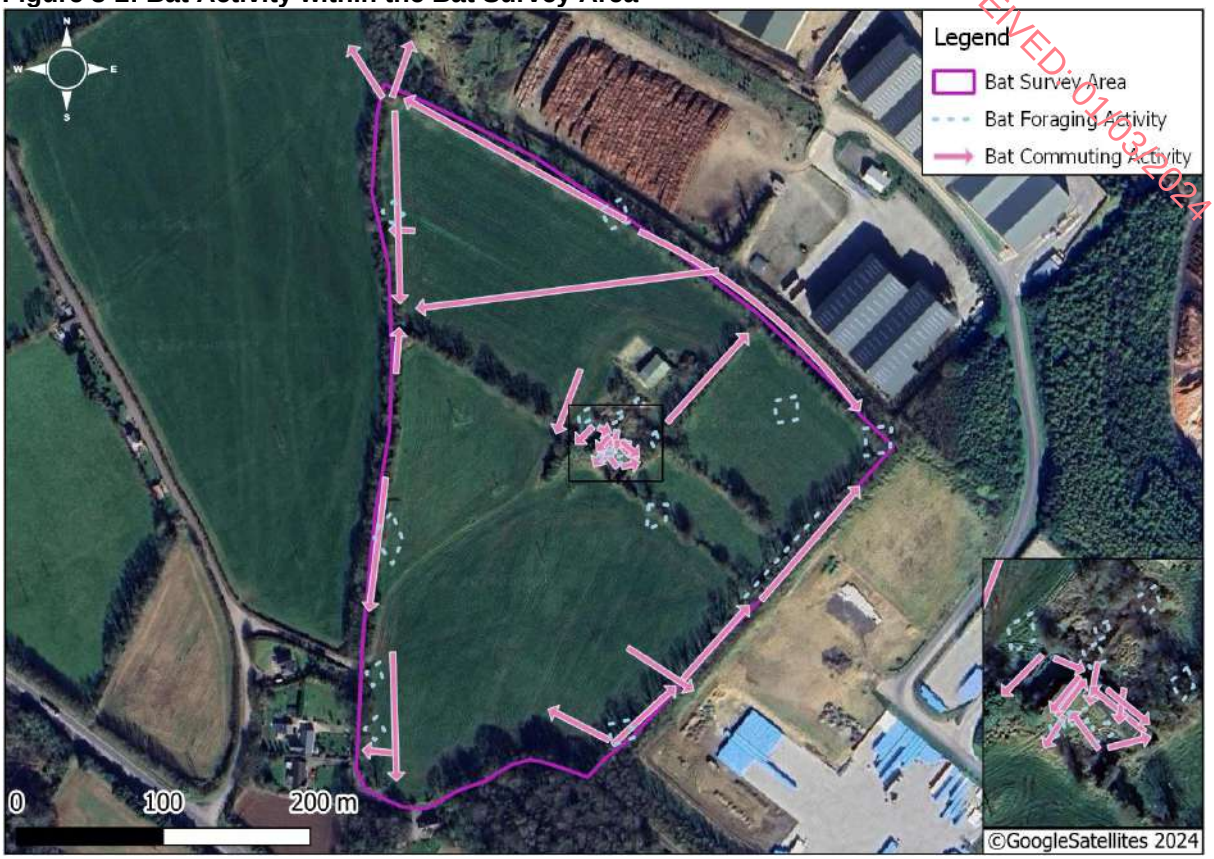
Overall, there was moderate activity was T3 with ca. twelve (12No.) bat passes recorded per hour. Leisler's bats had ca. seven (7No.) bat passes per hour, common pipistrelle had four (4No.) bat passes per hour and soprano pipistrelle had three (3No.) passes per hour. As mentioned above, there was one (1No.) individual recording from a brown long-eared bat at this transect.

T4

The first bat recorded at T4 was a Leisler's at 21:19 (twenty-six (26No.) minutes after sunset), but not observed by the surveyor. Leisler's, soprano pipistrelles and common pipistrelle continued to be recorded in moderate amounts until 21:41. The first bat was seen at 21:41, and was a common pipistrelle observed commuting from the south along the eastern hedgerow / treeline. Shortly afterwards a soprano pipistrelle was seen commuting in the same location, and this was the last bat observed. The last bat recorded was a soprano pipistrelle at 22:48.

Overall, there was moderate activity at T4, with ca. twenty-seven (27No.) bat passes recorded per hour. Leisler's bats had ca. five (5No.) passes per hour, common pipistrelle had ca. nine (9No.) passes per hour and soprano pipistrelle had ca. thirteen (13No.) passes per hour. There was one (1No.) individual recording of a brown long-eared bat at 22:46 along this transect.

Figure 3-2: Bat Activity within the Bat Survey Area



3.2.4 SM4 Results

The following Tables 3-3 and 3-4 summarise the results recorded on the SM4 unit deployed from July to August 2023 within the Site.

The total number of bat passes recorded per night and divided by the number of hours of recording provides a figure for this analysis. The bat activity levels were determined as follows:

- None – 0 passes
- Low = 1 - <10 passes per hour
- Moderate = >10 - < 50 passes per hour
- High = > 50 passes per hour

Overall, there was higher activity recorded at SM4-1 (Table 3-3, on the northern hedgerow/treeline) than SM4-2 (Table 3-4, on the eastern hedgerow/treeline) across the fourteen (14No.) nights. Common pipistrelles were the most frequently recorded species at both SM4s, followed by soprano pipistrelles and then Leisler's bats. There were low to zero recordings from Nathusius' pipistrelles, brown long-eared bats and *Myotis* species from both SM4s.

High levels of common pipistrelles were recorded on SM4-1 across eight (8No.) of the fourteen (14No.) nights surveyed. This suggests that the northern hedgerow/treeline is of high importance to foraging and commuting common pipistrelles. Moderate levels of soprano pipistrelles were recorded on seven (7No.) nights at this SM4 unit, while the rest of the nights surveyed recorded low levels of activity from this species. Leisler's were recorded in low amounts across all fourteen (14No.) nights surveyed at SM4-1. Brown long-eared bats and *Myotis* species were recorded only in low amounts across four (4No.) and five (5No.) nights surveyed respectively. No Nathusius' pipistrelles were recorded at SM4-1.

At SM4-2 common pipistrelles had moderate levels of activity on thirteen (13No.) out of fourteen (14No.) nights surveyed, with the last night recording low levels of this species. Both soprano pipistrelles and Leisler's bats had low levels of activity across all fourteen (14No.) nights. Brown long-eared bats were recorded in low levels on eight (8No.) nights surveyed, and the other six (6No.) nights did not record any brown long-eared bats. Finally, Nathusius' pipistrelles and *Myotis* species were only recorded in low abundances on two (2No.) nights surveyed.

Table 3-3: Results of SM4-1 deployed to monitor activity along the northern hedgerow / treeline

Static Monitor Location	Survey Period	Night	Common pipistrelle	Soprano pipistrelle	Leisler's bat	Brown Long Eared Bat	Nathusius' pipistrelle	Myotis *spp.*
SM4-1 – On the northern hedgerow /treeline	26th July – 8th August 2023 (14No nights total)	**1**	High	Low	Low	None	None	None
		2	High	Low	Low	None	None	Low
		3	Moderate	Low	Low	None	None	None
		4	High	Low	Low	None	None	None
		5	High	Moderate	Low	Low	None	Low
		6	High	Moderate	Low	None	None	None
		7	Moderate	Low	Low	None	None	None
		8	High	Moderate	Low	Low	None	None
		9	High	Moderate	Low	None	None	None
		10	Moderate	Moderate	Low	Low	None	Low
		11	Moderate	Low	Low	None	None	Low
		12	Moderate	Moderate	Low	None	None	None
		13	High	Moderate	Low	Low	None	None
		14	Moderate	Low	Low	None	None	Low

Table 3-4: Results of SM4-2 deployed to monitor activity along the eastern hedgerow / treeline.

Static Monitor Location	Survey Period	Night	Common pipistrelle	Soprano pipistrelle	Leisler's bat	Brown Long Eared Bat	Nathusius' pipistrelle	Myotis *spp.*
SM4-2 – On the eastern hedgerow /treeline	26th July – 8th August 2023 (14No. nights total)	**1**	Moderate	Low	Low	None	None	None
		2	Moderate	Low	Low	Low	Low	None
		3	Moderate	Low	Low	Low	None	None
		4	Moderate	Low	Low	None	None	None
		5	Moderate	Low	Low	Low	None	None
		6	Moderate	Low	Low	Low	None	None
		7	Moderate	Low	Low	None	None	Low
		8	Moderate	Low	Low	Low	None	None
		9	Moderate	Low	Low	Low	None	None
		10	Moderate	Low	Low	Low	None	None
		11	Moderate	Low	Low	Low	None	Low
		12	Moderate	Low	Low	None	Low	None
		13	Moderate	Low	Low	None	None	None
		14	Low	Low	Low	None	None	None

3.3 Overall Results

The following bats were recorded as a result of the emergence / dawn re-entry surveys and SM4s:

- Common pipistrelle, soprano pipistrelle, Leisler's, Nathusius' pipistrelle, brown long eared and *Myotis* species bats were recorded commuting / foraging within or above the Site. The most frequently encountered species of these were common pipistrelle, followed by soprano pipistrelle and Leisler's bats. Common pipistrelles were also the most frequently recorded species during the static monitoring surveys at two (2No.) hedgerow / treelines onsite;
- The following species were recorded within fifteen (15No.) minutes of sunset / sunrise during dusk / dawn surveys: common pipistrelle, soprano pipistrelle, brown long-eared

bat and Leisler's bat. This indicates that roosts for these bat species are likely to be present within the vicinity of the Site;

- The emergence, re-entry and activity surveys recorded the majority of bat commuting and foraging activity along the boundary hedgerow / treelines of the Site;
- The emergence / re-entry surveys also observed bats commuting over the derelict buildings in the centre of the Site that were surveyed, and also commuting over some of the hedgerow / treelines that traverse the Site (Figure 3-2);
- The static monitoring surveys recorded higher levels of bats along the northern hedgerow / treeline than the eastern hedgerow / treeline surveyed; and,
- No bats were identified to be roosting within any buildings or trees in the Site.

Based on the levels of activity and movement of the bats recorded during the surveys, it is considered that the Site is of higher local value to foraging / commuting bats.

4 IMPACT ASSESSMENT AND MITIGATION

The following bat species have been recorded during both the static survey and the emergence / re-entry and activity bat surveys: common pipistrelle, soprano pipistrelle, Leisler's bat, brown long eared and *Myotis* spp. Taking a precautionary approach and assuming that the *Myotis* calls recorded were from each of the three (3No.) *Myotis* species in Ireland, it can be assumed that eight (8No.) of the nine (9No.) resident bat species in Ireland were recorded during the surveys onsite. The lesser horseshoe bat was the only bat species not recorded during the surveys. All bat species recorded during the bat surveys are Annex IV species under the EU Habitats Directive and all have a favourable status in Ireland.

The impact assessment and mitigation will be undertaken in relation to the eight (8No.) bat species recorded within the Site: common pipistrelle, soprano pipistrelle, Leisler's bat, brown long eared and three (3No.) *Myotis* spp.

4.1 Potential Impacts on Bats

The Proposed Development will require the removal of vegetation and the installation of lighting. Bat species within the Site could potentially be affected during both the construction phase and operational phase of the Proposed Development. The principal potential impacts of the Proposed Development on bat fauna may be summarised as follows:

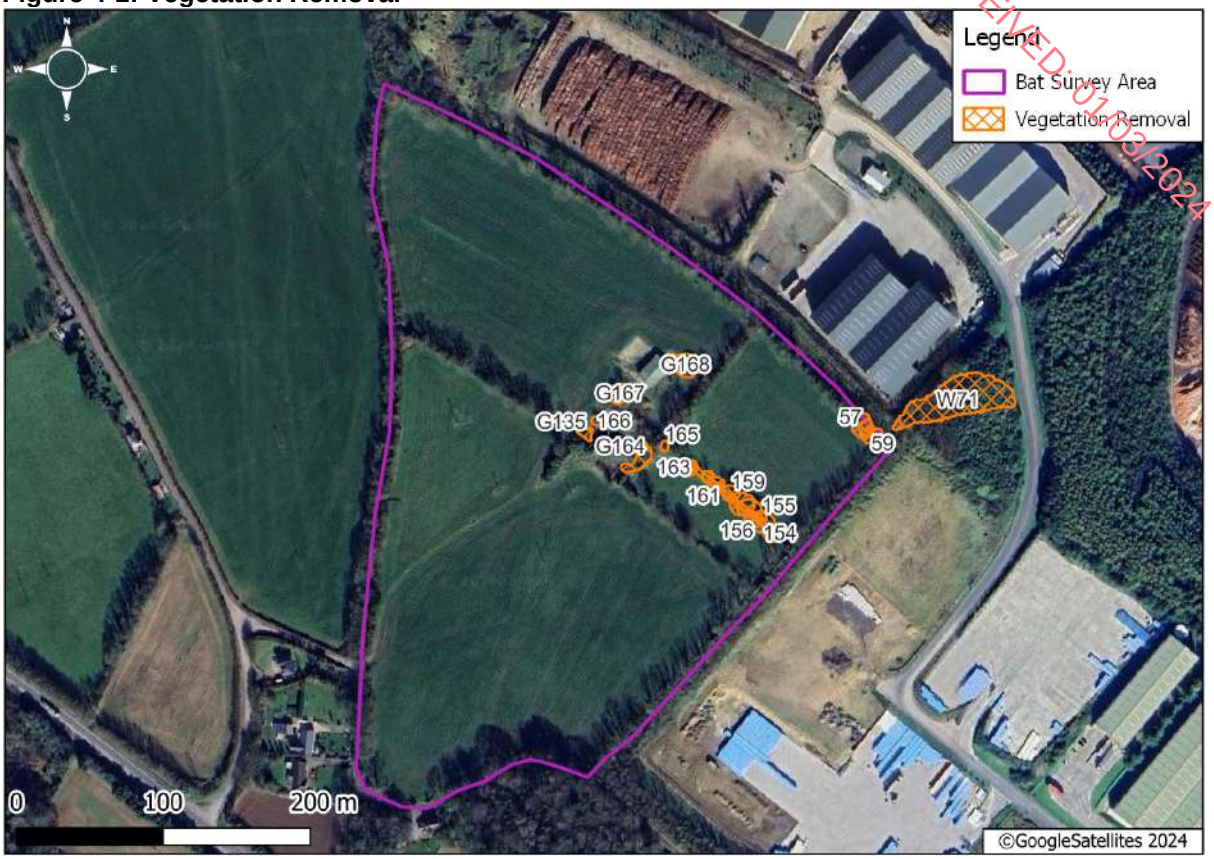
- Loss of commuting and foraging habitat; and,
- Impacts associated with lighting during the construction and operational phase.

4.1.1 Loss of Habitat

The surveys did not identify any bat roosts within the Site. However, bats were recorded commuting and foraging within the habitats onsite.

To facilitate the Proposed Development, some individual trees and areas of hedgerows, scrub and woodland will be removed to facilitate the Proposed Development, full details are outlined in Chapter 6 of the EIAR. Figure 4-1 below also shows the areas where vegetation will be removed onsite. Please note that the tree numbers correspond with the numbers presented in the Arboricultural Impact Assessment Report [7].

Figure 4-1: Vegetation Removal



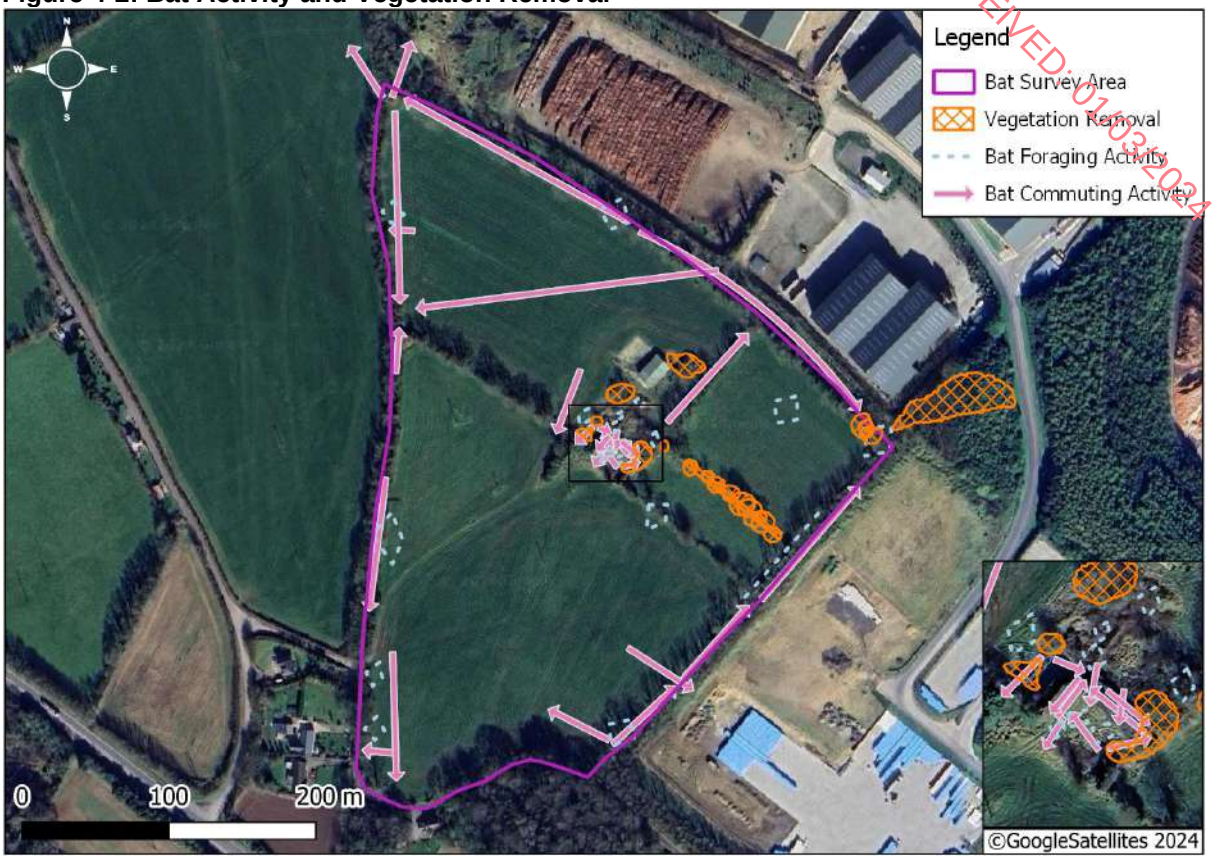
The dusk emergence surveys identified bats foraging and commuting over the mixed species groups G135, G164, G167 and G168 during the VP surveys, as well as over the individual trees numbered 165, and 166 in the Arboricultural Impact Assessment Report [7]. These trees / species groups will be removed to facilitate the Proposed Development.

Additionally, the transect surveys identified bats foraging and commuting over the trees numbered 57, 58 and 59 [7]. These trees will also be removed to facilitate the Proposed Development, which will result in the loss of some foraging and commuting habitats for bats.

However, the majority of the habitats that bats were observed to be foraging and commuting over will be retained, including all boundary hedgerow / treelines (excluding the removal of three (3No.) trees in the northern treeline to facilitate the new access road), see Figure 4-2 below.

It is considered that without the appropriate consideration of the loss of the foraging and commuting habitats for bats as mentioned above, that the Proposed Development could have a negative impact on commuting and foraging bat species. However, subject to an appropriate lighting strategy being implemented during the construction and operational phases of the Proposed Development (see Section 4.2 below), bats will be able to continue to utilise habitats on the perimeter of the Site.

Figure 4-2: Bat Activity and Vegetation Removal



4.1.2 Lighting of the General Area (street lighting, security lighting etc.)

Lighting for the Proposed Development has the potential to impact bat species in relation to commuting and foraging potential within Site and the wider area. The degree of this impact is dependent on the sensitivity of the bat species, as some bats are more tolerant of lighting. Pipistrelle species and Leisler's bats will tolerate low levels of lighting, while brown long eared bats and *Myotis* species are very sensitive to lighting and require the light levels to be below 1lux.

As *Myotis* species and brown long eared bats were recorded within the Site, it is important to ensure that lighting is directional and that there are buffer zones or screen plantings established to reduce light spillage onto the hedgerow / treelines that bats were observed using during the surveys.

In the absence of an appropriate lighting scheme, it is considered that the Proposed Development could have a negative impact on foraging and commuting bats.

4.2 Mitigation Measures

The following sections outline appropriate mitigation measures that will be implemented in order to reduce significant impacts of the Proposed Development on local bat populations.

4.2.1 Replacement and Additional Planting

As detailed in the Arboricultural Impact Assessment Report [7], the existing canopy cover of the vegetation on-site to be removed equates to ca. 4,128m^2. The new planting on-site will provide a total of ca. 10,562m^2 canopy cover, resulting in overall net-gain in canopy cover. It is also anticipated that this canopy cover will increase year on year as trees become established and reach maturity [7].

The additional planting will comprise of a mix of pedunculate oak (*Quercus robur*), Scots pine (*Pinus sylvestris*), alder (*Alnus glutinosa*), downy birch (*Betula pubescens*), wild cherry (*Prunus avium*), hazel (*Corylus avellana*), holly (*Ilex aquifolium*), hawthorn (*Crataegus monogyna*), blackthorn (*Prunus spinosa*) and spindle (*Euonymus europaeus*). Bats will utilise all forest types, from semi-natural to broadleaf and conifer plantations [10]. Therefore, once mature and successfully established, the new plantings onsite will provide additional suitable foraging and commuting habitats for bats, when trees have become mature.

The new planting has also been designed to offer new and replacement green corridors that connect to treelines and hedgerows in the surrounding landscape to offer ecological benefits [7]. Therefore, bats will be able to use the existing hedgerow / treelines, as well as the new planting for foraging and commuting.

4.2.2 Lighting Plan

Bats are averse to excessive lighting, subsequently, impacts could occur as a result of an inappropriate lighting strategy. Therefore, it is important that lighting installed for the Proposed Development will be completed with sensitivity for local wildlife while still providing the necessary lighting for human usage.

The lighting to be installed as part of the Proposed Development will be for safety and security. An External Lighting Design Report has been prepared and attached as Appendix 6-6 to the EIAR. This report shows the light spillage and calculations of the average illuminance levels on-site. Lighting will only be installed in the upper half of the Site boundary, along the northern, northeast and northwest treelines. This will ensure that the majority of the boundary hedgerow / treelines on-site will remain unimpacted by lighting from the Proposed Development and allow bats to continue using these features for foraging and commuting.

Along the northern and northwestern treeline, the illuminance levels have been calculated as:

- A minimum of 0.02lux (lx),
- A maximum of 13.9lx; and,
- An average of 1.48lx.

Along the eastern treeline, the illuminance levels have been calculated as:

- A minimum of 0.001lx;
- A maximum of 10.2lx; and,
- An average of 0.88lx.

The calculations show that the lighting installed in these areas will spill onto the retained hedgerow / treelines. The calculations show that the majority of the light spillage onto the retained hedgerow / treelines will be in levels of between 0.5lx – 5lx. However, some trees within the hedgerow / treelines will experience levels of up to 13.9lx within close proximity to the floodlighting and areas of hardstanding. As mentioned above, pipistrelle species and Leisler's bats will tolerate low levels of lighting, while *Myotis* species and brown long-eared bats usually require light levels to be below 1lx.

The lighting design for the Proposed Development has been revised where possible to reduce lux levels and remove any excessive lighting associated with the Proposed Development. This included the following:

- Reducing the number of lights associated with the Proposed Development from 115 No. lights to 99No., a reduction of over 15%;
- Lighting along the southern boundary has also been revised so that all lighting along the southern boundary is facing inwards towards the building; and,

- Lux levels have been kept to a minimum with the average lux level across the Site ranging from 0.88lx to 1.48lx, as described above.

The proposed lighting design has been designed to reduce the potential to negatively impact light sensitive bat species, such as brown long-eared bats and *Myotis* species, along the northern and western boundaries; however, the lux levels beyond the immediate vicinity of the Site will be significantly lower. Additionally, levels along the southern and eastern boundary will be kept below an average of 1lx, minimising any potential impacts on light sensitive bat species.

It should be noted that the majority of the activity recorded onsite were attributed to common pipistrelle, followed by soprano pipistrelle and Lesiler's bats, which are considered to be less sensitive to light pollution than brown long-eared bats and *Myotis* species.

Following the installation of the lighting associated with the operational phase of the Proposed Development, a suitably qualified and experienced ecologist will undertake a further Site inspection to inspect the lighting patterns and lux levels along the hedgerows / treelines on the Site and the findings will be presented to the planning authority. During the construction phase of the Proposed Development, the following measures are recommended:

- Construction should be limited to daylight hours in order to minimise adverse effects on nocturnal fauna;
- Avoidance of excessive lighting;
- Lighting will be aimed only where it is needed, with no upward lighting;
- Lighting should be turned down / off when not required; and,
- Accessories such as baffles, hoods or louvres can be used to reduce light spill and direct light only where it is needed.

4.2.3 Protection for Retained Hedgerow / Treelines and Individual Trees

The following mitigation measures will be followed in order to ensure that there are no adverse impacts to the retained hedgerows / treelines onsite. These mitigation measures are included in the Arboricultural Impact Assessment Report [7]:

Tree Protective Fencing

- *'A protective fence will be erected around retained trees, prior to the commencement of materials or machinery being brought onto site, removal of soil or any form of construction. The area within this fencing will form the construction exclusion zone (CEZ) and it will be afforded protection at all times. No works will be undertaken within this zone that causes compaction to the soil, severance of tree roots or damage to tree canopies;*
- *The fence is to be sited in accordance with the Tree Impact & Protection Plan submitted as part of the Planning Application;*
- *Details of the minimum distance for fencing from trees can be found in the Tree Schedule submitted as part of the Planning Application;*
- *The area within this fencing will form the CEX and it will be afforded protection at all times. No works will be undertaken within this zone that causes compaction to the soil, severance of tree roots or damage to tree canopy;*
- *Details of the minimum distance for fencing from trees can be found in the Tree Schedule submitted as part of the Planning Application;*
- *The precise form of fencing can vary provided it is fit for purpose and prevents* damaging activities within the CEZ. For a proposal of this nature, a number of

fencing/protection solutions will be required including the Heras 151 system of fencing, timber boards and hessian sacking wrapped in chestnut cleft pale;

- *The fences will have signs attached to it stating that it defines a CEZ and that no works are permitted beyond it and will remain in place for the duration of the works to prevent accidental disturbance and define the limits for construction vehicles and other construction staff;*
- *The protective fencing may only be removed following completion of all construction works; and,*
- *The following principles will be adopted by site personnel within the CEZ during construction, to ensure protection of retained trees:*
  - *No level changes.*
  - *No excavations.*
  - *No fires.*
  - *No use of herbicides.*
  - *No storage of materials, machinery or access for construction workers.'*

Site Compounds & Facilities

- *Site compounds and facilities will be located outside of all Root Protection Areas (RPAs) and CEZs as identified on the Tree Impact and Protection Plan (TIPP*).

Site Cranes, Piling Rigs and Machinery

- *The location of all drilling rig, supporting vehicles / equipment should be sited outside of RPAs to avoid soil compaction.*

Pollution Control

- *Any storage or mixing station located outside of the construction exclusion zone will be located in a place that minimises the risk of contaminated runoff entering to prevent adverse physiological impacts on trees that may result from contact with rooting environments. This may be achieved by using a non-permeable membrane on the ground, surrounded by sandbags or sawdust to contain any spillage*.

Temporary Ground Protection

- *Where it is not practical to protect RPAs by use of protective fencing, BS5837 allows for the fencing to be set back and the soil shielded by ground protection. A range of methods can be used including retaining existing hard surfaces or structures that already protect the soil, installing new temporary surfaces, or a combination of both. Whatever the choice of method, the end result must be that the underlying soil remains undisturbed and retains the capacity to support existing and new roots;*
- *If fences are to be set back on a temporary the following specifications are recommended for use as temporary ground protection to protect roots and soil;*
- *For pedestrian traffic, a plywood board with a minimum thickness of 40mm should be laid on a minimum of 100mm deep woodchip, with geotextile membrane beneath;*
- *For small plant machinery with a gross weight of up to 2 tonne, interlinking aluminium or composite tracks with sufficient load bearing capacity should be laid on a minimum of 150mm deep woodchip, with geotextile membrane beneath;*
- *For heavy machinery with a gross weight of up to 3.5 tonne, interlinking aluminium or composite track with sufficient load bearing capacity should be laid over a minimum layer of 200mm deep woodchip, with a geotextile membrane beneath;*

- *For weights above 3.5tonne a specialist temporary ground protection should be used that is capable of both supporting the required loads whilst providing protection to RPAs;*
- *Any temporary protective surfaces must remain in place until all construction activity is finished;*
- *Upon completion of construction works, the temporary ground protective measures should be removed working backwards from on top of the system. This will need to be done carefully ensure that there is no excavation or compaction of the original surface or change in ground levels; and,*
- *Once this material has been removed vehicular access to this part of the Site will not be permitted.*

Working within the Root Protection Area

- *All excavation must be carried out carefully using spades, forks and trowels, taking care not to damage the bark and wood of any roots. Specialist tools for removing soil around roots using compressed air such as an Air Spade may be an appropriate alternative to hand digging, if available;*
- *All soil removal must be undertaken with care to minimise the disturbance of roots beyond the immediate area of excavation. Where possible, flexible clumps of small roots, including fibrous roots, should be retained if they can be displaced temporarily or permanently beyond the excavation without damage;*
- *If digging by hand, a fork should be used to loosen the soil and help locate any substantial roots. Once the roots have been located the trowel should be used to clear the soil away from them without damaging the bark. Exposed roots that are to be removed should be cut cleanly with a sharp saw or secateurs 100-200mm behind the final face of the excavation; and,*
- *Roots temporarily exposed must be protected from direct sunlight, drying out and extreme temperatures by appropriate covering. Roots greater than 25mm in diameter should only be cut in exceptional circumstances. Roots greater than 100mm in diameter should only be cut after consultation with the project arboriculturist.*

Upgrading Existing Surfaces

- *'Where upgrading of existing hard surfaces is required, the preferred option will be to leave the surface in place and install the new surface specification on top;*
- *If the retained surface is impermeable, it may be appropriate to remove or puncture sections to create a more favourable environment for roots beneath, before the new surface is laid, through consultation with the project arboriculturist;*
- *Where the existing surface is to be removed or upgraded, the surface layer should be excavated down the existing subbase and the new surface specification installed on top, to prevent any damage to roots beneath;*
- *It is recommended that where possible, new and upgraded hard surfaces should be porous (e.g. permeable brick paving, porous resin bound aggregate or tarmac) to allow the flow or water and oxygen to roots. Wet concrete should only be poured if an impermeable geotextile fabric has first been installed to prevent soil contamination from toxic leachate; and,*
- *New surfaces and upgraded surfaces should be set back from the base of stems by a minimum of 500mm to allow space for future growth and minimise the risk of distortion with new surface.'*

Services Routes

- *'All services and utilities will be installed within existing service routes and where possible outside of RPAs;*
- *Where installation of utilities or services is required within RPAs, working practices will be adopted in accordance with the National Joint Utilities (NJUG) 10, Vol 4, Issue 2, 2007 'Guidelines for the Planning, Installation and Maintenance of Utility Apparatus in Proximity to Trees';*
- *In accordance with 4.1.3 of NJUG 10 2007, acceptable techniques in order of preference include: a) Trenchless; b) Broken Trench; and c) Continuous Trench. Trenchless methods involve the use of thrust boring machinery, whilst broken and continuous trench methods require that excavations within RPAs are carried out using hand tools only; and,*
- *For a proposal of this nature, broken or continuous trench methods are the most appropriate and should be employed as per NJUG 10, to prevent any damage to tree roots or disruption to soil rooting environments.'*

Soft Landscaping

- *'To avoid damage to existing tree roots and prevent soil compact, any machinery used to remove the existing surface and ground vegetation for purposes of soft landscaping (e.g. seeding new lawns or laying turf) should be sited outside of RPAs. If this is not possible, hand tools must be used;*
- *The removal of the surface layer with RPAs must not exceed 50mm, to prevent exposure and damage of tree roots beneath;*
- *Soft landscaping works must not involve raising or lowering of the existing ground level within any RPA as this can starve roots of oxygen and cause irreversible physiological damage to trees;*
- *The use of rotavators within RPAs is prohibited; and,*
- *Any level changes outside RPAs must be graded to marry existing soil levels within RPAs.*

It is the responsibility of the main contractor to ensure that all Site personnel fully understand the protection measures on the Site, that tree protection measures are adhered to at all times, and that the project arboriculturist is contacted if there are any issues related to trees.'

4.2.4 Protection for Bats during the Felling of Mature Trees

In order to ensure that vegetation clearance works in relation to the Proposed Development do not have a significant impact on bats, the following procedures and mitigation measures will be implemented as part of the Proposed Development:

- In advance of construction commencing, updated bat inspections will be required to confirm the presence / absence of roosting bats within the trees that will be removed as part of the Proposed Development;
- The felling of trees with suitable roosting features will be carried out under the supervision of the ECoW and will be felled using hand tools only;
- The ECoW will visually inspect the trees following the felling for the presence of bats;
- Felled trees should be pushed gently to allow potential bats within to become active;
- Felled trees should then be left in place for at least 24 hours to allow bats to escape before removal offsite;

- If bats were to be found to be roosting within the trees, further measures will be considered in order to protect bats against disturbance and the NPWS will be consulted for advice and a derogation licence will be obtained, if required, and,
- The management and removal of trees at the Site will be undertaken in a systematic way to ensure that retained trees will not be damaged by the works.

4.2.5 Landscape Plan

A Landscape Plan has been prepared by MacroWorks and attached as Appendix 6-4 of the EIAR. This landscape plan comprises a screening planting mix around the northern and western boundary of the Site which will infill and bolster existing hedgerows and trees. Species within this screening planting mix will comprise of a native whip planting mix and advanced nursey stock, and will be allowed to grow to reach maturity, which will provide potential foraging, commuting and roosting habitats for bats in the future. Existing hedgerows will also be allowed to grow a minimum of 8m high and will be pruned for width and density.

The grassland will also be managed in a way that promotes species diversity, including measures that allow seed heads to form before mowing takes place. The landscape plan will ensure ecological connectivity onsite, ensuring that bats will be able to use the existing and new hedgerows / treelines for foraging and commuting purposes.

The following landscape recommendations are also advised:

- Avoid the use of herbicides and chemicals (weed killers, etc.) within the development zone where possible.

4.2.6 Provision of Alternative Roosting Habitats

It is proposed to install artificial bat boxes within the Site. Artificial bat boxes will be erected on suitable mature trees within the Site. Artificial bat boxes can provide vital roosting places in habitats devoid of natural roosting opportunities. Bat boxes can also provide additional suitable roosting habitats for bats in an area.

Bat boxes should be placed in a position sheltered from strong wind and exposed to the sun for part of the day. The boxes will be located in / close to linear features, such as the treelines and placed a minimum of 2m above the ground. The number and location of which will be specified by an ecologist. Figure 4-3 below shows suitable bat roost box examples including a Pole Mounted Bat Box, Bat Box Schwegler 1FF and Vivara Small Bat Box.

The exact location of the bat boxes will be determined by an experienced ecologist after the completion of the construction phase of the Proposed Development. This is to allow the ecologist to assess the onsite conditions and will ensure that the bat boxes are situated in the most appropriate location possible.

Figure 4-3: Examples of suitable bat boxes

4.2.7 Monitoring

Following the installation of the lighting associated with the operational phase of the Proposed Development, a suitably qualified and experienced ecologist will undertake a further Site inspection to inspect the lighting patterns and lux levels along the hedgerows / treelines on the Site and the findings will be presented to the Planning Authority.

5 CONCLUSIONS

The bat surveys undertaken for the Proposed Development included a walkover of the lands within the Site during a daytime visit, tree inspections, external building inspections, two (2No.) dusk emergence surveys, one (1No.) dawn emergence survey, two (2No.) dusk transect surveys, one (1No.) dawn transect survey and static monitoring surveys.

The results of the surveys can be summarised as follows:

- The inspections of the Site identified suitable potential roosting habitats for bats within buildings and trees on site, and suitable potential foraging and commuting habitats for bats along the hedgerows/treelines that border and traverse the Site;
- Eight (8No.) of the nine (9No.) resident Irish bat species were recorded across the survey events onsite;
- Common pipistrelle were the most frequently recorded species during the dusk and dawn surveys, as well as the static monitoring surveys;
- The buildings were subject to emergence and re-entry surveys; however, no bats were observed roosting within the buildings;
- The transect surveys did not identify bats roosting within any trees onsite, but identified moderate to high activity from foraging and commuting bats at most transects along the boundary hedgerow/treelines and over the buildings and vegetation in the centre of the Site;
- Based on the bat activity within the Site shortly after sunset during the dusk surveys and right before sunrise during the dawn surveys, it is considered likely that there are bats roosting within the vicinity of the Site; however, no bat roosts were identified within the Site; and,
- It was concluded that the Site is of high local value for foraging and commuting bats.

The Proposed Development will result in some loss of some commuting/foraging habitats for bats, as mixed species groups of vegetation and some individual trees that bats were observed foraging and commuting over will be removed. However, the majority of the habitats that bats were observed using onsite, including all boundary hedgerows/treelines, will be retained.

Additionally, plantings on site will result in a net-gain canopy cover, providing additional potential foraging and commuting habitats for bats once trees become mature. The replacement and enhancement plantings will also ensure landscape connectivity remains onsite. While the lighting on site will result in some light spillage onto retained hedgerow/treelines that bats were observed foraging and commuting along, pipistrelle and Leisler's species will likely still use the Site for foraging and commuting.

It is considered that if the mitigation measures presented within this report are followed, significant impacts on bats will be reduced and the overall impact from the Proposed Development on bats will not be significant.

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APPENDIX 6-2

February 2024

Bird Report

Proposed Plasterboard Manufacturing Plant

On behalf of GABM Ltd.

Gorteens, Co. Kilkenny

MALONE O'REGAN ENVIRONMENTAL

Form ES - 04

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Job Number: E2077

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Revision Record

Issue No.	Date	Description	Remark	Prepared	Checked	Approved
01	29/02/24	Bird Report	Final	HT	AK	DH

Bird Report

Proposed Plasterboard Manufacturing Plant

GABM Ltd.

Gorteens, Co. Kilkenny

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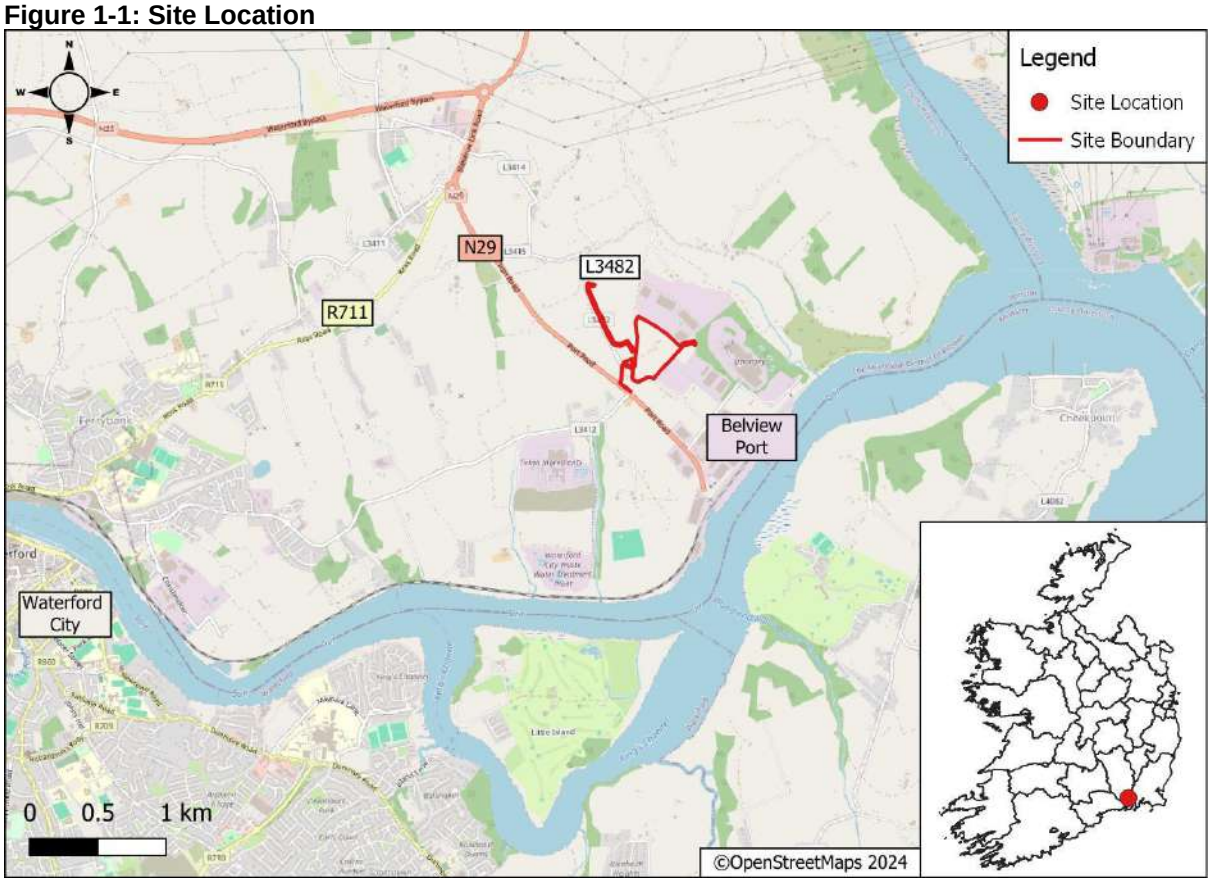
1 INTRODUCTION

Malone O'Regan Environmental (MOR) has been commissioned by GABM Ltd. ('the Applicant') to undertake breeding bird surveys to assess the likely effects, if any, from the construction and operation of a proposed plasterboard manufacturing plant, a waste gypsum handling plant, a site access road, infrastructure, and associated works ('the Proposed Development').

The Proposed Development will be located on a site that is circa (ca.) 11.57 hectares (ha) in size and is located on a greenfield site within the townland of Gorteens, Slieverue, Co. Kilkenny (ITM 665240 614063), ca. 5km northeast of Waterford City and is shown in Figure 1-1 ('the Site').

Figure 1-1: Site Location



1.1 Purpose of the Report

The purpose of this report is to outline the methodologies and results of the bird habitat assessment and the breeding bird surveys undertaken at the Site.

Bird Habitat Assessment

The aim of the bird habitat assessment was to ascertain the potential of the Site to provide suitable habitat for breeding birds, to support important assemblages of wintering birds or support rare or notable species.

Breeding Bird Surveys

The aim of the breeding bird survey aimed to assess the following:

- To identify and assess the number of active breeding bird territories within the Site;

- To map active nests, where present, within the Site;
- To evaluate the overall bird community within the Site by recording all behavioural activity of birds;
- Utilise the information in order to identify and assess any areas of the Site that may require special consideration during the breeding bird season;
- Assess all potential impacts, if any, of the Proposed Development on breeding bird species; and,
- Provide additional mitigation measures, should they be required.

1.2 Legislation Relevant to Wild Birds

All wild birds are protected by law under the Wildlife Act 1976 and subsequent amendments. All species are afforded full protection under this Act, which makes it a criminal offence for anyone without a licence to:

- Kill or injure a wild bird;
- Disturb, damage or remove a wild bird nest or eggs; and,
- Disturb any wild bird while at the nest.

In addition to domestic legislation birds are also protected under the EU Birds Directive (2009/147/EC). The Birds Directive provides for a network of sites to protect birds at their breeding, feeding, roosting and wintering areas.

For the purposes of this report, a species was considered to be of 'conservation concern' should it be included one or more the following:

- Annex 1 of the EU Birds Directive.
- Part 1 of the Fourth Schedule of the Wildlife Act, 1976 (as amended).
- Birds of Conservation Concern in Ireland (BoCCI) red list; and,
- BoCCI amber list.

1.3 Statement of Authority

This report was prepared by Mr. Henry Tennyson, Environmental Consultant. Henry is a qualifying member of the Chartered Institute of Ecology and Environmental Management (CIEEM) and over three years' experience working in the environmental consultancy sector, including the preparation of Appropriate Assessments, habitat surveys and specialist protected species surveys.

This report was checked by Ms. Amelia Keane, Senior Environmental Consultant - Ecology. Amelia is a qualify of the CIEEM and has over four years' experience working in the ecological consultancy with a specialist interest in ornithology. As part of her role, Amelia is required regularly conducts ornithological surveys and prepare specialist ornithological assessments and reports.

The report was approved by Mr. Dyfrig Hubble, Associated Director - Ecology. Dyfrig is a full member of the Chartered Institute of Ecology and Environmental Management. Dyfrig has over 18 years' experience working in the ecological consultancy sector, including habitat surveys and appraisals and specialist protected species surveys in support of Planning Applications.

2 METHODOLOGY

The methodologies used to establish the presence or potential presence of breeding birds and potentially suitable habitat are summarised below.

2.1 Desk Study

A desk-based review of information sources was completed, which included the following sources of information:

- Review of aerial maps of the Site and surrounding area;
- The National Parks and Wildlife Service (NPWS) website was consulted to obtain the most up to date detail on conservation objectives for the European sites relevant to this assessment [1];
- Bird Watch Ireland – The Irish Wetland Bird Survey (I-WeBS) data was reviewed with regard to wintering waterbird population within the vicinity of the Site [2]; and,
- The National Biodiversity Data Centre (NBDC) website was consulted with regard to species distributions within 2km of the Site [3].

2.2 Field Studies

2.2.1 Habitat Assessment

The Site was assessed for its potential to support assemblages of birds of rare or notable species, as well as designated bird species. As part of this assessment, a habitat survey was undertaken using the Fossitt's '*Guide to Habitats in Ireland'* [4].

The habitat survey aimed to identify the extent and quality of habitats present on the Site. The initial survey was carried out by two (2No.) suitably qualified MOR ecologists on the 13th March 2023. A follow up habitat survey was carried out on the 31st May 2023 by two (2No.) suitably qualified MOR ecologists.

2.2.2 Bird Habitat Assessment

During the initial survey, the Site was assessed for its potential to provide nesting habitat for breeding birds, to support important assemblages of wintering birds or support rare or notable species.

All field boundaries were walked, and the habitats onsite were fully assessed for their potential to provide suitable nesting, winter roosting habitat or foraging habitat. Areas of dense hedging, scrub habitat, wet grassland habitat, tall grassland habitat and onsite water features were noted.

Following the initial Site assessment, a desk-based review and review of the design of the Proposed Development, it was deemed necessary to undertake specialist breeding bird surveys onsite.

2.2.3 Breeding Bird Survey

Breeding bird transect surveys were undertaken on the 19th April, the 26th May and the 9th July 2023. These breeding bird surveys were conducted in line with the methodology described in:

- BTO - *A Field Guide to Monitoring Nests* [5]; and,
- Common Bird Census in *Bird Monitoring Methods* [6].

In order to establish whether any breeding bird species were utilising the Site or the airspace above the Site, the Common Bird Census (CBC) methodology was utilised. The transect

survey was designed to cover all accessible habitat within the Site (see Figure 2-1) and was undertaken by a suitably qualified and experienced MOR ecologist.

All birds were recorded through sight and sound. Optical equipment was used, including binoculars, in order to minimise disturbance to potentially breeding birds. Suitable vegetation onsite was examined for the presence of nests. During the survey, the behavioural activity of the recorded birds was noted using the BTO breeding status codes [2]. Birds that displayed non-territorial behaviours were recorded as well (i.e., birds that were foraging and not calling, birds that were loafing).

Therefore, birds were classified as non-breeding, possibly breeding and confirmed breeding based on the behaviours exhibited. The criteria for each classification is described below:

- Non-breeding – Birds that were flying over the Site, birds that were foraging and not calling, birds that were loafing;
- Possibly Breeding – Birds observed in suitable nesting habitat and displaying either territorial and / or courtship behaviours, nest building behaviours or observed visiting a possible nest; and,
- Confirmed Breeding – Birds observed either on nest or carrying faecal sac or food, sighting of a nest with eggs / chicks, used nests, eggshells or recently fledged young.

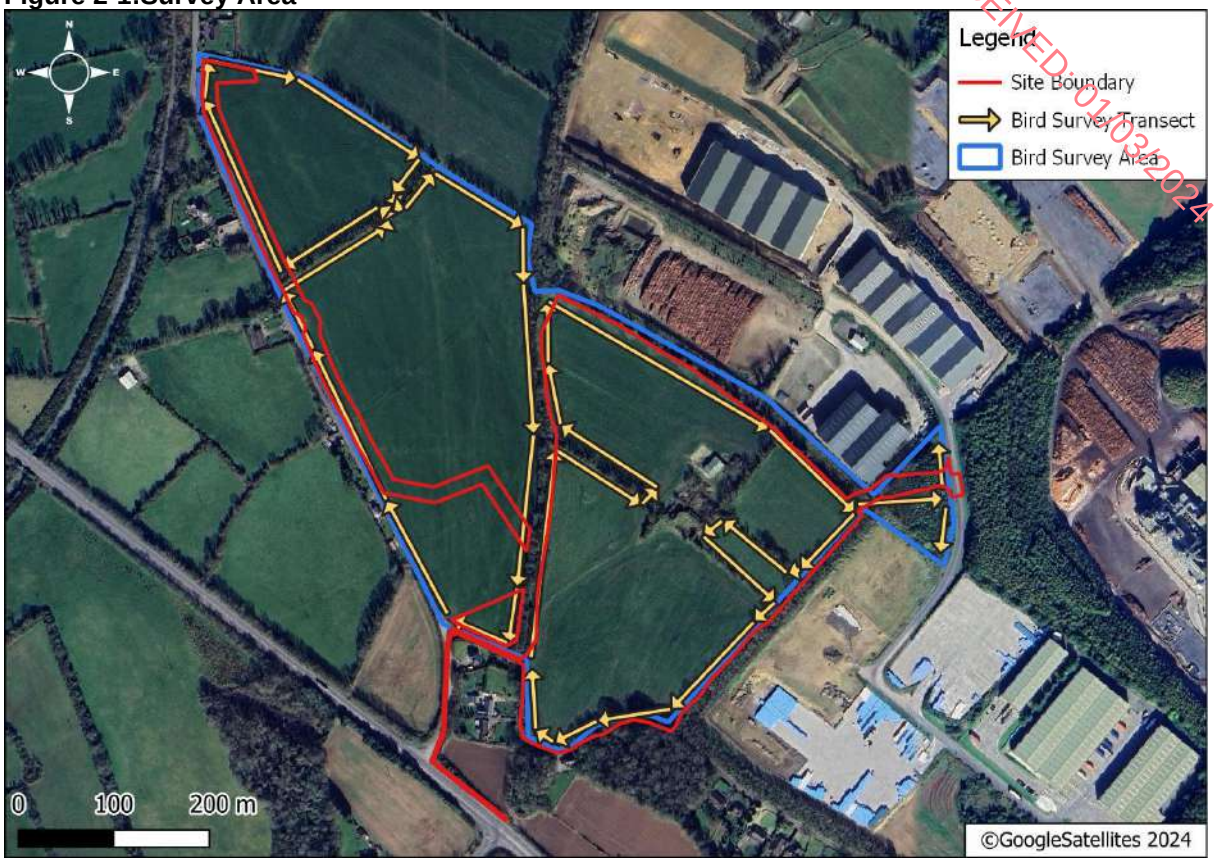
The metadata for the breeding bird surveys are described in Table 2-1.

Table 2-1: Breeding Bird Survey Metadata

Visit	Date	Survey Times (Start-End)	Temperature (°C) (Start – End)	Wind (Beaufort Wind Scale)	Rain	Cloud Cover
1*	19/04/2023	07:45 – 09:10	8°C-9°C	4	None	100%
2	26/05/2023	07:50 – 09:00	12°C-15°C	3	None	0-33%
3	09/07/2023	07:45 - 09:20	13°C -15°C	2	None	0-33%

*Note: Visit 1 did not include lands to the northwest that encompassed the berm.

Figure 2-1:Survey Area



2.3 Survey Constraints

During the first detailed ecological survey undertaken at the Site in March 2023, it was noted that two sections of hedgerows had been recently removed. This included a section of hedgerow ca. 125m in length that separated three (3No.) fields in the northern section of the Site and also a section of hedgerow / treeline, ca. 30m in length along the western site boundary. MOR were advised by the Applicant that these hedgerows had been removed by the landowner in February 2023. These 2No. sections of hedgerows / treelines were unable to be surveyed as part of the EIAR.

For the purpose of this EIAR, MOR made conservative assumptions with regards to the habitat type that may have been present, based on aerial imagery and the findings of the other detailed surveys that were completed on adjoining lands. It is considered that given the results of multiple surveys that were successfully completed and the similar nature of the habitats on-site, the results of the breeding bird surveys that were completed provide an accurate assessment of the ecological value of the overall Site for breeding / wintering birds.

In addition, due to the nature of bird surveys, it is considered that there is potential that some birds may have been missed due to the fact that birds may not have been vocalising or seen in the dense vegetation. However, given the fact that the results of multiple surveys were combined and given the simple nature of the habitats onsite, it is considered that the results of the breeding bird surveys provide an accurate assessment of the ecological value of the Site for breeding / wintering birds.

No other surveys constraints identified.

2.4 Avian Receptor Evaluation

The value of the avian receptors at the Site were evaluated using the ecological evaluation guidance given in the National Roads Authority (NRA) guidance on assessment of ecological impacts of National Road Schemes [7]. This guidance provides ratings for resources based primarily on geographic context and allows for resources at International, National, County and Local (higher and lower value) levels. Key ecological receptors for assessment are those deemed to be above the 'Local Importance (lower value)' evaluation (see Table 2-2 below).

Table 2-2: NRA Guidance for Evaluation Criteria relevant to Avian Fauna

Resource Evaluation	Criteria
International Importance	'European Site' including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA), proposed Special Area of Conservation, or Proposed Special Protection Area (pSPA). Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971). World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972). Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979). Resident or regularly occurring populations (assessed to be important at the national level) of the following: • Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive.
National Importance	Site designated or proposed as a Natural Heritage Area (NHA), Statutory Nature Reserve, Refuge for Fauna and Flora protected under the Wildlife Acts, or National Park, Resident or regularly occurring populations (assessed to be important at the national level) of the following: • Species protected under the Wildlife Acts; and / or • Species listed on the relevant Red Data list.
County Importance	County important populations of species, or viable areas of semi-natural habitats or natural heritage features identified in the National or Local BAP (if this has been prepared). Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level. Resident or regularly occurring populations (assessed to be important at the County level) of the following: • Species of bird, listed in Annex I and / or referred to in Article 4(2) of the Birds Directive. • Species protected under the Wildlife Acts; and / or, • Species listed on the relevant Red Data list.
Local Importance (High Value)	Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP (if this has been prepared). Resident or regularly occurring populations (assessed to be important at the Local level) of the following: • Species of bird, listed in Annex I and / or referred to in Article 4(2) of the Birds Directive. • Species protected under the Wildlife Acts; and / or, • Species listed on the relevant Red Data list.

Resource Evaluation	**Criteria**
Local Importance (Low Value)	Species that remain common and widespread. Green-listed species.

3 RESULTS

3.1 Desk Study

3.1.1 National Biodiversity Data Centre

The NBDC was consulted for records of bird species within 2km of the Site [3]. Table 3-1 below provides a summary of the records of birds that occur within 2km of the Site in the last 10 years. CIEEM's guidelines recommend that consideration be given to the biodiversity conservation value of the species that occur within this zone of influence [8].

Table 3-1: NBDC records for bird species with 2km of the Site[1] (NBDC Grids: S61L, S61M, S61R and S61R)

Common Name	Scientific Name	Date of last record	Designation
Bird Species			
Barn Swallow	*Hirundo rustica*	10/05/2022	Wildlife Acts 1976 / 2000 Birds of Conservation Concern Amber List
Common Buzzard	*Buteo buteo*	10/05/2022	Wildlife Acts 1976 / 2000 Birds of Conservation Concern Green List
Eurasian Curlew	*Numenius arquata*	17/07/2016	Wildlife Acts 1976 / 2000 EU Habitats Directive Annex II Section II Bird Species Birds of Conservation Concern Red List
Common Pheasant	*Phasianus colchicus*	10/05/2022	Wildlife Acts 1976 / 2000 EU Habitats Directive Annex II Section I and Annex III and Section I Bird Species
Great Spotted Woodpecker	*Dendrocopos major*	19/12/2022	Wildlife Acts 1976 / 2000 Birds of Conservation Concern Amber List

3.1.2 Irish Wetland Bird Survey (I-WeBS)

The Site is not located within or adjacent to any Special Protection Areas (SPA), however, the Site is located ca. 800m north of the River Suir. The River Suir forms part of the '*River Suir Lower'* I-WeBS site. Therefore, in order to determine potential species that may utilise the Site or the wider area during the winter months, a data request was submitted to the I-WeBS, which is coordinated by BirdWatch Ireland and under contract to the NPWS. The data request was for all available data from the nearest I-WeBS sites. This included a number of subsites within the River Suir Lower site and the Waterford Harbour site:

- River Suir Lower: Belview – Little Island – Faithlegg (Subsite code: 0M390);
- River Suir Lower: Coolfinn (Subsite code: 0M360);
- River Suir Lower: Derrigal – Portnascully (Subsite code: 0M361);

[1] Note that only species recorded within the past 10 years were included in this table. The parameter of 10 years was chosen to allow for habitat adaption and modification, it is considered that any records over 10 years old are not representative of the current distribution of species populations.

- River Suir Lower: Fiddown – Tibberaghny (Subsite code: 0M398);
- Waterford Harbour: Barrow Bridge – Passage East (Subsite code: 0M496); and,
- Waterford Harbour: Barrow Bridge – Creadan Strand (Subsite code: 0M498).

These records were reviewed in order to gain an understanding into the potential assemblages of bird populations that may utilise the Site or the adjoining fields.

The data received from BirdWatch Ireland covers a period from 2012/2013 winter season to 2021/2022 winter season. A total of thirty-five (35No.) species have been recorded during the 10-year period. However, during the 2020/2021 winter season, a total of fourteen (14No.) species were recorded, which included bean goose, black-headed gull, common gull, cormorant, curlew, greenshank, grey heron, greylag goose, little egret, mallard, mute swan, pink-footed goose, teal and whooper swan.

None of the species recorded in the last 10-years were recorded in numbers that would be considered of international importance. However, several species were recorded in numbers that would be considered to be of national importance, including:

- Bar-tailed godwit were recorded at numbers of national importance during the 2013/2014 season in the Waterford Harbour at Passage East - Creadan Head;
- Great crested grebe were recorded at numbers of national importance during the 2013/2014 season in the Waterford Harbour at Passage East - Creadan Head;
- Greylag geese were recorded at numbers of national importance at River Suir - Coolfinn during the 2012/2013 season;
- Greylag geese were recorded at numbers of national importance at River Suir - Derrigal – Portnascully during the 2012/2013, 2013/2014, 2014/2015, 2015/2016, 2017/2018, 2018/2019 and 2019/2020 seasons; and,
- Greylag geese were recorded at numbers of national importance at River Suir - Fiddown - Tibberaghny during the 2012/2013, 2015/2016, 2016/2017, 2018/2019, 2019/2020 and 2021/2022 seasons.
- Teal were recorded at numbers of national importance during the 2013/2014 & 2014/2015 seasons in the River Suir at Fiddown – Tibberaghny.

It should be noted that these subsites are not located within the immediate vicinity of the Site, the nearest records to the Site would be from the Passage East area which is located ca. 6km southeast of the Site. Therefore, these populations of bird species are not located within close proximity to the Site. Furthermore, it should be noted that none of these species identified are considered to exclusively occur within this area.

3.2 Field Studies

3.2.1 Habitat Assessment

The habitat assessment identified five (5No.) habitats within the Site. These habitats were described as follows:

Improved Agricultural Grassland (GA1)

Improved agricultural grassland is the dominant habitat within the Site. The Proposed Development will be located between four (4No.) fields of improved agricultural grassland.

These fields were all intensively managed and were species poor habitats. The species were predominantly made up of perennial ryegrass (*Lolium perenne*.) and clover species (*Trifolium spp*.).

Mixed Broadleaf Woodland (WD1)

An area of immature woodland was located on the northeastern section of the Site as shown in Figure 3-1. The habitat was made up on a dense mix of ash (Fraxinus excelsior), sycamore (*Acer pseudoplatanus*), wild cherry (*Prunus avium*), oak (*Quercus sp.),* hawthorn (*Crataegus monogyna*), elm (*Ulmus glabra*) and Scots pine (*Pinus sylevstris*).

Scrub (WS1)

There were two (2No.) areas of scrub located within close proximity to the derelict buildings, agricultural shed and artificial surfaces (BL3), and one (1No.) on the eastern section between the agricultural grassland and immature woodland. There were trees within the scrub area. This area was highly influenced by agricultural practices on the Site.

The species comprised of hawthorn, elm, Laurel (*Laurus nobilis*), elder (*Sambucus nigra*), ash, field maple (*Acer campestre*), hazel (*Corylus avellana*) and rowan (*Sorbus aucuparia*).

Hedgerow / Treeline (WL1 / WL2)

There were hedgerow / treelines on the boundaries of the Site and transversing the Site. The hedgerow / treeline was comprised of hawthorn, blackthorn (*Prunus spinosa*), holly (*Ilex aquifolium*), wych elm, ash, pedunculate oak (*Quercus robur*), turkey oak (*Quercus cerris*), crab apple (*Malus sylvestris*), sycamore (*Acer pseudoplantanus*), beech (*Fagus sylvatica*), small leaf lime (*Tilia cordata*), wild cherry and plum (*Prunus domestica*). Refer to Figure 3-1 for details on the locations of hedgerow / treelines.

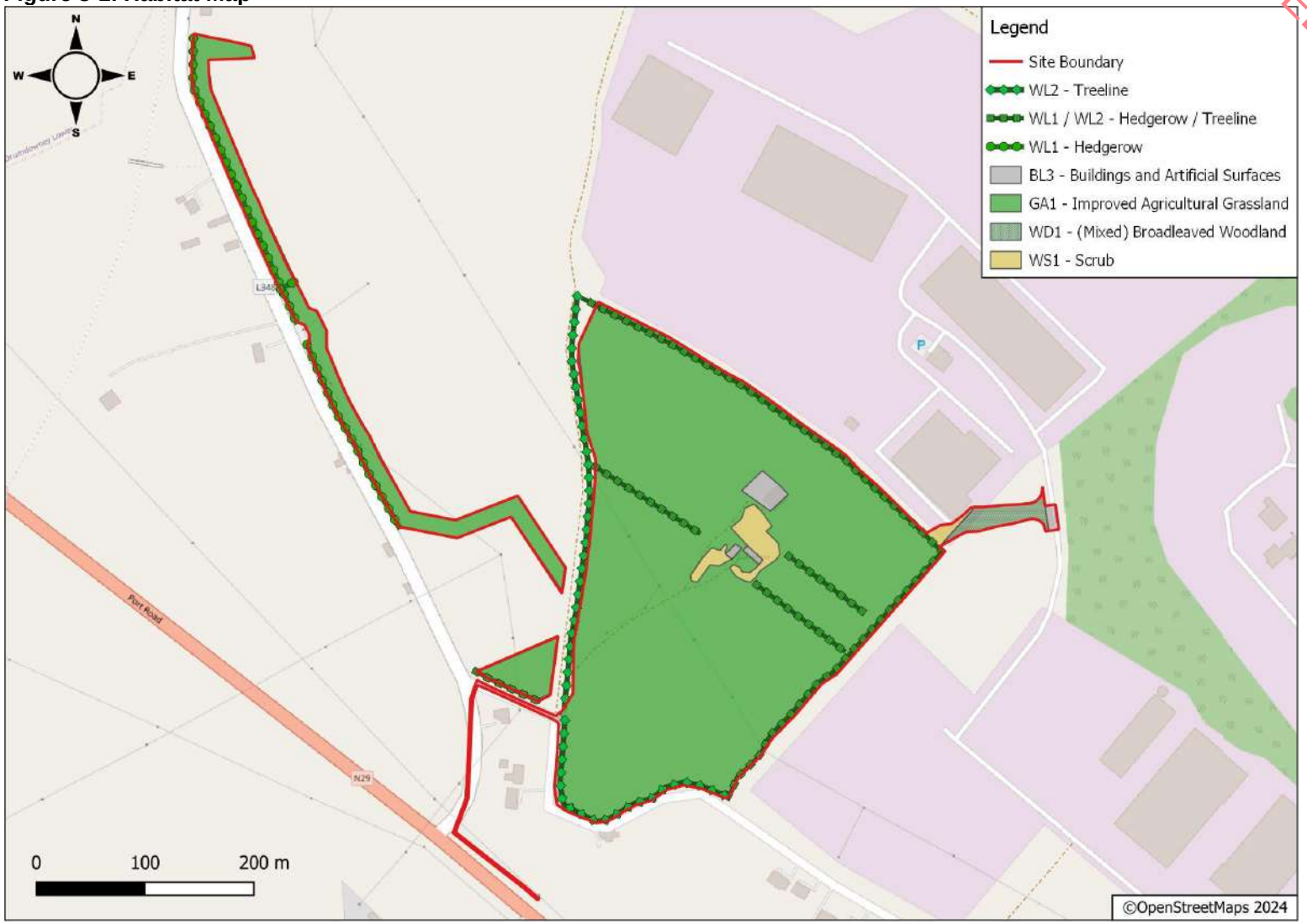
Buildings and Artificial Surfaces (BL3)

There were three (3No.) buildings located within the Site boundary – two (2No.) derelict houses and one (1No.) agricultural shed. Additionally, there was an area of hard-standing that was previously used as an agricultural yard around the agricultural shed.

The two (2No.) derelict houses located on the Site were not in use and were overgrown with ivy and in poor condition. Full details are provided in Chapter 13 of the EIAR submitted as part of this planning application.

The L3482 local road is part of the Site boundary and was made up of artificial surfaces.

Figure 3-1: Habitat Map



3.2.2 Bird Habitat Assessment

The habitats within the Site and the adjoining fields are primarily comprised of improved agricultural grassland (intensively managed), scrub, areas of hard standing and buildings. There are also a number of hedgerows / treelines and wooded areas within the Site and surrounding the Site.

Winter Bird Habitat Assessment

It is considered that the agricultural grassland fields may provide suitable habitat foraging habitat for wintering birds. However, there are no onsite waterbodies that are considered suitable for wintering waterbirds or wildfowl. In addition, the onsite habitats are common throughout Ireland and within the immediate vicinity of the Site.

Breeding Bird Habitat Assessment

The broadleaved woodland, hedgerow / treelines and areas of scrub were considered to provide suitable nesting and foraging habitat for breeding countryside birds. In addition, the agricultural grassland onsite may provide suitable foraging habitat for breeding birds. However, there are no waterbodies located onsite and as such it is considered that the Site does not have suitable habitat for breeding waterbirds. In addition, at the time of the Site surveys the agricultural grassland were being utilised for the production of fodder for livestock (i.e., silage production), which may provide suitable nesting habitat for ground-nesting birds.

3.2.3 Breeding Bird Surveys

Table 3-1 contains a summary of the birds recorded onsite and their status according to the Birds of Conservation Concern in Ireland (BoCCI), which is the third assessment of the status of all regularly occurring birds on the island of Ireland [9].

During the breeding bird surveys, a total of twenty-six (26No.) species were recorded:

- Twenty-two (22No.) Green-listed BoCCI non-Annex I species– blackbird, blackcap, blue tit, buzzard, chaffinch, chiffchaff, dunnock, garden warbler, great tit, greenfinch, goldfinch, hooded crow, long-tailed tit, magpie, pheasant, pied wagtail, robin, rook, song thrush, stonechat, woodpigeon and wren;
- Three (3No.) Amber-listed BoCCI, non-Annex I species were recorded - barn swallow, goldcrest and lesser black-backed gull; and,
- One (1No.) Red-listed BoCCI, non-Annex I species was recorded – swift.

Of the species recorded three (3No.) were classified as '*Confirmed Breeding,*' buzzard, goldfinch and barn swallow (see Table 3-1 below). An active buzzard nest was noted in the hedgerow / treeline, goldfinch chicks were heard calling from a hedgerow and a barn swallow nest was noted in the agricultural shed. In addition, fifteen (15No.) other species were classified as '*Possibly Breeding'* and eight (8No.) species were classified as non-breeding.

Details on the species that were recorded, their abundance and their behaviours are provided in Table 3-1 below.

Table 3-1: Birds Recorded within the Survey Area during the Breeding Bird Surveys

BoCCI Conservation Status (EU Birds Directive Annex Species)	Species	Latin Name	Number Recorded			Behaviour Activities	Breeding Status
			Visit 1	Visit 2	Visit 3		
Green-listed	Blackbird	*Turdus merula*	9	10	1	Individuals were noted calling and perching in hedgerow / treeline, flying and foraging over improved agricultural grassland and flushed from hedgerow / treeline by surveyor.	Possibly Breeding
	Blackcap	*Sylvia atricapilla*	2	2	9	Individuals were noted calling, singing and perching in hedgerow / treeline.	Possibly Breeding
	Blue tit	*Cyanistes caeruleus*	19	16	4	Individuals were noted flying over the Site, calling aggressively, perching and foraging from hedgerow / treeline.	Possibly Breeding
	Buzzard	*Buteo buteo*	1	0	1	Individuals noted flying from nest and flying and calling over Site.	Confirmed Breeding
	Chaffinch	*Fringilla coelebs*	0	11	9	Individuals were noted singing and calling from hedgerow / treeline and perching on branch.	Possibly Breeding
	Chiffchaff	*Phylloscopus collybita*	1	1	0	Individuals noted singing from treeline.	Possibly Breeding
	Dunnock	*Prunella modularis*	1	3	1	Individuals noted calling from hedgerow / treeline.	Possibly Breeding

BoCCI Conservation Status (EU Birds Directive Annex Species)	Species	Latin Name	Number Recorded			Behaviour Activities	Breeding Status
			Visit 1	Visit 2	Visit 3		
	Garden Warbler	*Sylvia borin*	0	1	0	Individual noted singing from hedgerow / treeline.	Possibly Breeding
	Goldfinch	*Carduelis carduelis*	0	9	1	Chicks heard in hedgerow and individuals perching and calling in the hedgerows.	Confirmed Breeding
	Great Tit	*Parus major*	0	8	6	Individuals were noted calling and singing from hedgerow / treeline.	Possibly Breeding
	Greenfinch	*Chloris chloris*	2	0	2	Individuals were noted calling, perching and flying in treeline.	Possibly Breeding
	Hooded Crow	*Corvus cornix*	0	5	1	Individual noted perching on treeline before flying.	Non-breeding
	Long-tailed tit	*Aegithalos caudatus*	0	5	1	Individuals noted singing from hedgerow / treeline.	Possibly Breeding
	Magpie	*Pica pica*	0	1	0	Individual noted flying over improved agricultural grassland.	Non-breeding

BoCCI Conservation Status (EU Birds Directive Annex Species)	Species	Latin Name	Number Recorded			Behaviour Activities	Breeding Status
			Visit 1	Visit 2	Visit 3		
	Pheasant	*Phasianus colchicus*	1	0	0	Individual (female) flushed from improved agricultural grassland.	Non-breeding
	Pied Wagtail	*Motacilla alba yarrellii*	2	0	0	Individuals were noted flying over Site.	Non-breeding
	Robin	*Erithacus rubecula*	6	3	1	Individuals were noted foraging in scrub, perching, calling and singing in hedgerow / treeline.	Possibly Breeding
	Rook	*Corvus frugilegus*	0	2	8	Individuals were noted flying over the Site and calling from improved agricultural grassland.	Non-breeding
	Song Thrush	*Turdus philomelos*	1	0	0	Individual calling territorially from hedgerow / treeline.	Possibly Breeding
	Stonechat	*Saxicola rubicola*	1	0	0	Individual noted perching on tree.	Non-breeding
	Woodpigeon	*Columba palumbus*	1	8	8	Individuals were noted flying over Site and calling from hedgerow / treeline.	Possibly Breeding

BoCCI Conservation Status (EU Birds Directive Annex Species)	Species	Latin Name	Number Recorded			Behaviour Activities	Breeding Status
			Visit 1	Visit 2	Visit 3		
	Wren	*Troglodytes troglodytes*	22	18	30	Individuals were noted calling, singing, perching and flying in hedgerow / treeline.	Possibly Breeding
Amber-listed	Goldcrest	*Regulus regulus*	0	0	1	Individual was noted calling in hedgerow / treeline.	Possibly Breeding
	Barn Swallow	*Hirundo rustica*	1	11	22	Individuals were noted flying over Site and perching on the powerlines. During Visit 2, one (1No.) nest was identified within the agricultural shed.	Confirmed Breeding
	Lesser Black-backed Gull	*Larus fuscus*	0	1	0	Individual was noted flying over Site.	Non-breeding
Red-listed	Swift	*Apus apus*	0	0	2	Individuals were noted flying over improved agricultural grassland.	Non-breeding

4 SITE ASSESSMENT

During the breeding bird surveys, a total of twenty-six (26No.) avian species were recorded within the survey area. The species recorded are considered to be common within the Irish countryside and none of these species were present in significant numbers.

4.1 Breeding Bird Assessment

During the breeding bird surveys, a total of twenty-six (26No.) avian species were recorded, and of these species:

- Three (3No.) species were confirmed to be breeding within the survey area – two (2No.) species within the hedgerow / treeline and one (1No.) species within the agricultural shed;
- Fifteen (15No.) species displayed territorial behaviours that were classified as possibly breeding within the hedgerow / treelines; and,
- Eight (8No.) species were categorised as non-breeding.

The majority of birds identified within the study area were observed within the hedgerows / treelines and woodland for nesting / possible nesting and were observed foraging within the agricultural grasslands. These habitats are common throughout the wider landscape. No ground nesting bird species were recorded during the surveys and no species were noted utilising silage or scrub habitat for nesting purposes. Although some bird species were noted foraging within the agricultural grassland, due to the intensive management of the land and field being mowed out several times during the summer months it is considered that this habitat is of limited ecological value. In addition, barn swallows were observed nesting in the agricultural shed onsite.

Overall, the Site is not considered to be of significant importance for any breeding species given the fact that only three (3No.) species were confirmed to be breeding within the survey area.

Therefore, according to the receptor evaluation set out in Table 2-2, none of the species recorded as confirmed breeding within the survey area were considered to be of International, National or County importance. Therefore, it is considered that these species are of Local Importance (Low Value).

4.2 Winter Bird Assessment

As mentioned in Section 3.1.2, The Site is comprised of agricultural grassland, scrub, buildings and artificial surfaces, and hedgerow / treelines that traverse and surround the Site. In addition, the habitats within the survey area were also comprised predominantly of improved agricultural grassland and hedgerow / treelines. Within the wider area, there are agricultural fields, residential properties and industrial facilities including SeedTech warehouses and existing Suir Shipping facilities are located within the vicinity of the Site.

Of the thirty-five (35No.) species recorded in the I-WeBS from 2012/2013 winter season to 2021/2022 winter season, only one (1No.) has been recorded by the NBDC within 2km of the Site in the last ten (10No.) years – Eurasian curlew. Curlew typically prefer wetland or coastal habitats during the winter period [10], although it is not uncommon for this species to occur in flocks in pastures on coastal areas, similar to the Site [11]. However, given the level of disturbance onsite from agricultural practices and levels of industry surrounding the Site, it is not considered that the Site is of importance for this species, and it is likely that this species will utilise areas closer to the River Suir / Waterford Estuary.

Additionally, given the inland nature of the Site and the distance separating the Site from the nearest SPA (Tramore Back Strand SPA: Site Code – 004027), 11.1km, it is considered that

wintering wetland / waterbird species will utilise wetland and coastal areas closer to the SPA or Waterford Estuary.

It is possible that wintering countryside bird species may utilise the Site as a potential foraging ground or roost within the hedgerow / treelines. However, given the fact that the Site and surrounding fields are comprised predominantly of agricultural grassland and based on desk-based assessments, it is considered that the Site and study area are not considered to be sites of importance for wintering bird species.

5 IMPACT ASSESSMENT AND MITIGATION

This section will assess potential impacts, if any, on breeding and wintering bird species within the Site and the vicinity of the Site and will put forward mitigation measures, if required, that will be implemented as part of the Proposed Development to ensure no adverse effects occur to any bird species.

5.1 Potential Impacts

5.1.1 Construction Phase

5.1.1.1 Breeding Birds

As mentioned in Section 4 above, the Site is considered to provide suitable nesting habitats for breeding birds through the treelines / hedgerows, onsite buildings and scrub, and provides suitable foraging habitats for breeding birds through the agricultural grassland, scrub and hedgerow / treelines. However, these habitats are abundant within the wider area, and it is considered that the Site is not a site of importance for breeding birds.

It is not considered that the Proposed Development will have a significant impact on birds given the nature of the habitats present onsite as well as the type of farming activities being undertaken onsite and the industrial activities within the wider area. Although, birds may be subject to some temporary disturbance during construction, this is not considered likely to be significant given the fact that birds are highly mobile and therefore will move away from disturbances. As such, it can be concluded that should any birds be disrupted during any of the works they will move to a suitable area elsewhere.

However, as part of the Proposed Development, the following clearance / removal works will be required:

- Removal of sixteen (16No.) trees (1,572m^2);
- Removal of four (4No.) groups of trees and scrub vegetation (735m^2);
- Removal of one (1No.) hedgerow (259m);
- Removal of a section of immature woodland (1,1562m^2); and,
- The demolition of the onsite buildings, including the agricultural shed.

Therefore, although the majority of the onsite hedgerows / treelines will be retained and protected, mitigation measures will be required in order to ensure no impacts occur to breeding birds during the vegetation removal and demolition works.

5.1.1.2 Wintering Bird Species

It is not considered that the Site is of importance for wintering bird species based on the desk-based assessment and the habitats present onsite.

Wintering waterbird and wildfowl species tend to preference habitats similar to those present along the River Suir and the Waterford Estuary including mudflats, marshlands and coastal grasslands, all of which are located within the wider area. Therefore, it is considered that wintering waterbird species would be likely to utilise these areas as opposed to the onsite habitats. In addition, the onsite habitats may provide suitable foraging and roosting habitat for wintering countryside bird species; however, given the abundance of this habitat within the wider area, it is considered that the Site is not a site of importance for wintering bird species.

Overall, the required vegetation clearance and loss of agricultural grassland onsite may result in a loss of foraging grounds to wintering bird species. However, the implementation of the landscape plan will provide suitable habitat for wintering countryside bird species.

Therefore, based on the desk-based assessments, it is considered that the Proposed Development will result in a negligible impact on wintering bird species.

5.1.2 Operational Phase

As part of this application, a Noise Impact Assessment has been undertaken and provides baseline noise levels and predicted noise levels from the Proposed Development (refer to Chapter 11 of the EIAR). The assessment states that the existing sound levels at the Noise Sensitive Receptors averaged $L_{Aeq,T}$ values ranged from 33dB to 58dB over the daytime and night-time. According to the predicted noise models, during the operational phase of the Proposed Development, it is considered that the Proposed Development will result in a change of +1dB and below during the daytime and + 3dB and below on the existing ambient evening time and night-time background noise levels of the Site.

Given the close proximity to nearby industrial developments and the current agricultural management of the Site, it is considered likely that bird species within the locality are habituated to the disturbed environment. Furthermore, studies have shown that the levels of disturbance on waterbirds in highly disturbed areas, such as industrial area and adjacent to roads, are considered to be low when predicted noise levels range between 55dB and 72dB for continuous and repetitive noise events [12]. This is due to the fact that the birds within these areas are often habituated to constant anthropogenic noise levels. Although these levels are associated with waterbirds, it is considered that a similar level of disturbance from noise can be applied to the species that were recorded onsite.

The noise from the Proposed Development will be consistent in nature and not subject to short duration, impulsive or sudden noise events. Based on predicted noise levels from the Proposed Development (+3dB or below the current background ($L_{A90,T}$) noise levels) and the current ambient ($L_{Aeq,T}$) noise levels it is considered that the noise associated with the Proposed Development will be non-intrusive and would be negligible to breeding or wintering birds within the vicinity of the Site (please refer to Chapter 11 of the EIAR for further details on noise associated with the Proposed Development).

Furthermore, the Site and the lands within the vicinity of the Site are not considered a site of importance for breeding or wintering birds, as discussed above. Therefore, given the limited ecological value of the Site and the fact that operational noise will not result in impacts to bird species, it is considered that the Proposed Development will not result in any significant impacts to breeding or wintering birds within the vicinity of the Site during the operational phase.

5.2 Mitigation Measures

5.2.1 Construction Phase

5.2.1.1 Breeding Birds

In order to ensure that no disturbances occur to breeding birds, the following measures will be implemented:

- Given the presence of barn swallow nesting within the agricultural shed, prior to demolition works a suitably qualified ECoW will inspect the shed and other buildings to ensure that there are no active nests;
- The demolition of the onsite buildings will take place outside the breeding bird seasons (1st March to 31st August);
- Vegetation clearance works will take place outside the breeding bird season (1st March to 31st August). This is as per Section 40 of the Wildlife Act 1976, as amended by Section 46 of the Wildlife (Amended) Act 2000, which states that the cutting, grubbing, burning or destruction by other means of vegetation growing on uncultivated

lands or hedgerows or ditches will be restricted during the besting and breeding seasons for birds and wildlife;

- In the event that demolition or vegetation clearance works need to be undertaken within the main breeding season, the following measures will be implemented:
    - The project ECoW will consult with the NPWS;
    - Prior to vegetation clearance on the Site, the project ECoW will inspect the Site; and,
    - In the unlikely event that birds nest within the active working area during the works, all works will cease with immediate effect and will not resume until the project ECoW has been consulted.

Furthermore, in order to ensure that no impacts occur to breeding bird species as a result of habitat loss, the following enhancement measures will be implemented:

- Ten (10No.) artificial swallow nests will be installed around the Site. The location of these will be determined by the project ECoW during the construction phase; and,
- In order to compensate for the previous removal of trees, scrub, immature woodland and hedgerow / treeline onsite, a Landscape Plan has been developed to include 10,562m^2 of screening tree planting mix. Once established this will provide suitable nesting, foraging and perching habitat for bird species in the area.

It is considered that the Proposed Development will result in a short-medium term loss of nesting habitat and foraging habitat due to the required vegetation clearance. However, the Landscape Plan will provide suitable replacement habitat once it has been established. As opposed to only planting whips, more established trees will be included in the planting to facilitate quicker establishment that will further mitigate the loss.

5.2.1.2 Winter Birds

No mitigation measures are considered necessary for wintering birds during the construction phase.

5.2.2 Operational Phase

No mitigation measures are considered necessary for breeding or wintering birds during the operational phase.

5.3 Ecological Enhancement Measures

5.3.1 Landscape Planting

A landscape plan has been prepared by MacroWorks and attached as Appendix 6-4 of the EIAR. This landscape plan comprises a screening planting mix around the northern and western boundary of the Site which will infill and bolster existing hedgerows and trees. Species within this screening planting mix will comprise of a native whip planting mix and advanced nursey stock, and will be allowed to grow to reach maturity, which will provide potential foraging, commuting and nesting habitats for birds in the future. Existing hedgerows will also be allowed to grow a minimum of 8m high and will be pruned for width and density.

The grassland will also be managed in a way that promotes species diversity, including measures that allow seed heads to form before mowing takes place. The landscape plan will ensure ecological connectivity onsite, ensuring that birds will be able to use the existing and new hedgerows / treelines for foraging and commuting purposes.

Please refer to Chapter 6 of the EIAR (Biodiversity) and Appendix 6-4 of the EIAR for full details.

5.3.2 Measure for Birds

A variety of bird nest boxes designed to attract a variety of nesting bird species will be erected on suitable trees within the Site. The creation of nesting habitat, along with the creation of species rich habitat will encourage an abundance of invertebrate life (a potential food source) will be beneficial to local birds. General bird boxes designed to cater for a variety of species will be used, the number and location of which will be specified by an ecologist. Refer to examples provided in Figure 5-1.

An example is the 1B Schwelger Nest Box - This nest box will attract a wide range of species and is available with different entrance hole sizes to prevent birds from competing with each other for the boxes.

Different bird species require difference entrance sizes as outlined below:

- The circular 26mm entrance hole suits blue, marsh, coal, and crested tit and possibly wren. All other species are prevented from using the nest box due to the smaller entrance hole;
- The circular 32mm entrance hole will attract great, blue, marsh, coal and crested tit, redstart, nuthatch, collared and pied flycatcher, wryneck, tree, and house sparrow;
- The 45mm entrance hole will attract starling; and,
- Open-fronted nest boxes will attract robins, wrens, pied and grey wagtail, song thrush and blackbirds.

The exact location of the bird boxes will be determined by an experienced ecologist after the completion of the proposed works. This is to allow the ecologist to assess the exact conditions that have been created and thus to ensure that the bird boxes are sited in the most appropriate location possible. However, it is recommended that bird boxes be facing between north and south-east to avoid strong winds, rain, and sunshine. In addition, bird boxes should be tilted slightly forward to ensure that rain runs off the top and there should be a clear flight path to access the nestbox hole. Also, bird boxes with a hole should be placed ca. 2-4m off the ground, whereas open-fronted bird boxes should be placed lower than 2m among dense vegetation where predators will not easily see it.

It should be noted that the distance between nest boxes can vary. Species such as house sparrow and starling have a preference for nesting in colonies and therefore the bird boxes should be placed closer to each other, whereas species robins and tits can be highly territorial and therefore the nest boxes should be separate by a greater distance.

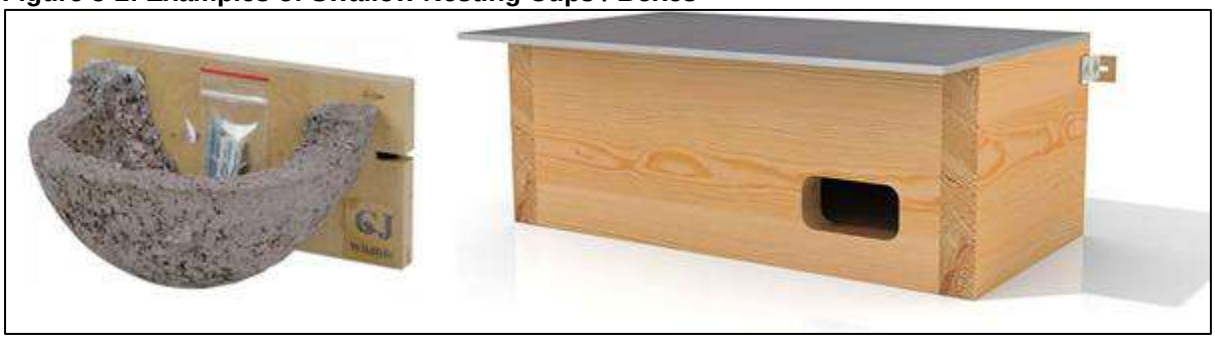
Additionally, these bird boxes will be subject to annual inspections and the results of which will be provided to the planning authority.

Figure 5-1: Variety of Bird Box Designs to Accommodate a Diversity of Species

Additionally, given that barn swallows were confirmed to be breeding with the agricultural shed on the Site, suitable alternate habitat will be provided as part of the Proposed Development. This will be through the installation of swallow nest in appropriate locations around the Site. Examples of swallow cups and swallow / swift nest boxes are shown in Figure 5-2.

The number and location of these boxes will be specified by the ECoW during the construction phase and their locations will be submitted to the Planning Authority. Additionally, these nest boxes will be subject to annual inspections and the results of which will be provided to the planning authority.

Figure 5-2: Examples of Swallow Nesting Cups / Boxes



6 CONCLUSIONS

During the breeding bird surveys, a total of twenty-six (26No.) species were recorded:

- Twenty-two (22No.) Green-listed BoCCI non-Annex I species– blackbird, blackcap, blue tit, buzzard, chaffinch, chiffchaff, dunnock, garden warbler, great tit, greenfinch, goldfinch, hooded crow, long-tailed tit, magpie, pheasant, pied wagtail, robin, rook, song thrush, stonechat, woodpigeon and wren;
- Three (3No.) Amber-listed BoCCI, non-Annex I species were recorded - barn swallow, goldcrest and lesser black-backed gull; and,
- One (1No.) Red-listed BoCCI, non-Annex I species was recorded – swift.

Of the species recorded three (3No.) were classified as '*Confirmed Breeding,*' buzzard, goldfinch and barn swallow (see Table 3-1 below). An active buzzard nest was noted in the hedgerow / treeline, goldfinch chicks were heard calling from a hedgerow and a barn swallow nest was noted in the agricultural shed. In addition, fifteen (15No.) other species were classified as '*Possibly Breeding'* and eight (8No.) species were classified as non-breeding.

The onsite habitats are considered to provide suitable habitat for breeding birds, which are common across Ireland. Therefore, mitigation measures will be implemented to ensure no impacts occur to breeding birds during the construction phase. In addition, the clearance of vegetation will be mitigated for by the landscape planting around the Site, which will provide a future net-gain in canopy cover of ca. 6,434m^2, and the loss of potential barn swallow nesting habitat (the agricultural shed) will be mitigated by the installation of swallow nesting boxes.

The onsite habitats are not considered to be of importance to wintering bird species and it is not considered that the Proposed Development will have a significant impact on any wintering bird species. This is based on the presence of suitable habitats in the wider area which these species are more likely to favour, namely the River Suir and the Waterford Estuary.

Overall, given the location of the Site in an industrial area and the intense agricultural practices currently occurring onsite, it is considered that the Proposed Development will not have a significant impact on breeding or wintering bird species, provided that mitigation measures outlined in the reports are adhered to.

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APPENDIX 6-3

Tree Experts in the Built Environment

John Morris Arboricultural Consultancy

Tree Risk Management | Trees, Planning & Development | Expert Witness | Arboricultural Clerk of Works | Government Support

Client: **GABM Ltd**
Site: Plasterboard Plant
Gorteens
Slieverue
Co. Kilkenny

Date: 05th February 2024
Ref: 23-461-04
Version: 1

ARBORICULTURAL IMPACT ASSESSMENT & METHOD STATEMENTS

John Morris Arboricultural Consultancy

DOCUMENT CONTROL SHEET

Originating Author:	Date:	Version	Notes:
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Purpose of Document

This report provides an assessment of trees and hedgerows on land at Gorteens in County Kilkenny, in accordance with the guidelines outlined in BS5837:2012 *Trees in relation to design, demolition and construction – Recommendations*. It provides an overview of the constraints posed by trees and hedgerows on or within influencing distance of the site and assesses the impacts of the proposal on these trees and hedgerows.

It includes:

- A **Tree Schedule** that provides information for each tree and hedgerow;
- A **Tree Constraints Plan** that illustrates the location and constraints posed by trees and hedgerows;
- An **Arboricultural Impact Assessment** that considers the impacts of the proposal to those trees; and hedgerows
- An **Arboricultural Method Statement** that outlines how retained trees and hedgerows will be protected during works, and;
- A **Tree Impact & Protection Plan** that illustrates the impact of the proposal upon trees and hedgerows, and protection measures that should be adopted during works.

The information contained within this report is intended to provide Kilkenny County Council with sufficient information to assess tree related issues associated with the proposal.

Executive Summary

GABM Ltd are applying for a state of the art plasterboard manufacturing plant. The plant will also contain a modern plasterboard board recycling plant that will enable waste plasterboard boards to be used in the manufacture of new boards. The Proposed Development will have a production capacity to handle approximately 195,000 tonnes of plasterboard per annum and have the capacity to produce 20 million metres squared of plasterboard board per year.

The proposal will require the removal of:

- Sixteen individual trees equating to 1,572m²
- Four groups of trees and scrub vegetation equating to 735m²
- One hedgerow totalling 259m²
- Part of one woodland totalling 1,562m²

The reason for these removals is facilitate the new manafacturing buildings and access road into the site.

To mitigate the removal of 4,128m² trees, hedgerow and woodland it is proposed to plant 10,562m² of screening tree planting mix.

The species of trees in the planting mix will include Pedunculate oak, Scots Pine, alder, downy birch, wild cherry, bird cherry, hazel, holly, hawthorn, blackthorn and spindle.

The location of new planting has been strategically positioned to help screen and integrate the proposal into its surrounding environment offering visual amenity and positively contributing to the surrounding landscape character. The planting will also offer new and replacement green corridors that connect to treelines and hedgerows in the surrounding landscape to offer ecological benefits and increase biodiversity.

The new tree planting will provide a future net-gain in canopy cover of approximately 6,434m² on the pre-development baseline.

The layout of the site has been designed to protect and incroporate trees and hedgerows, and to comply with relevant planning policies relating to trees and hedgerows in the Kilkenny City and County Development Plan (2021-2027).

The following measures are required to ensure the protection of trees and woodlands during works:

- Tree Protective Fencing
- Construction Exclusion Zones

CONTENTS

APPENDICES

ATTACHMENTS

DOCUMENT TITLE	DOCUMENT REFERENCE
TREE SCHEDULE	23-461-01
TREE CONSTRAINTS PLAN	23-461-02
TREE IMPACT & PROTECTION PLAN	23-461-03

1. INTRODUCTION

Instruction

1.1. Instruction was received from GABM Ltd on 12th August 2023 to undertake a tree survey and prepare an arboricultural report to in connection with a planning application for a new plasterboard board manufacturing plant and all associated site works at Gorteens, Slieverue, Co. Kilkenny.

Scope

1.2. The survey has been carried out in accordance with BS5837:2012 *Trees in relation to design, demolition and construction – Recommendations.*

1.3. The information collected during the survey has been used to prepare a report in connection with a planning application.

Site

The site comprises land at Gorteens, Slieverue, Co. Kilkenny (Figure 1).

Figure 1. Site red line boundary for Plasterboard Plant.

2. TREE SURVEY

Site Visit

2.1. The tree survey was undertaken on 04th and 5th October 2023.

2.2. Details of the survey methodology and assessment criteria can be found in Appendix 1.

2.3. A copy of the survey data can be found in the Tree Schedule (Ref: 23-461-01) attached to this report.

2.4. The extent of the tree survey has been marked on the Tree Constraints Plan (Ref: 23-461-02)

also attached to this report.

2.5. The tree survey considered all trees, woodlands and hedgerows that have the potential to be impacted by the proposals including those outside the application area, but within influencing distance.

2.6. On the Tree Constraints Plan, the above ground constraints posed by canopy spread are plotted as a continuous line around the tree and shaded in the corresponding BS5837 retention category colour, whilst the below ground constraints posed by the Root Protection Area (RPA) have been plotted as a continuous magenta line with the text RPA inscribed.

2.7. The purpose of the tree survey is to provide information to the client on the constraints posed by trees, allowing informed decisions to made that will avoid or reduce impacts on trees.

Description of Trees & Hedgerows

2.8. The application site includes land south of the existing stores and agricultural fields that is currently used for silage.

2.9. The main tree cover comprises mature hedgerows around the site boundary, and around a smallholding by the derelict dwelling within the centre of the site. The boundary hedgerows are growing from raised banks, have good species diversity and structure and are important features that provide visual amenity, ecological value and contribution to the local landscape character. The hedgerows mainly comprise native species including hawthorn *(Crataegus monogyna),* blackthorn *(Prunus spinosa),* holly *(Ilex aquifolium),* wych elm *(Ulmus glabra),* ash *(Fraxinus excelsior),* oak *(Quercus sp.)* and crab apple *(Malus sylvestris).*

2.10. The hedgerows include a diverse variety of mature and veteran trees including ash, Pedunculate oak *(Quercus robur),* Turkey oak *(Quercus cerris)*, sycamore *(Acer pseudoplatanus),* beech *(Fagus sylvatica),* small leaf lime *(Tilia cordata)* and crab apple, wild cherry *(Prunus avium)* including some plum *(Prunus domestica)* in the hedgerows around the derelict dwelling. Parts of the site are bordered by mature woodlands that include Scots pine *(Pinus sylvestris)* and Norway spruce *(Picea abies).* These trees also provide high visual amenity, ecological value and greatly contribute to the landscape character of the local area.

2.11. A summary assessment of tree quality is contained in Table 1.

Table 1. Overview assessment of tree quality by BS5837 retention categroy.

	Category A	Category B	Category C	Category U	Total
Trees	11	52	63	19	**145**
Woodlands & Groups	2	5	9	0	**16**
Hedgerows	1	4	2	0	**7**
Total	**14**	**61**	**74**	**19**	**168**

2.12. A summary of the tree population by age class is contained in Table 2.

Table 2. Summary of age class.

	Young	Semi-mature	Early mature	Mature	Over Mature	Ancient or Veteran	Dead
Trees	1	11	42	85	**3**	**1**	**13**
Woodlands & Groups	0	1	2	4	**0**	**0**	**0**
Hedgerows	0	1	2	2	**0**	**0**	**0**
Total	**1**	**13**	**46**	**91**	**3**	**1**	**13**

Photographic Record

Figure 2. Mature trees and woodland around western boundary of site.

Figure 3. Mature trees around west and north boundary of site.

Figure 4. Mature trees along southern boundary of site with lane.

Figure 5. Tree groups and scrub vegetation around derelict dwelling and barn in centre of site.

Figure 6. Mature beech tree from hedgerow along southern boundary.

3. ARBORICULTURAL PRINCIPLES

Trees and Development

3.1. Trees provide a multitude of economic, environmental and social benefits to individuals and communities including (but not limited) to visual amenity and landscape value, ecosystem services and habitats for local wildlife. Trees can also hold historic and cultural importance by providing links to the past that create a sense of place and belonging.

3.2. They are living, self-optimising, mechanical organisms that grow in and react to the environment in which they are located and are capable of being wounded or infected by objects or other organisms that can cause a decline in health or result in death.

3.3. Development proposals that will impact trees should consider the value and contribution made by those trees, the impacts of development activity upon their health and an assessment of future conflicts that may arise between trees and the development proposal.

Below Ground Constraints

3.4. Soils contain organic and mineral material, air and water that provides a medium essential for root growth. The physical properties of soils including texture, porosity and bulk density can greatly impact the availability of water, nutrients and oxygen in the soil available to support the function and growth of tree roots. Protection of the soil environment in which trees grow is therefore essential to ensure tree vitality.

3.5. Tree roots provide support and anchorage and allow the uptake and transport of water, nutrients and oxygen for tree function and growth. Roots are commonly found in the upper 600-1000mm of soil, however depth can vary significantly depending on soil and local site conditions. Typically, tree root systems comprise a network of lateral roots that provide structural support and smaller fibrous roots that function in the uptake of water, nutrients and oxygen. Protection of the tree roots is therefore essential to ensure tree vitality.

Impacts of Construction & Development

3.6. The processes of construction including the movement of machinery and equipment near trees can cause soil compaction that can starve roots of oxygen and water, resulting in tree decline or death. Increasing ground levels near trees can cause similar impacts, whilst belowground soil excavations can damage root bark or lead to root severance and impair structural stability. Further impacts include (but are not limited to) contamination of soils by toxic substances such as cement or chemicals and root desiccation due to inadequate protection during exposure.

Root Protection Areas

3.7. In accordance with BS5837, the Root Protection Area (RPA) indicates the notional minimum area of ground around a tree deemed to contain sufficient roots and rooting volume to avoid adverse physiological or structural impairment and to support future tree function, growth and health.

3.8. The RPA is calculated in accordance with Section 4.6 of BS5837 and is summarised in Appendix 2.

3.9. The RPA is plotted as a continuous circle centred on the base of the stem, however where pre-

existing site conditions such as the presence of built structures, changes in topography, soil type and structure or past management are likely to act as barriers, or alter normal distribution, BS5837 allows modifications to the shape of the RPA can be made based upon sound arboricultural assessment.

3.10. The default position should be that no development works occur inside RPAs, however in accordance with BS5837 when there is an overriding justification, it may be appropriate to implement specialist methods of construction or technical solutions that will reduce or eliminate the impact to roots and soil environments.

3.11. Additionally, where an area of RPA is lost, it should be demonstrated that the tree can remain viable with the area lost from encroachment compensated elsewhere contiguous with its RPA, based on the species, age, condition and past management of the tree, pre-existing site conditions and nature of operations proposed is undertaken.

Above Ground Constraints

3.12. Tree stems and crowns can restrict the availability of space on a development site that may result in conflicts between trees and the new built environment. The design and layout of a site should take into consideration the presence of tree canopies, as well as individual species characteristics and future growth requirements in order to create a harmonious relationship between trees and the new built environment.

4. PLANNING POLICY, STATUTORY CONSIDERATIONS & TREE LEGISLATION

Planning Policy

4.1. The National Planning Framework 'Project Ireland 2040' and National Development Plan (2018-2027) underpin planning policy across Ireland. These documents recognise the need to manage future growth in a planned, productive and sustainable way.

4.2. At the heart of Green Infrastructure Planning is to protect, preserve and enhance national capital by:

> *"protecting and valuing important and vulnerable habitats, landscapes, natural heritage and green spaces".*

4.3. Thes site falls within the jurisdiction of Kilkenny County Council, which has a statutory obligation to ensure that provision is made for the protection of trees, woodlands and hedgerows under the Local Government Planning and Development Act (2000), through implementation of a Development Plan. The current plan is the **Kilkenny City and County Development Plan (2021-2027).**

Kilkenny City and County Development Plan (2021-2027)

4.4. The Kilkenny City and County Development Plan (2021-2027) provides guidance for trees and hedgerows in relation to proposals of development as follows:

Chapter 9 Heritage, Culture and the Arts

Development Management Requirements:

- *To protect and where possible enhance wildlife habitats and landscape features which act as ecological corridors/networks and stepping stones, such as river corridors, hedgerows and road verges, and to minimise the loss of habitats and features of the wider countryside (such as ponds, wetlands, trees) which are not within designated sites.*
- *To ensure that appropriate mitigation and/or compensation measures to conserve biodiversity, landscape character and green infrastructure networks are required in developments where habitats are at risk or lost as part of a development.*
- *To protect existing woodlands, trees and hedgerows which are of amenity or biodiversity value and/or contribute to landscape character of the county, and to ensure that proper provision is made for their protection and management, when undertaking, approving or authorising development.*
- *To ensure that when undertaking, approving or authorising development that sufficient information is provided to enable an assessment of impacts on woodlands, trees, and hedgerows.*
- *To have regard to, and seek the conservation of identified trees and woodlands from a) the National Survey of Ancient and Long-Established Woodlands, b) the Tree Register of Ireland (c) sites of significance identified in the Kilkenny Woodlands Survey 1997, (d) the National Survey of Native Woodlands, and (e) Survey of Mature Trees in Kilkenny City and Environs, in the assessment of planning applications.*
- *To retain hedgerows, and other distinctive boundary treatment such as stone walls, when undertaking, authorising or approving development; where the loss of the existing boundary is unavoidable as part of development, to ensure that a new hedgerow is planted using native species, and species of local provenance to replace the existing hedgerow and/or that the wall is re-built using local stone and local vernacular design.*
- *To discourage the felling of mature trees to facilitate development and, where appropriate make use of Tree Preservation Orders to protect important trees and groups of trees which may be at risk or have an amenity, biodiversity or historic value.*
- *To require the planting of native broadleaved species, and species of local provenance, in new developments as appropriate. See Appendix G for a list of native trees and shrubs.*
- *To facilitate appropriate development that reflects the scale, character and sensitivities of the local landscape throughout the county, and require that developments minimise the loss of natural features such as trees, hedgerows and stone walls.*

Chapter 13 Requirements for development

13.29 Tree and Hedgerow Preservation

To ensure that trees and hedgerows are protected on a site which has been the subject of a grant of planning permission, a cash lodgement/bond may be required, the amount of which shall be determined by the Planning Authority.

Development will not generally be permitted where there is likely damage or destruction either to trees protected by a Tree Preservation Order or those which have a particular local amenity or nature conservation value, or are listed in the Survey of Mature Trees in City and Environs.

Development that requires the felling of mature trees of amenity value, conservation value or special interest, even though they may not be listed in the Development Plan, will be discouraged.

The replacement of hedgerows/trees shall have due regard to the ecological function of hedgerows as a wildlife corridor. When planting new hedgerows, a mixture of native species shall be proposed and this shall occur at the commencement of building works and should link to existing hedgerows to aid ecological networks.

Where trees and hedgerows are identified and affected by a proposed development, a survey will be required and completed in accordance with BS 5837 Trees in relation to design, demolition and construction – Recommendations 2012.

In general, the following requirements should be addressed where the protection of existing trees and landscaping issues arise:

• Topographical Survey - Accurately measured showing all relevant site features.

• Soil assessment – where appropriate to determine whether a soil is shrinkable, that may cause the potential for indirect damage. Soil structure composition and PH for the provisions of new planting.

• A tree survey - details trees and hedgerows identified on the topographical survey and on land adjacent to the development site, including individual trees, groups of trees and woodlands. Identifying tree dimensions, quality and retention value in accordance with the context of the proposed development (see sections 4.5 Table 1+2 of BS 5837).

• The tree survey -should identify the constraints posed by trees, both above and below ground, which will inform the site layout design. Constraints include, the presence of a Tree Preservation Order (TPO), the existing and eventual crown spreads of trees and their unreasonable obstruction of light etc.

• Arboricultural Impact Assessment - a report should be compiled by an arboriculturist using the data collated from the site survey. The report should assess the impact and the effects the proposed design has directly and indirectly on the trees and where necessary recommends mitigation.

• A Tree Protection Plan – details the proposed design layout shown on a plan with all trees clearly identified with their root protection areas (RPA) annotated based on the topographical survey to include all trees. The classification of each tree and the required protection measures during development. New Planting – takes account of existing landscape features and is essential for consideration in the layout, design and future use of a proposed development.

New planting should account for the future growth of canopies, stems and root systems to maturity and their potential effects on existing site structures.

• Arboricultural Method Statements – demonstrates how unavoidable construction operations may take place within the RPA or crown spread of trees (whichever is greatest), clearly demonstrating how these operations will have a little detriment to retained trees. These operations may include but are not exclusive to: -

a. Temporary access

b. Installation of service runs

c. Construction of hard standing

d. Foundation excavations

e. Subterranean structures e.g. basement extensions

4.5. Appendix F in the Kilkenny City and County Development Plan (2021-2027) includes a list of 468 mature trees in Kilkenny City. A review of Appendix F confirms that none of the trees within the application boundary of this planning application are included on the list.

Tree Preservation Orders & Conservation Areas

4.6. Tree Preservation Orders (TPOs) may be made under Section 45 of the Local Government (Planning and Development) Act, 1963 and subsequent acts. Part XIII of the Planning and Development Act 2000 sets out the provisions for TPOs. A TPO can be made if it appears to the planning authority to be desirable and appropriate in the interest of amenity or the environment. A TPO can apply to a tree, trees, group of trees or woodland.

4.7. The principle effect of a TPO is to prohibit the cutting down, topping, lopping or wilful destruction of trees without the planning authority's consent. The order can also require the owner and occupier of the land subject to the order to enter into an agreement with the planning authority to ensure the proper management of the tree, trees or woodland.

4.8. The Kilkenny City and County Development Plan (2021-2027) includes a list of Tree Preservation orders in Appendix E. None of the trees within the application site are included on this list.

Appendix E: Tree Preservation Orders in County Kilkenny

Site	TPO Ref No.
Oldcourt, Inistioge	1/85
Keatingstown	1/84
Barna, Freshford	1/92
Sawney's Wood, Castlecomer	1/67
Christendom Wood, Ferrybank	1/2008

Appendix E. Tree Preservation Orders in County Kilkenny (Source: Kilkenny City and County Development Plan 201-2027.

4.9. The Kilkenny City and County Development Plan (2021-2027) and associated appendices relating to trees and hedgerows have influenced the design and layout of the proposal, as well as the proposals for mitigation.

Felling Licenses

4.10. It is an offence for any person to uproot or cut down any tree unless the owner has obtained permission in the form of a felling licence from the Forest Service, with the exception of the following scenarios (under section 19 of the Forestry Act 2014):

- A tree in an urban area. (An urban area is an area that is comprised of a city, town or
- borough specified in Part 2 of Schedule 5 and in Schedule 6 of the Local Government Act 2001, before the enactment of the Local Government Reform Act 2014 (this act dissolved Town Councils, however, the old boundaries of these areas are still considered as urban for the purpose of the Forestry Act 2014).
- A tree within 30 metres of a building (other than a wall or temporary structure) but excluding any building built after the trees were planted.
- A tree less than 5 years of age that came about through natural regeneration and removed from a field as part of the normal maintenance of agricultural land (but not where the tree is standing in a hedgerow).
- A tree uprooted in a nursery for the purpose of transplantation.
- A tree of the willow or poplar species planted and maintained solely for fuel under a short rotation coppice.
- A tree outside a forest within 10 metres of a public road and which, in the opinion of the owner (being an opinion formed on reasonable grounds), is dangerous to persons using the public road on account of its age or condition.
- A tree outside a forest, the removal of which is specified in a grant of planning permission, providing it was indicated on the lodged plans as being planned for removal as part of the application.
- A tree outside a forest of the hawthorn or blackthorn species growing in a hedge.
- A tree outside a forest in a hedgerow and felled for the purposes of its trimming the hedge providing that the tree does not exceed 20 centimetres diameter at 1.3 metres above ground level.
- Agricultural holdings can fell a limited small number of trees not exceeding 3 cubic metres.
- The maximum number of trees permitted to be felled under that exemption per year is 4 trees (12 cubic metres)
- Outside a forest, apple, pear, plum, or damson species are exempt from the need for a felling license.

Wildlife

4.11. The cutting or felling of trees and hedgerows is prohibited during the period 1st April to 31st August every year with limited exceptions under the Wildlife Acts 1976-2008.

5. ARBORICULTURAL IMPACT ASSESSMENT

Development Proposal

5.1. GABM Ltd are applying for a state of the art plasterboard board manufacturing plant. The plant will also contain a modern plasterboard board recycling plant that will enable waste plasterboard boards to be used in the manufacture of new boards. The Proposed Development will have a production capacity to handle approximately 195,000 tonnes of plasterboard per annum and have the capacity to produce 20 million metres squared of plasterboard board per year at Gorteens, Slieverue, Co. Kilkenny.

Design Principles

5.2. The proposal has been influenced by the existing tree and hedgerow cover on site, and by relevant Planning Policy in relation to trees and hedgerows.

5.3. The default position has been to avoid works within the canopy or RPA of tree sand hedgerows, however where this has not been possible due to site constraints a hierarchy of mitigation has been applied in Figure 7.

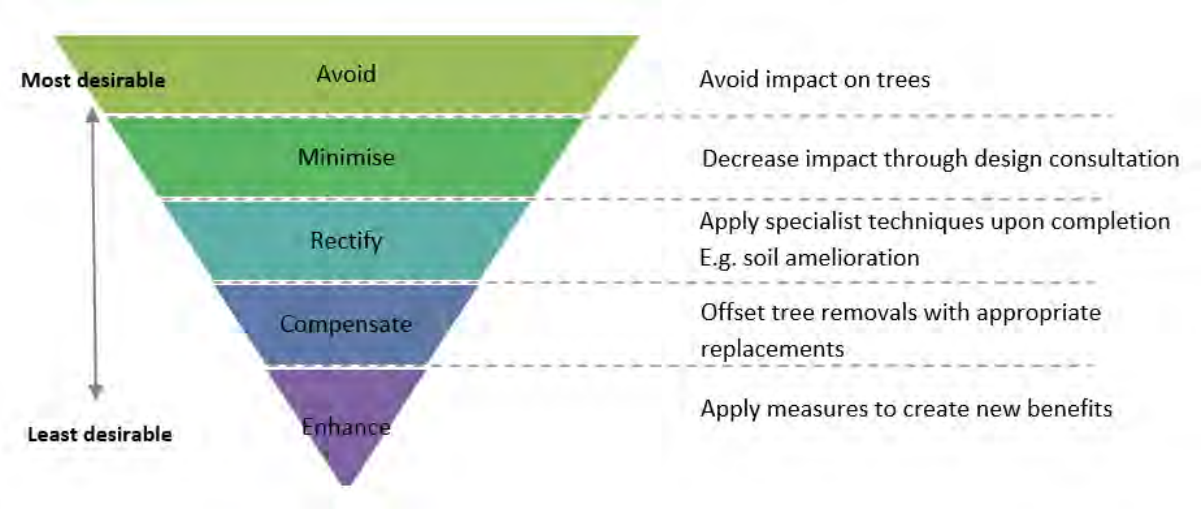


Figure 7. Trees & Development Mitigation Hierarchy (John Morris Arboricultural Consultancy, 2019).

The Impact

5.4. The proposal will require the removal of:

- Sixteen individual trees equating to 1,572m²
- Four groups of trees and scrub vegetation equating to 735m²
- One hedgerow totalling 259m²
- Part of one woodland totalling 1,562m²

5.5. The reason for these removals is facilitate the new Plasterboard Plant buildings and access road into the site.

5.6. Chart 1 summarises the combined total number of trees, groups and hedgerows proposed for removal by BS5837 retention category.

5.7. Chart 2 summarises the combined total number of trees, groups and hedgerows proposed for removal by age class.

5.8. Details for each individual feature can be found in the Tree Schedule attached to this report.

Chart 1. Proposed Tree, Group and Hedgerow removals by age class.

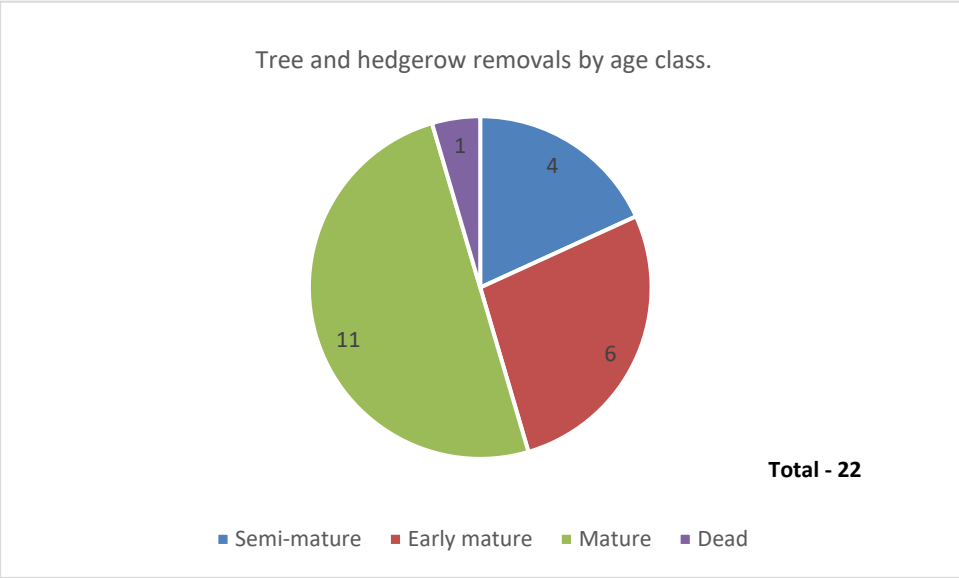
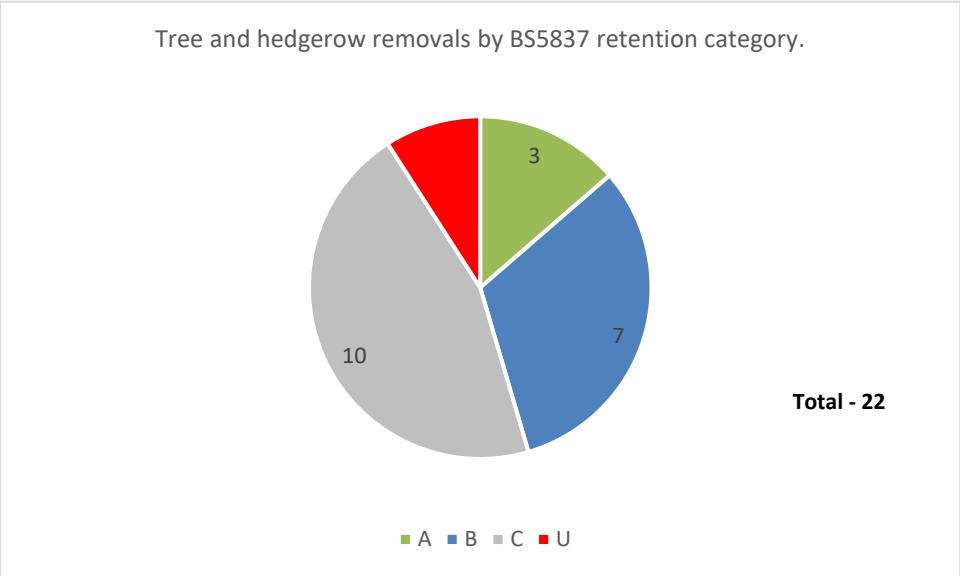


Chart 2. Proposed Tree, Group and Hedgerow removals by BS5837 retention category.



Canopy Cover Assessment

5.9. Canopy cover is defined as the surface area (usually in m² or as a percentage) of a trees stem, branches and leaves that cover the ground when viewed from above. The greater the canopy cover, the greater the potential for those trees to provide a range of social, environmental and economic benefits.

5.10. The existing canopy cover (including individual trees, groups of trees, hedgerows and woodland) that will be lost due to proposed development will be approximately **4,128m²** (Table 5).

5.11. New tree planting will provide a combined total of **10,562m²** of canopy cover (see Landscape Mitigation Plan prepared by Macro Works and Table 6).

5.12. New planting will therefore provide a net-gain in canopy cover of approximately **6,434m²** and this will increase year on year as trees become established and reach maturity.

Table 5. Existing canopy cover in m² lost because of proposed development.

Removals	Canopy Area lost (m²)
Trees	1,572
Tree Groups	735
Hedgerow	259
Woodland	1,562
Total	**4,128**

NOTE – Formula used to calculate existing individual tree canopy cover is 3.142(((N+S)/2)x((E+W)/2))).

Table 6. Proposed canopy cover in m² from new tree and woodland planting.

Tree Size	Diameter	Radius	Canopy Area (m²)	No. of trees	Total Canopy Area (m²)
Screening Panting Mix					10,562
Total					**10,562**

NOTE – Formula used to calculate new individual tree canopy cover is 3.142r² (based on new tree canopies being a perfect circle).

Design Iteration

5.13. The layout of the Plasterboard Plant has been designed to incorporate and protect mature trees, woodland and hedgerows that extend around the boundaries of the site. The Plasterboard Plant buildings and yards will be higher than the existing ground levels and careful consideration has been given to ensure appropriate separation distances between embankments, retaining walls, trees and hedgerows. In several locations, the embankments and retaining walls follow Root Protection Areas to protect tree roots and allow space for future growth and development of roots and canopies. In other locations there is a marginal encroachment into RPAs. An individual assessment has been undertaken at each of these locations by considering species, age and surrounding environment of tree and extent of the banking, and works are not considered to have any negative impact on tree health. All trees have expansive rooting environments contiguous with and beyond RPAs on all other sides.

5.14. Part removal of a single hedgerow and trees associated with the northern part of the smallholding and derelict dwelling in the central area of the site, is unavoidable due to long internal manufacturing and processing layout required for the Plasterboard Plant to operate. The southern hedgerow and trees by the derelict dwelling have been incorporated into the layout.

Construction Phase

5.15. All site compounds, facilities and routes to allow the movement of construction traffic and positioning of rigs must be sited beyond influencing distance of RPAs and outside Construction Exclusion Zones of trees.

Magnitude of Impact

5.16. The magnitude of impact as result of the proposal has been assessed by considering the BS5837 retention category and subcategory of trees to be removed (Table 4). The aim is to assess the direct impacts on the existing tree population from an arboricultural perspective, but also the impact in terms of visual amenity, landscape value and contribution to the wider surrounding area.

5.17. The assessment does not look at impacts from an ecological perspective but may allow for high level observations to be made in terms of the relationship between trees and their contribution to green connectivity, which can offer ecological and biodiversity benefits including nesting, foraging and transport mechanisms for local wildlife.

Table 4. Magnitude of arboricultural impact (John Morris Arboricultural Consultancy 2020).

Magnitude Category	Description of Impact
High	The proposal will require the removal of category A trees of high quality and able to offer a significant future contribution for at least 40 years. These trees are irreplaceable and may include specimen trees that are an excellent example of their species, notable, veteran or ancient trees or ancient woodland.

Medium	The proposal will require the removal of category B trees of moderate quality able to offer a substantial future contribution for at least 20 years. These trees may include those that provide amenity value and contribute to the character of the site and local area. These trees would be difficult to replace and new planting is likely to take a minimum of 15-25 years to provide satisfactory mitigation.
Low	The proposal will require the removal of category C trees of low quality able to provide a contribution for at least 10 years. These trees may include younger trees or those in poor health with a limited useful life expectancy. These trees should not be regarded as a significant constraint and could normally be easily with new better quality planting with benefits realised in under 5 years.
Negligible	The proposal will require the removal of category U trees of poor quality. These trees include those than cannot be retained in the context of current land use for longer than 10 years or pose a risk to persons or property due to decline.
None	The proposal will not require the removal of any trees.

5.18. The proposal will require the removal of category A, B and C trees, hedgerow, and woodland.

5.19. This has been identified as a **medium to high** magnitude of impact.

5.20. To mitigate the magnitude of impact, feasible and realistic measures must be implemented to reduce the timeframe over which the impact will take to recover, or for which replacement features will take to provide compensation for benefits that were lost.

Mitigation and Improvements

5.21. To mitigate the removal of 4,128m² trees, hedgerow and woodland it is proposed to plant 10,562m² of screening planting mix.

5.22. The species of trees in the planting mix will include Pedunculate oak, Scots Pine, alder, downy birch, wild cherry, bird cherry, hazel, holly, hawthorn, blackthorn and spindle.

5.23. The location of new planting has been strategically positioned to help screen and integrate the proposal into its surrounding environment offering visual amenity and positively contributing to the surrounding landscape character. The planting will also offer new and replacement green corridors that connect to treelines and hedgerows in the surrounding landscape to offer ecological benefits and increase biodiversity.

5.24. The new tree planting will provide a future net-gain in canopy cover (measured in sqm) on the pre-development baseline.

6. ARBORICULTURAL METHOD STATEMENTS

Purpose

6.1. The purpose of this statement is to provide a system of working to ensure retained trees are protected at all times during construction. It should be read in conjunction with the Tree Impact & Protection Plan (TIPP) attached to this report.

6.2. A copy of this report must be made permanently available for the duration of the development. It can be:

- Included in tender documents to identify and quantify tree protection and management requirements;
- Used to plan timing of site operations to minimise the impact upon trees, and;
- Referenced on site for practical guidance on how to protect trees.

6.3. The compliance of arboricultural method statements is a recommended as a condition of planning and is necessary to ensure the protection and vitality of retained trees.

Key Responsibilities

6.4. It is the responsibility of the main contractor to ensure that all site personnel fully understand the protection measures on the site, that tree protection measures are adhered to at all times, and that the project arboriculturist is contacted if there are any issues related to trees.

Tree Protective Fencing

6.5. A protective fence will be erected around retained trees, prior to the commencement of materials or machinery being brought onto site, removal of soil or any form of construction. The area within this fencing will form the construction exclusion zone (CEZ) and it will be afforded protection at all times. No works will be undertaken within this zone that causes compaction to the soil, severance of tree roots or damage to tree canopies.

6.6. The fence is to be sited in accordance with the Tree Impact & Protection Plan attached to this report.

6.7. Details of the minimum distance for fencing from trees can be found in the Tree Schedule attached to this report.

6.8. The precise form of fencing can vary provided it is fit for purpose and prevents damaging activities within the CEZ. For a proposal of this nature, a number of fencing/protection solutions will be required including the Heras 151 system of fencing, timber boards and hessian sacking wrapped in chestnut cleft pale.

6.9. Details of the various types of fencing is provided in Appendix 3.

6.10. The fence will have signs attached to it stating that it defines a CEZ and that no works are permitted beyond it.

6.11. An example of a tree protection sign is provided in Appendix 4.

6.12. The protective fencing may only be removed following completion of all construction works.

6.13. The following principles will be adopted by site personnel within the CEZ during construction, to ensure protection of retained trees:

- No level changes.
- No excavations.
- No fires.
- No use of herbicides.
- No storage of materials, machinery or access for construction workers.

Site Compounds & Facilities

6.14. Site compounds and facilities will be located outside of all RPAs and CEZs as identified on the TIPP.

Site Cranes, Piling Rigs and Machinery

6.15. The location of all drilling rig, supporting vehicles / equipment should be sited outside of RPAs to avoid soil compaction.

Pollution Control

6.16. Any storage or mixing station located outside of the construction exclusion zone will be located in a place that minimises the risk of contaminated runoff entering to prevent adverse physiological impacts on trees that may result from contact with rooting environments. This may be achieved by using a non-permeable membrane on the ground, surrounded by sandbags or sawdust to contain any spillage.

Temporary Ground Protection

6.17. Where it is not practical to protect RPAs by use of protective fencing, BS5837 allows for the fencing to be set back and the soil shielded by ground protection. A range of methods can be used including retaining existing hard surfaces or structures that already protect the soil, installing new temporary surfaces, or a combination of both. Whatever the choice of method, the end result must be that the underlying soil remains undisturbed and retains the capacity to support existing and new roots.

6.18. If fences are to be set back on a temporary the following specifications are recommended for use as temporary ground protection to protect roots and soil.

6.19. For pedestrian traffic, a plywood board with a minimum thickness of 40mm should be laid on a minimum of 100mm deep woodchip, with geotextile membrane beneath.

6.20. For small plant machinery with a gross weight of up to 2 tonne, interlinking aluminium or composite tracks with sufficient load bearing capacity should be laid on a minimum of 150mm deep woodchip, with geotextile membrane beneath.

6.21. For heavy machinery with a gross weight of up to 3.5tonne, interlinking aluminium or composite track with sufficient load bearing capacity should be laid over a minimum layer of 200mm deep woodchip, with a geotextile membrane beneath.

6.22. For weights above 3.5tonne a specialist temporary ground protection should be used that is capable of both supporting the required loads whilst providing protection to RPAs.

6.23. Any temporary protective surfaces must remain in place until all construction activity is finished.

6.24. Upon completion of construction works, the temporary ground protective measures should be removed working backwards from on top of the system. This will need to be done carefully ensure that there is no excavation or compaction of the original surface or change in ground levels.

6.25. Once this material has been removed vehicular access to this part of the site will not be

permitted.

Working within the Root Protection Area

6.26. All excavation must be carried out carefully using spades, forks and trowels, taking care not to damage the bark and wood of any roots. Specialist tools for removing soil around roots using compressed air such as an Air Spade may be an appropriate alternative to hand digging, if available.

6.27. All soil removal must be undertaken with care to minimise the disturbance of roots beyond the immediate area of excavation. Where possible, flexible clumps of small roots, including fibrous roots, should be retained if they can be displaced temporarily or permanently beyond the excavation without damage.

6.28. If digging by hand, a fork should be used to loosen the soil and help locate any substantial roots. Once the roots have been located the trowel should be used to clear the soil away from them without damaging the bark. Exposed roots that are to be removed should be cut cleanly with a sharp saw or secateurs 100-200mm behind the final face of the excavation.

6.29. Roots temporarily exposed must be protected from direct sunlight, drying out and extreme temperatures by appropriate covering. Roots greater than 25mm in diameter should only be cut in exceptional circumstances. Roots greater than 100mm in diameter should only be cut after consultation with the project arboriculturist.

Upgrading Existing Surfaces

6.30. Where upgrading of existing hard surfaces is required, the preferred option will be to leave the surface in place and install the new surface specification on top.

6.31. If the retained surface is impermeable, it may be appropriate to remove or puncture sections to create a more favourable environment for roots beneath, before the new surface is laid, through consultation with the project arboriculturist.

6.32. Where the existing surface is to be removed or upgraded, the surface layer should be excavated down the existing subbase and the new surface specification installed on top, to prevent any damage to roots beneath.

6.33. It is recommended that where possible, new and upgraded hard surfaces should be porous (e.g. permeable brick paving, porous resin bound aggregate or tarmac) to allow the flow or water and oxygen to roots. Wet concrete should only be poured if an impermeable geotextile fabric has first been installed to prevent soil contamination from toxic leachate.

6.34. New surfaces and upgraded surfaces should be set back from the base of stems by a minimum of 500mm to allow space for future growth and minimise the risk of distortion with new surface.

Services Routes

6.35. All services and utilities will be installed within existing service routes and where possible outside of RPAs.

6.36. Where installation of utilities or services is required within RPAs, working practices will be

adopted in accordance with the National Joint Utilities (NJUG) 10, Vol 4, Issue 2, 2007 'Guidelines for the Planning, Installation and Maintenance of Utility Apparatus in Proximity to Trees'.

6.37. In accordance with 4.1.3 of NJUG 10 2007, acceptable techniques in order of preference include:

a) Trenchless; b) Broken Trench; and c) Continuous Trench. Trenchless methods involve the use of thrust boring machinery, whilst broken and continuous trench methods require that excavations within RPAs are carried out using hand tools only.

6.38. For a proposal of this nature, broken or continuous trench methods are the most appropriate and should be employed as per NJUG 10, to prevent any damage to tree roots or disruption to soil rooting environments.

Soft Landscaping

6.39. To avoid damage to existing tree roots and prevent soil compact, any machinery used to remove the existing surface and ground vegetation for purposes of soft landscaping (e.g. seeding new lawns or laying turf) should be sited outside of RPAs. If this is not possible, hand tools must be used.

6.40. The removal of the surface layer with RPAs must not exceed 50mm, to prevent exposure and damage of tree roots beneath.

6.41. Soft landscaping works must not involve raising or lowering of the existing ground level within any RPA as this can starve roots of oxygen and cause irreversible physiological damage to trees.

6.42. The use of rotavators within RPAs is prohibited.

6.43. Any level changes outside RPAs must be graded to marry existing soil levels within RPAs.

7. ABOUT THE AUTHOR & LIMITATIONS

Authors Qualifications & Experience

7.1. This report has been written by John Morris, Director and Principal Arboricultural Consultant at John Morris Arboricultural Consultancy Ltd. John has a First Class BSc (Hons) in Housing (Ulster University) and a Post Graduate Diploma (UK NQF Level 7) in Arboriculture & Urban Forestry (Myerscough College & University of Central Lancashire). John has worked in the housing, development and arboricultural sectors combined for over 15 years and regularly undertakes continuous professional development (CPD) in all areas of arboriculture and wider business administration. John is a Professional member of the Arboricultural Association (AA) and Associate member of the Institute of Chartered Foresters (ICF).

Limitations

7.2. This report is for planning purposes and is not a detailed assessment of the health and condition of trees, however where defects have been identified works have been recommended to ensure site safety.

7.3. This report does not take responsibility for the effects of extreme weather conditions, vandalism, accidents or any works to trees that occur without the authors knowledge, or that are not recommended within this report.

7.4. Tools used during the assessment have been limited to a sounding mallet, probe or binoculars. No invasive or diagnostic equipment has been used, nor have any aerial inspections, belowground root investigations, or soil, leaf or root samples been taken for further testing or analysis.

7.5. Trees were assessed on 4th and 5th October 2023 and the information gathered during the survey pertains to that moment in time. The observations within this report will remain valid for two years from the date of inspection. It is recommended that trees are inspected again within two years of the date of this report to assess what works are required for reasons of good arboricultural management and to enable the client to manage their legal reasonability in terms of tree risk management.

7.6. The location of trees places reliance on the accuracy of the topographical survey unless otherwise caveated within the report.

7.7. All works recommendation as a result of the survey should be undertaken by a suitably qualified and insured arborist in accordance with BS3998:2020 *Tree Works – Recommendations* to prevent any structural or physiological impairment to trees.

Appendix 1: Tree Survey Criteria (BS5837:2012)

The assessment of the trees has been carried out in accordance with the guidance provided in Annexe C of BS5837, which requires that any tree on or influencing distance of the site with a stem diameter of over 75mm at 1.5m above ground level be recorded.

Stem diameter measurements were taken using a girthing tape or Biltmore stick, and in accordance with Annexe D of BS5837.

Height, crown spread, and canopy clearance measurements are recorded in accordance with the measurement convention detailed in paragraph 4.4.2.6 of BS5837.

The trees are categorised in an order defined in **Table 1** of BS5837, a copy of which can be seen below in **Figure 1**, but which can be summarised as:

- **Category A** Trees of high quality and value in such a condition as to be able to make a substantial contribution for a minimum of 40 years.
- **Category B** Trees of moderate quality and value in such a condition as to make a significant contribution for a minimum 20 years.
- **Category C** Trees of low quality and value currently in adequate condition and able to remain until new planting can be established with a minimum useful life expectancy of 10 years, and young trees with a stem diameter less than 150mm.
- **Category U** Trees in poor structural condition or physiological decline that cannot be realistically retained in the context of current land use for more than 10 years.

Further subcategories 1-3 indicate the area(s) in which a tree or group retention value lies.

- Mainly arboricultural.
- Mainly landscape.
- Mainly cultural, including conservation.

Table 1 **Cascade chart for tree quality assessment**

Category and definition	Criteria (including subcategories where appropriate)			Identification on plan
Trees unsuitable for retention (see Note)				
Category U Those in such a condition that they cannot realistically be retained as living trees in the context of the current land use for longer than 10 years	• Trees that have a serious, irremediable, structural defect, such that their early loss is expected due to collapse, including those that will become unviable after removal of other category U trees (e.g. where, for whatever reason, the loss of companion shelter cannot be mitigated by pruning) • Trees that are dead or are showing signs of significant, immediate, and irreversible overall decline • Trees infected with pathogens of significance to the health and/or safety of other trees nearby, or very low quality trees suppressing adjacent trees of better quality *NOTE Category U trees can have existing or potential conservation value which it might be desirable to preserve; see **4.5.7**.*			See Table 2
	1 Mainly arboricultural qualities	**2 Mainly landscape qualities**	**3 Mainly cultural values, including conservation**	
Trees to be considered for retention				
Category A **Trees of high quality** with an estimated remaining life expectancy of at least 40 years	Trees that are particularly good examples of their species, especially if rare or unusual; or those that are essential components of groups or formal or semi-formal arboricultural features (e.g. the dominant and/or principal trees within an avenue)	Trees, groups or woodlands of particular visual importance as arboricultural and/or landscape features	Trees, groups or woodlands of significant conservation, historical, commemorative or other value (e.g. veteran trees or wood-pasture)	See Table 2
Category B **Trees of moderate quality** with an estimated remaining life expectancy of at least 20 years	Trees that might be included in category A, but are downgraded because of impaired condition (e.g. presence of significant though remediable defects, including unsympathetic past management and storm damage), such that they are unlikely to be suitable for retention for beyond 40 years; or trees lacking the special quality necessary to merit the category A designation	Trees present in numbers, usually growing as groups or woodlands, such that they attract a higher collective rating than they might as individuals; or trees occurring as collectives but situated so as to make little visual contribution to the wider locality	Trees with material conservation or other cultural value	See Table 2
Category C **Trees of low quality** with an estimated remaining life expectancy of at least 10 years, or young trees with a stem diameter below 150 mm	Unremarkable trees of very limited merit or such impaired condition that they do not qualify in higher categories	Trees present in groups or woodlands, but without this conferring on them significantly greater collective landscape value; and/or trees offering low or only temporary/transient landscape benefits	Trees with no material conservation or other cultural value	See Table 2

Appendix 2 – Calculation of the Root Protection Area

Circle Radius

The circle radius has been calculated by obtaining the stem diameter (measured at 1.5m above the ground) in millimetres and multiplying it by 12. Where the tree is multi-stemmed, an average stem diameter is calculated by the following formula specified in section 4.6.1 (a) & (b) of BS5837.

For trees with two to five stems, the combined stem diameter should be calculated as follows:

$$\sqrt{(\text{stem diameter 1})^2 + (\text{stem diameter 2})^2 \ldots + (\text{stem diameter 5})^2}$$

For trees with more than five stems (not illustrated in Annex C), the combined stem diameter should be calculated as follows:

$$\sqrt{(\text{mean stem diameter})^2 \times \text{number of stems}}$$

This total is then divided by 1000 to provide a circle radius in metres.

RPA Areas

The RPA has been assessed according to the recommendations set out in section 4.6 of BS5837. It is calculated by multiplying the radius squared by 3.142 (π).

Length of sides of a square

Section 5.5.3 of BS5837 recommends that the ground protection and barriers should be shown as a polygon surrounding the stem of the tree. With a circle, the distance from the edge of the circle to the centre will remain constant, but with a square, the distance from the centre of the tree to the sides of the square is less than the distance to the corner of the square. The area of the square must remain the same as the area of the circle. In order to ensure that it is
the case, the length of side of the square is calculated at the square root of the RPA area.

Minimum barrier distance

This is the closest point that a side of the square can be to the centre of the tree.

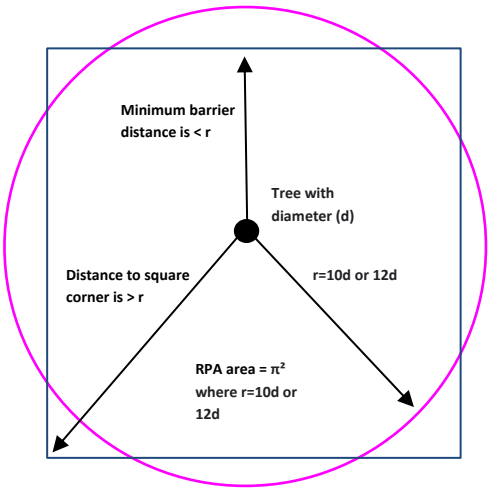


Figure 1. Illustration of area calculations and minimum barrier distances

Figure 1 illustrates the differences between a square and a circle in area. Where the distance from the centre of the tree to the corner of the square is greater than the radius of the circle (r), but the distance from the centre of the tree to the side of the square is greater than the radius of the circle (r), the total area will remain the same. The minimum barrier distance from the tree is calculated by taking the length of the side and dividing it by two.

Clarification note on the RPA radius

The RPA radius is not the automatic minimum distance of the tree protection. It is a notional figure for use as a means of calculating the actual area of the RPA. BS5837 clarifies this under *Section 3.7 Root Protection Area (RPA) – layout design tool indicating the minimum area around a tree deemed to contain sufficient roots and rooting volume to maintain the trees viability, and where the protection of the roots and soil structure is treated as a priority.*

Appendix 3 – Example of Tree Protective Fencing

heras® 151 and 151steadfast system

round top panel with anti-climb mesh
high visibility orange blocks
steadfast strut
anti-tamper coupler
fully tested and certificated
health and safety compliant (HSG 151)

Having invented the original concept of temporary fencing back in the 80's, Heras is proud of its reputation as a true innovator.

Our latest solution for securing site perimeters and protecting the public has been phenomenally successful since its launch, and offers the ultimate market leading temporary fencing system.

Our safest, most stable and most secure system ever offers you total peace of mind, and unrivaled performance.

You can be sure that by installing the Heras® 151 Steadfast System (patent pending), you are conforming fully to the latest HSE Guidelines on 'Protecting The Public' from the dangers of construction sites.

Heras has campaigned widely over recent years against falling product standards, and has consulted closely with senior figures across the construction industry to ensure our products meet and exceed your expectations. The latest innovative system means you should never again need to compromise on:

- Value for money
- Quality
- Performance
- Design
- Ease of installation.

All backed up with unbeatable service from our nationwide branch network – deal direct with Heras – your safety first fencing supplier.

Fully Tested and Certificated

- Extensive independent testing by Sheffield Hallam University has proved the performance of the system, resisting wind speeds well in excess of gale force.
- The HSE has confirmed that the system meets all of the guidelines in the HSG 151 Publication 'Protecting the Public – Your next move'.
- In turn, therefore, we can offer customers a certificate of compliance when they purchase the system from Heras.
- It is your responsibility to ensure the system is correctly installed and fixed. For help and advice, contact your nearest branch.

151 system

The key components of the Heras 151 system are as listed.

Round Top Panel with Anti-Climb Mesh

- The strongest panel on the market, with 3 sides formed from a continuous length of tube, eliminating the top corner weld, often the weakest point in traditional panel design.

High Visibility Orange Block

- Permanently coloured with a durable UV stabilised "in situ" casing and filled with solid high density concrete.
- Effectively highlights any potential trip hazard.
- Beware of cheap imitations – painted coatings will chip and peel.

Heraslock® Anti-Tamper Coupler

- Providing additional security these couplers can only be removed with the use of the specialist tool.

151 steadfast system

The Heras 151 steadfast system incorporates all the benefits of the 151 system, with the addition of the patented...

Heras® Steadfast Strut

- The unique design of this clever strut dramatically increases the stability of the fence.
- The strut fits neatly within the high visibility block allowing a neat and compact solution. And acts as an integrated anti-lift device.
- 3 additional fixing holes incorporated into the design allow for spit pins and thunderbolts, dependent on ground conditions.

Optional Extras

- Heras® Steadfast Safety Strips with reflective coating can be fitted in minutes to highlight site dangers.
- Front support brackets allow vastly improved performance on softer ground conditions and fit quickly and easily into the high visibility blocks.

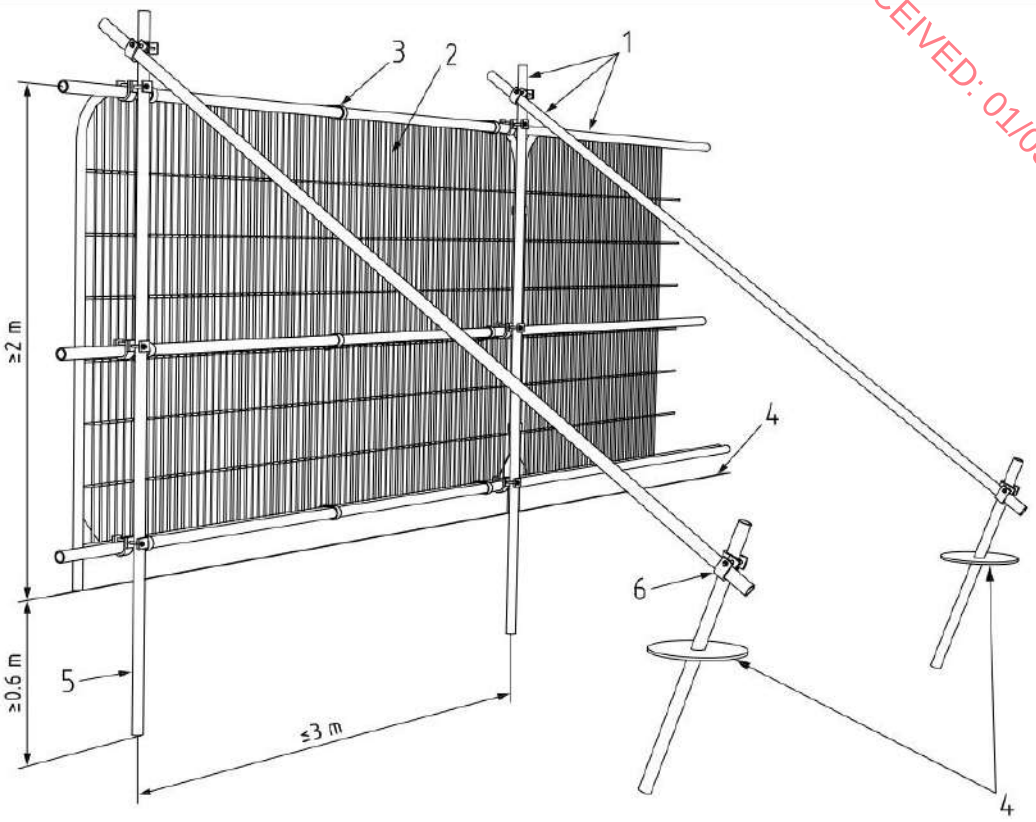
Our latest solution for securing site perimeters and protecting the public has been phenomenally successful since its launch, and offers the ultimate market leading temporary fencing system.

1. Front stabilizer
2. High visibility footblocks
3. Round top panel
4. Steadfast strut
5. Anti-tamper coupler
6. Optional steadfast safety strips
7. Anti-climb round top panel with steadfast mesh to increase stability

ROUND TOP PANELS WITH ANTI-CLIMB MESH

Heras | The Original Name for Temporary Fencing
www.theherasgroup.co.uk
Tel: 0844 472 0011

Figure 2 **Default specification for protective barrier**



Key

1 Standard scaffold poles
2 Heavy gauge 2 m tall galvanized tube and welded mesh infill panels
3 Panels secured to uprights and cross-members with wire ties
4 Ground level
5 Uprights driven into the ground until secure (minimum depth 0.6 m)
6 Standard scaffold clamps

Appendix 4 – Example of Tree Protective Signs

LEGEND

- Category A (Tree stem and canopy spread)
- Category B
- Category C
- Category U
- Root Protection Area
- Existing Layout
- Site Boundary

NOTES

Purpose of Tree Survey
The tree survey has been carried out in accordance with BS5837:2012 *Trees in relation to design, demolition and Construction - Recommendations.*

The purpose is to illustrate the constraints and opportunities posed by trees and hedgerows, to help the design team prepare a layout that is considerate of the existing canopy cover on and within influencing distance of the site.

Caveats
Tree and hedgerow positions place reliance on topographical survey. The position of trees and hedgerows not recorded on the topographical survey remains indicative.

Scale is for planning purposes only.

Plan should be read in colour and in conjunction with accompanying Tree Schedule.

BS5837 Retention Categories
The purpose of the tree categorization method is to identify the quality and value (in a non-fiscal sense) of the existing tree stock, allowing informed decisions to be made concerning which trees should be removed or retained in the event of development occurring.

Category A
Trees of high arboricultural quality and value in such condition to make a significant contribution for a minimum of 40 years.

Category B
Trees of moderate arboricultural quality and value in such condition to make a substantial contribution for a minimum of 20 years.

Category C
Trees of low arboricultural quality and value currently in adequate condition and able to remain until new planting is established with a minimum useful life expectancy of 10 years, or trees with a stem diameter of <150mm.

Category U
Trees in poor physiological or structural condition that cannot realistically be retained in the context of current land use for longer than 10 years.

Date	Details of Change	By	Version
10.10.23	Original	JM	v1
22.02.24	Insert final red line boundary	JM	v1

TITLE:
Tree Constraints Plan - Insert 1

PROJECT / SITE:
Plasterboard Plant, Gorteens, Slieverue, Co. Kilkenny

CLIENT:
GABM Ltd

DRAWING REF:
23-461-02

REVISION:
Version 1

DATE: 10.10.2023

SCALE: 1:1000@A1

DRAWN BY: JM

CHECKED BY: JL

John Morris Arboricultural Consultancy Ltd
Executive Suites, Weavers Court, Linfield Road, Belfast, BT12 5GH
Email: info@johnmorristrees.com | Mobile: +44 (0) 7830 793 467
Web: www.johnmorristrees.com

RECEIVED: 01/03/2024

PROPOSED ACCESS ROAD

S02 C.L.51.802 I.L. 50.602

S02 C.L.51.362 I.L. 50.162

S01 C.L.50.922 I.L. 49.797

EXIST C.L.50.820 I.L. 49.710

PROPOSED YARD

PROPOSED 15m CANOPY

PROPOSED GAS SKID 5x6m

PROPOSED RAINWATER HARVESTING TANKS

PROPOSED STAIRS

PROPOSED SOLAR PANELS

PROPOSED RETAINING WALL

PROPOSED RETAINING WALL

PROPOSED RETAINING WALL

PROPOSED SETTLEMENT TANK

PROPOSED OIL SEPARATOR

PROPOSED SOAKAWAY PIT

SITE 1 - PROPOSED GYPSUM PLANT F.F.L.+54.350

Example of Signs for Tree Protection Fencing

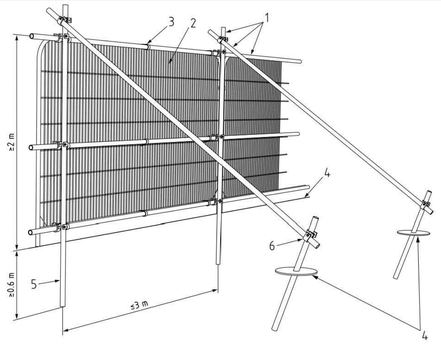
PROTECTIVE FENCING. THIS FENCING MUST BE MAINTAINED IN ACCORDANCE WITH THE APPROVED PLANS AND DRAWINGS FOR THIS DEVELOPMENT.

TREE PROTECTION AREA
KEEP OUT !
(TOWN & COUNTRY PLANNING ACT 1990)
TREES ENCLOSED BY THIS FENCE ARE PROTECTED BY PLANNING CONDITIONS AND/OR ARE THE SUBJECTS OF A TREE PRESERVATION ORDER.
CONTRAVENTION OF A TREE PRESERVATION ORDER MAY LEAD TO CRIMINAL PROSECUTION

ANY INCURSION INTO THE PROTECTED AREA MUST BE WITH THE WRITTEN PERMISSION OF THE LOCAL PLANNING AUTHORITY

Example of Tree Protection Fencing

Figure 2 **Default specification for protective barrier**



Key

1 Standard scaffold poles
2 Heavy gauge 2 m tall galvanized tube and welded mesh infill panels
3 Panels secured to uprights and cross-members with wire ties
4 Ground level
5 Uprights driven into the ground until secure (minimum depth 0.6 m)
6 Standard scaffold clamps

LEGEND

- Category A (Tree stem and canopy spread)
- Category B
- Category C
- Category U (pruning or removal required for safety reasons)
- Root Protection Area
- Trees and hedgerow proposed for removal (see landscape plan for replacement and mitigatory planting.
- Site Boundary
- Existing Layout
- Proposed Layout
- Tree Protection Fencing (area within forms Construction Exclusion Zone and is required to protect retained trees canopies, stems, roots and soil). Refer to Tree Schedule for min. radial distances (m) for Protective Fencing.
- +39.620 Existing Ground Levels
- 39.620 Proposed Ground Levels
- Existing Services
- Proposed Services

NOTES

Purpose of Tree Survey
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Category C
Trees of low arboricultural quality and value currently in adequate condition and able to remain until new planting is established with a minimum useful life expectancy of 10 years, or trees with a stem diameter of <150mm.

Category U
Trees in poor physiological or structural condition that cannot realistically be retained in the context of current land use for longer than 10 years.

Date	Details of Change	By	Version
01.01.24	Original	JM	v1

TITLE: Tree Impact & Protection Plan - Insert 1

PROJECT / SITE: Plasterboard Plant, Gorteens, Slieverue, Co. Kilkenny

CLIENT: GABM Ltd

DRAWING REF: 23-461-03

REVISION: Version 1

DATE: 01.01.2024

SCALE: 1:1000@A1

DRAWN BY: JM

CHECKED BY: JL

John Morris Arboricultural Consultancy Ltd
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Email: info@johnmorristrees.com | Mobile: +44 (0) 7530 765 487
Web: www.johnmorristrees.com

0 20 40m

NATIONAL PRIMARY ROUTE

BM 34.45

Client	GABM Ltd
Project / Site	Plasterboard Plant, Gorteens,
	Slieverue, Co. Kilkenny
Reference	23-461-01
Survey Date	4th and 5th October 2023

Abreviation	Definition	Age Class		Physiological Condition		Structural Condition		Category		U.L.E	Sub category	
H	Height (m)	Y (Young)	Newly planted (<10 yrs old)	Good	No obvious health problems	Good	No visible defects	A	High value and conservation	40+	1	Mainly arboricultural
Stem Dia.	Stem diameter (mm)	SM (Semi-mature)	First third of life expectancy	Fair	Intervention may improve health	Fair	Defects may require intervention	B	Moderate value and conservation	20+	2	Mainly landscape
C.C	Crown clearance (m)	EM (Early mature)	Second third of life expectancy	Poor	Serious ill health or dying	Poor	Dangerous or no remedy	C	Low value and conservation	10+	3	Mainly cultural
L.B.H	Lowest (significant) branch height (m)	M (Mature)	Full age for species					U	Not suitable for retention	<10		
L.B.D	Direction of lowest (significant) branch	OM (Over mature)	Beyond life expectancy & in decline									
U.L.E	Minimum useful life expectancy (yrs)	V (Veteran)	Ancient characteristics or conservation value		Prefix							

*G - Group H - Hedgerow W - Woodland P - Tree is on private land *Tree is not on topographical survey and therfore position remains indicitive # Measurements estimated (tree is inaccessible)*

Tree No.	Tag No.	Species	Botanical Name	H (m)	Stem Dia.	No of Stems	Crown Spread (m)				C.C (m)	L.B.H (m)	L.B.D	Age	Physiological	Structural	Comments	Recommendations	U.L.E	Cat.	RPA (m2)	RPA Radial distance (m)
							N	E	S	W												
G1	0601	Mixed Species Group	*N/a*	14	350	1	3	5	3	5	1	0	N/a	EM	Fair	Fair	Dense linear tree line comprising beech, elm and ash with understorey of hawthorn, holly and ivy, from stone field boundary.	None.	20+	B2	55	4
2	0602	Elm	*Ulmus sp.*	14	469	2	5	6	3	6	4	2	South	Dead.	Dead.	Dead.	Two stems from base forming spreading crown, Dutch Elm Disease, dead.	Fell.	<10	U	102	6
G3	0603	Mixed Species Group	*N/a*	16	480	1	6	7	6	7	5	0	0	M	Fair	Fair	Linear tree group comprising ash, elm and beech with dense understorey of hawthorn, elder, elm and beech saplings, clad with bramble and ivy, from west of field ditch. A small number of ash have Ash Dieback. Good natural regeneration from understorey species to provide successive canopy cover.	Fell 2no. dead ash (marked with x on plan).	20+	B2	102	6
4	0604	Ash (Common)	*Fraxinus excelsior*	16	647	5	7	7	6	6	4	2	North	M	Fair	Fair	Multistem from base forming spreading crown, codominant limb north with bark inclusion, surrounded by dense vegetation.	Reduce height and radial by 3m.	10+	C1	191	8
5	0605	Ash (Common)	*Fraxinus excelsior*	11	270	1	5	2	2	3	5	4	North	SM	Fair	Fair	Single ivy clad stem forming suppressed assymetric crown, from hedgerow.	None.	10+	C1	34	3
H6	0606	Mixed Species Hedgerow	*N/a*	5	220	1	1	1	1	1	0	0	N/a	M	Fair	Fair	Dense linear hedgerow comprising hawthorn, briar and bramble.	None.	20+	B2	23	3
7	0607	Ash (Common)	*Fraxinus excelsior*	11	260	3	5	6	5	1	4	4	East	EM	Fair	Fair	Four ivy clad stems from base forming suppressed asymmetric crown, stem cavity with decay from historic stem failure, from hedgerow.	None.	10+	C1	28	3
8	0608	Ash (Common)	*Fraxinus excelsior*	16	611	4	7	7	7	6	0	0	South	M	Fair	Fair	Four ivy clad stems from base forming broad spreading crown, from hedgerow.	None.	10+	C1	163	7
9	0609	Ash (Common)	*Fraxinus excelsior*	10	250	1	1	1	2	5	5	5	West	Dead.	Dead.	Dead.	Dead.	Fell.	<10	U	28	3
10	0610	Sycamore	*Acer pseudoplatanus*	15	270	1	3	5	4	2	5	5	South	SM	Fair	Fair	Single stem forming spreading crown, surrounded by vegetation.	None.	10+	C1	34	3
11	0611	Pedunculate oak	*Quercus robur*	16	750	1	9	8	10	6	2	2	East	M	Fair	Fair	Single stem forming broad spreading crown, deadwood <50mmø, fallen dead tree caught up in crown.	Remove fallen dead tree caught up in crown.	20+	B1	254	9
12	0612	Ash (Common)	*Fraxinus excelsior*	12	690	1	4	5	5	6	0	3	South	OM	Fair	Poor	Single stem, hollow with decay, crown failure with failed broken limbs and deadwood >100mmø, cavities, snags, dead bark, Pseudomonas syringae subsp. savastanoi pv. Fraxini, veteran features with ecological value, from hedgerow.	Reduce to 8m. Retain stem for ecological value.	20+	B3	222	8
13	0613	Ash (Common)	*Fraxinus excelsior*	21	940	1	8	8	8	9	2	4	South	M	Fair	Fair	Single stem forming broad spreading crown, stem cavity at 2mS, from hedgerow.	None.	20+	B1	408	11
14	0614	Ash (Common)	*Fraxinus excelsior*	18	780	1	8	5	9	6	4	5	South	M	Fair	Fair	Single stem forming broad spreading crown, from hedgerow.	Crown lift to 5.2m over site.	20+	B1	272	9
15	0615	Ash (Common)	*Fraxinus excelsior*	20	760	1	8	9	8	4	5	4	East	M	Fair	Fair	Single stem forming broad spreading crown, from hedgerow.	None.	20+	B1	254	9
16	0616	Ash (Common)	*Fraxinus excelsior*	12	608	2	7	5	6	7	4	3	South	M	Fair	Fair	Two ivy clad stems forming low spreading crown, previous crown reduction over site, from hedgerow.	None.	10+	C1	163	7
17	0617	Ash (Common)	*Fraxinus excelsior*	12	280	1	5	4	4	5	5	5	West	EM	Fair	Fair	Single stem forming compact crown, from top of bank.	None.	20+	B1	34	3
18	0618	Ash (Common)	*Fraxinus excelsior*	16	560	1	9	4	8	7	4	5	South	M	Fair	Fair	Single stem forming broad spreading crown, from top of bank.	Crown lift to 5.2m over site.	20+	B1	137	7
19	0619	Ash (Common)	*Fraxinus excelsior*	16	600	1	7	5	7	9	4	4	South	M	Fair	Fair	Three leaders from 4m forming broad spreading crown, from hedgerow.	Crown lift to 5.2m over site.	20+	B1	163	7
20	0620	Ash (Common)	*Fraxinus excelsior*	18	950	1	8	9	9	7	4	6	South	M	Fair	Fair	Single ivy clad stem forming broad spreading crown, ivy up into central crown, from hedgerow.	None.	20+	B1	408	11

Reference	23-461-01
Survey Date	4th and 5th October 2023

Abreviation	Definition	Age Class		Physiological Condition		Structural Condition		Category		U.L.E	Sub category	
H	Height (m)	Y (Young)	Newly planted (<10 yrs old)	Good	No obvious health problems	Good	No visible defects	A	High value and conservation	40+	1	Mainly arboricultural
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C.C	Crown clearance (m)	EM (Early mature)	Second third of life expectancy	Poor	Serious ill health or dying	Poor	Dangerous or no remedy	C	Low value and conservation	10+	3	Mainly cultural
L.B.H	Lowest (significant) branch height (m)	M (Mature)	Full age for species					U	Not suitable for retention	<10		
L.B.D	Direction of lowest (significant) branch	OM (Over mature)	Beyond life expectancy & in decline									
U.L.E	Minimum useful life expectancy (yrs)	V (Veteran)	Ancient characteristics or conservation value		Prefix	G - Group H - Hedgerow W - Woodland P - Tree is on private land *Tree is not on topographical survey and therfore position remains indicitive # Measurements estimated (tree is inaccessible)						

Tree No.	Tag No.	Species	Botanical Name	H (m)	Stem Dia.	No of Stems	Crown Spread (m) N	E	S	W	C.C (m)	L.B.H (m)	L.B.D	Age	Physiological	Structural	Comments	Recommendations	U.L.E	Cat.	RPA (m2)	RPA Radial distance (m)
21	0621	Ash (Common)	*Fraxinus excelsior*	17	860	1	8	8	8	8	5	5	East	M	Fair	Fair	Single ivy clad stem forming broad spreading crown, ivy up into central crown, from hedgerow.	None.	20+	B1	327	10
22	0622	Crab apple	*Malus sylvestris*	8	433	2	4	4	5	4	4	2	West	M	Fair	Fair	Two ivy clad stems from base forming low spreading crown, from hedgerow.	None.	20+	B1	82	5
23	0623	Ash (Common)	*Fraxinus excelsior*	20	940	1	8	9	9	9	3	3	South	M	Fair	Fair	Single ivy clad stem forming broad spreading crown, from hedgerow.	None.	20+	B1	408	11
24	0624	Ash (Common)	*Fraxinus excelsior*	8	290	1	4	2	4	3	5	4	West	EM	Fair	Fair	Single ivy clad stem forming compact crown, from hedgerow.	None.	10+	C1	41	4
25	0625	Ash (Common)	*Fraxinus excelsior*	12	403	2	5	6	5	6	5	2	East	EM	Poor	Poor	Two ivy clad stems from base forming spreading crown, crown dieback with deadwood <50mmø, limb failures in central crown, from hedgerow.	None.	10+	C1	72	5
26	0626	Pedunculate oak	*Quercus robur*	12	670	1	6	5	6	7	5	4	South	M	Fair	Fair	Single ivy clad stem forming low spreading crown, from hedgerow.	None.	20+	B1	206	8
27	0627	Holly	*Ilex aquifolium*	10	436	3	3	3	3	3	0	2	West	M	Fair	Fair	Multistem from base with dense foilage, from hedgerow.	None.	20+	B1	82	5
28	0628	Ash (Common)	*Fraxinus excelsior*	16	810	1	7	8	9	10	4	5	South	M	Fair	Fair	Two ivy clad stems forming broad spreading crown, previous crown reduction over field.	None.	20+	B1	290	10
29	0629	Ash (Common)	*Fraxinus excelsior*	17	480	1	5	4	8	8	5	5	South	EM	Fair	Fair	Single stem forming spreading crown, storm damage with torn limb from E of crown, from hedgerow.	None.	10+	C1	102	6
30	0630	Ash (Common)	*Fraxinus excelsior*	17	660	1	7	5	8	6	5	5	South	M	Poor	Poor	Single ivy clad stem forming spreading crown, crown dieback with deadwood <50mmø, broken limbs, from hedgerow.	Reduce to 8m. Retain stem for ecological value.	10+	C1	191	8
31	0631	Ash (Common)	*Fraxinus excelsior*	17	490	1	5	5	8	4	5	2	South	EM	Fair	Fair	Two ivy clad stems forming spreading crown, from hedgerow.	None.	10+	C1	113	6
32	0632	Ash (Common)	*Fraxinus excelsior*	16	680	2	6	3	6	3	4	3	South	M	Fair	Poor	Two ivy clad stems forming broad spreading crown, limb failures throughout crown, from top of bank.	None.	10+	C1	206	8
33	0633	Ash (Common)	*Fraxinus excelsior*	17	650	1	8	7	7	6	5	3	East	M	Fair	Fair	Single ivy clad stem forming broad spreading crown, deadwood <50mmø in lower crown, from hedgerow.	None.	20+	B1	191	8
34	0634	Ash (Common)	*Fraxinus excelsior*	15	290	1	5	4	1	1	4	4	South	SM	Fair	Fair	Single ivy clad stem forming suppressed crown, from top of bank.	None.	10+	C1	41	4
35	0635	Ash (Common)	*Fraxinus excelsior*	15	420	1	5	4	8	5	5	4	East	EM	Fair	Fair	Single ivy clad stem forming spreading crown, limb lost over field leaving snag, from hedgerow.	None.	10+	C1	82	5
36	0636	Ash (Common)	*Fraxinus excelsior*	16	724	2	7	8	7	7	5	5	South	M	Fair	Fair	Two ivy clad stems from base forming broad spreading crown, ivy high into crown, from hedgerow.	None.	10+	C1	238	9
37	0637	Ash (Common)	*Fraxinus excelsior*	16	550	1	7	5	7	8	5	5	South	EM	Fair	Fair	Single ivy clad stem forming spreading crown, from hedgerow.	None.	10+	C1	137	7
38	0638	Ash (Common)	*Fraxinus excelsior*	16	480	1	6	4	5	6	3	2	East	EM	Fair	Fair	Single ivy clad stem forming spreading crown, from hedgerow.	None.	10+	C1	102	6
39	0639	Ash (Common)	*Fraxinus excelsior*	17	490	1	7	7	8	9	5	4	West	EM	Fair	Fair	Single ivy clad stem forming spreading crown, from hedgerow.	None.	10+	C1	113	6
40	0640	Ash (Common)	*Fraxinus excelsior*	17	650	1	7	6	8	9	5	5	East	M	Fair	Fair	Single ivy clad stem forming spreading crown, from hedgerow.	None.	10+	C1	191	8
41	0641	Ash (Common)	*Fraxinus excelsior*	18	680	1	9	8	9	7	5	5	South	M	Fair	Fair	Pair of ivy clad stems forming broad spreading crown, dieback throughout with deadwood <50mmø, from hedgerow.	None.	10+	C2	206	8
42	0642	Ash (Common)	*Fraxinus excelsior*	10	270	1	5	5	4	3	5	6	East	SM	Fair	Fair	Single stem forming suppressed crown, from bank.	None.	10+	C1	34	3
43	0643	Crab apple	*Malus sylvestris*	10	410	2	5	4	6	5	4	4	South	M	Fair	Fair	Two ivy clad stems from base forming low spreading crown, from hedgerow.	None.	20+	B1	72	5
44	0644	Ash (Common)	*Fraxinus excelsior*	12	650	1	3	2	3	3	3	4	South	Dead.	Dead.	Dead.	Dead ivy clad stem, from hedgerow.	Fell.	<10	U	191	8
45	0645	Ash (Common)	*Fraxinus excelsior*	18	500	1	6	5	7	7	4	3	South	M	Fair	Fair	Single ivy clad stem forming spreading crown, from hedgerow.	None.	10+	C1	113	6
46	0646	Ash (Common)	*Fraxinus excelsior*	14	280	1	7	5	2	4	4	4	North	EM	Fair	Fair	Single ivy clad stem forming suppressed asymmetric crown, from hedgerow.	None.	10+	C1	34	3

Reference	23-461-01
Survey Date	4th and 5th October 2023

Abreviation	Definition	Age Class		Physiological Condition		Structural Condition		Category		U.L.E	Sub category	
H	Height (m)	Y (Young)	Newly planted (<10 yrs old)	Good	No obvious health problems	Good	No visible defects	A	High value and conservation	40+	1	Mainly arboricultural
Stem Dia.	Stem diameter (mm)	SM (Semi-mature)	First third of life expectancy	Fair	Intervention may improve health	Fair	Defects may require intervention	B	Moderate value and conservation	20+	2	Mainly landscape
C.C	Crown clearance (m)	EM (Early mature)	Second third of life expectancy	Poor	Serious ill health or dying	Poor	Dangerous or no remedy	C	Low value and conservation	10+	3	Mainly cultural
L.B.H	Lowest (significant) branch height (m)	M (Mature)	Full age for species					U	Not suitable for retention	<10		
L.B.D	Direction of lowest (significant) branch	OM (Over mature)	Beyond life expectancy & in decline									
U.L.E	Minimum useful life expectancy (yrs)	V (Veteran)	Ancient characteristics or conservation value		Prefix							

*G - Group H - Hedgerow W - Woodland P - Tree is on private land *Tree is not on topographical survey and therfore position remains indicative # Measurements estimated (tree is inaccessible)*

Tree No.	Tag No.	Species	Botanical Name	H (m)	Stem Dia.	No of Stems	Crown Spread (m)				C.C (m)	L.B.H (m)	L.B.D	Age	Physiological	Structural	Comments	Recommendations	U.L.E	Cat.	RPA (m2)	RPA Radial distance (m)
							N	E	S	W												
47	0647	Ash (Common)	*Fraxinus excelsior*	19	580	1	8	5	5	8	5	4	East	M	Fair	Fair	Single ivy clad stem forming broad spreading crown, from hedgerow.	None.	20+	B1	150	7
48	0648	Ash (Common)	*Fraxinus excelsior*	20	670	1	7	9	9	7	5	5	South	M	Fair	Fair	Two ivy clad leaders from 5m forming broad spreading crown, from hedgerow.	None.	20+	B1	206	8
49	0649	Ash (Common)	*Fraxinus excelsior*	19	700	1	8	9	8	9	4	4	East	M	Fair	Fair	Single ivy clad stem forming broad spreading crown, from hedgerow.	None.	20+	B1	222	8
50	0650	Ash (Common)	*Fraxinus excelsior*	7	550	1	1	1	5	6	4	5	South	OM	Fair	Poor	Single ivy clad stem, crown failure with single limb over field.	Reduce to 5m snag. Retain stem for ecological value.	<10	U	137	7
51	0651	Crab apple	*Malus sylvestris*	8	330	1	3	4	6	3	5	2	South	M	Fair	Fair	Multistem from base forming low spreading crown, limbs pruned over field, from hedgerow.	None.	10+	C1	48	4
52	0652	Crab apple	*Malus sylvestris*	8	350	1	4	5	5	4	5	2	South	M	Fair	Fair	Group forming low spreading canopy, from hedgerow.	None.	20+	B2	55	4
53	0653	Ash (Common)	*Fraxinus excelsior*	18	660	1	7	6	8	9	5	5	East	M	Fair	Fair	Single ivy clad stem forming broad spreading crown, from hedgerow.	None.	20+	B1	191	8
54	0654	Ash (Common)	*Fraxinus excelsior*	19	550	1	5	7	8	6	5	5	South	M	Poor	Poor	Single ivy clad stem forming broad spreading crown, severe crown dieback, deadwood >100mmø, from hedgerow.	Reduce to 8m. Retain stem for ecological value.	<10	U	137	7
55	0655	Ash (Common)	*Fraxinus excelsior*	16	420	1	6	7	6	6	2	4	West	M	Fair	Fair	Single ivy clad stem forming spreading crown, from hedgerow.	None.	10+	C1	82	5
56	0656	Crab apple	*Malus sylvestris*	12	580	1	6	7	5	7	4	4	East	M	Fair	Fair	Single ivy clad stem forming low spreading crown,from hedgerow.	None.	40+	A3	150	7
57	0657	Ash (Common)	*Fraxinus excelsior*	16	742	2	9	3	8	10	3	2	West	M	Fair	Poor	Two stems from base forming broad spreading crown, stem cavities with hollowing, from hedgerow.	Remove to facilitate new access road.	10+	C1	254	9
58	0658	Ash (Common)	*Fraxinus excelsior*	18	340	1	7	3	5	7	5	5	West	EM	Fair	Fair	Two stems from base forming spreading crown, from hedgerow.	Remove to facilitate new access road.	10+	C1	55	4
59	0659	Ash (Common)	*Fraxinus excelsior*	18	480	1	3	7	8	8	5	3	South	M	Fair	Fair	Single stem forming broad spreading crown, from hedgerow.	Remove to facilitate new access road.	20+	B1	102	6
60	0660	Ash (Common)	*Fraxinus excelsior*	16	625	3	7	8	9	8	2	2	West	M	Fair	Fair	Three stems from base forming broad spreading crown, badal decay with cerrioporus squamousus fruiting bodies at base, from bank at end of hedgerow.	Reduce to 8m. Retain stem for ecological value.	10+	C1	177	8
H61	0661	Mixed Species Hedgerow	*N/a*	8	320	1	2	2	3	2	0	0	South	M	Fair	Fair	Linear hedgerow comprising hawthorn, crab apple, ash and holly, clad with ivy and bramble, extendeds along bank beneath mature tree line.	None.	40+	A2	48	4
62	0662	Ash (Common)	*Fraxinus excelsior*	12	416	2	7	6	7	6	4	3	West	EM	Fair	Fair	Two ivy clad stems from base forming spreading crown, surrounded by vegetation.	None.	10+	C1	82	5
63	0663	Ash (Common)	*Fraxinus excelsior*	14	266	3	6	5	5	4	4	0	West	EM	Fair	Fair	Three stems from base forming spreading crown, surrounded by vegetation.	None.	10+	C1	34	3
64	0664	Ash (Common)	*Fraxinus excelsior*	12	340	1	6	5	5	5	4	3	West	EM	Fair	Fair	Single ivy clad stem forming spreading crown, surrounded by vegetation.	None.	10+	C1	55	4
65	0665	Ash (Common)	*Fraxinus excelsior*	16	539	3	7	6	6	7	4	3	West	M	Fair	Fair	Three stems from base forming spreading crown, surrounded by vegetation.	None.	10+	C1	137	7
66	0666	Ash (Common)	*Fraxinus excelsior*	12	280	1	3	2	2	3	N/a	N/a	N/a	Dead.	Dead.	Dead.	Dead.	Fell.	<10	U	34	3
67	0667	Ash (Common)	*Fraxinus excelsior*	16	284	2	9	5	1	1	5	3	West	SM	Fair	Fair	Two stems from base forming suppressed crown, stem over field W reduced to 3m.	None.	10+	C1	34	3
68	0668	Ash (Common)	*Fraxinus excelsior*	16	390	1	7	5	3	7	2	2	North	EM	Fair	Fair	Two leaders from 2m forming spreading crown.	None.	10+	C1	72	5
69	0669	Sycamore	*Acer pseudoplatanus*	16	702	3	4	6	8	8	2	2	South	M	Fair	Fair	Three stems from base forming spreading crown, from stone field boundary.	None.	20+	B1	222	8
70	0670	Ash (Common)	*Fraxinus excelsior*	18	310	1	3	4	5	5	5	3	South	EM	Fair	Fair	Single stem forming spreading crown.	None.	10+	C1	41	4
W71	0671	Mixed Species Woodland	*N/a*	18	350	1	5	5	5	5	0	0	West	EM	Fair	Fair	Dense mixed species woodland comprising ash, sycamore, wild cherry, oak, hawthorn, elm and Scots pine.	Remove c.1,562m² to facilitate new access road into site.	20+	B2	55	4
72	0672	Ash (Common)	*Fraxinus excelsior*	11	160	1	4	3	2	2	0	0	South	SM	Fair	Fair	Single stem self-sown by wall of derelict ruin.	None.	10+	C1	10	2
73	0673	Ash (Common)	*Fraxinus excelsior*	15	480	1	7	7	5	5	5	3	South	M	Fair	Fair	Single ivy clad stem forming spreading crown.	None.	20+	B1	102	6

Reference	23-461-01
Survey Date	4th and 5th October 2023

Abreviation	Definition	Age Class		Physiological Condition		Structural Condition		Category		U.L.E	Sub category	
H	Height (m)	Y (Young)	Newly planted (<10 yrs old)	Good	No obvious health problems	Good	No visible defects	A	High value and conservation	40+	1	Mainly arboricultural
Stem Dia.	Stem diameter (mm)	SM (Semi-mature)	First third of life expectancy	Fair	Intervention may improve health	Fair	Defects may require intervention	B	Moderate value and conservation	20+	2	Mainly landscape
C.C	Crown clearance (m)	EM (Early mature)	Second third of life expectancy	Poor	Serious ill health or dying	Poor	Dangerous or no remedy	C	Low value and conservation	10+	3	Mainly cultural
L.B.H	Lowest (significant) branch height (m)	M (Mature)	Full age for species					U	Not suitable for retention	<10		
L.B.D	Direction of lowest (significant) branch	OM (Over mature)	Beyond life expectancy & in decline									
U.L.E	Minimum useful life expectancy (yrs)	V (Veteran)	Ancient characteristics or conservation value		Prefix							

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Tree No.	Tag No.	Species	Botanical Name	H (m)	Stem Dia.	No of Stems	Crown Spread (m)				C.C (m)	L.B.H (m)	L.B.D	Age	Physiological	Structural	Comments	Recommendations	U.L.E	Cat.	RPA (m2)	RPA Radial distance (m)
							N	E	S	W												
74	0674	Ash (Common)	*Fraxinus excelsior*	16	593	4	3	5	5	5	2	2	East	M	Fair	Fair	Four ivy clad stems from base forming spreading crown.	None.	20+	B1	163	7
75	0675	Ash (Common)	*Fraxinus excelsior*	16	610	1	8	7	7	7	2	1	West	M	Fair	Fair	Single stem forming broad spreading crown.	None.	20+	B1	163	7
76	0676	Ash (Common)	*Fraxinus excelsior*	16	693	3	7	7	7	8	6	5	West	M	Fair	Fair	Three stems from base forming broad spreading crown.	None.	20+	B1	222	8
77	0677	Ash (Common)	*Fraxinus excelsior*	19	832	2	7	8	8	8	5	5	South	M	Poor	Poor	Three ivy clad stems forming broad spreading crown, dieback, deadwood >100mmø, from stone field boundary at woodland edge.	Reduce to 10m. Reatin stem for ecological value.	10+	C1	308	10
78	0678	Sycamore	*Acer pseudoplatanus*	18	480	1	6	7	4	5	1	2	North	M	Fair	Fair	Single ivy clad stem forming spreading crown, from bank by road.	None.	20+	B1	102	6
79	0679	Sycamore	*Acer pseudoplatanus*	12	180	1	5	5	4	3	1	2	East	SM	Fair	Fair	Single stem forming spreading crown.	None.	10+	C1	14	2
80	0680	Wych elm	*Ulmus glabra*	11	280	1	3	5	4	3	1	1	East	EM	Fair	Fair	Single stem forming spreading crown.	None.	20+	B1	34	3
81	0681	Ash (Common)	*Fraxinus excelsior*	21	820	1	8	8	7	5	5	6	East	M	Fair	Fair	Single stem forming broad spreading crown, dieback and deadwood <50mmø.	Reduce height and radial crown spread by 3m.	20+	B1	308	10
82	0682	Wych elm	*Ulmus glabra*	10	280	1	4	5	5	4	1	2	North	EM	Fair	Fair	Single stem forming spreading crown.	None.	20+	B1	34	3
83	0683	Ash (Common)	*Fraxinus excelsior*	20	660	1	9	8	6	9	1	5	North	M	Fair	Fair	Single ivy clad stem forming broad spreading crown.	None.	20+	B1	191	8
G84	0684	Mixed Species Group	*N/a*	8	150	1	4	4	4	4	0	0	South	EM	Fair	Fair	Mixed species understorey group comprising wych elm, hawthorn, ash and holly.	None.	10+	C2	10	2
85	0685	Elm	*Ulmus sp.*	12	269	3	4	3	4	4	N/a	N/a	N/a	Dead.	Dead.	Dead.	Dead.	Fell.	<10	U	34	3
86	0686	Elm	*Ulmus sp.*	11	250	1	4	2	1	3	N/a	N/a	N/a	Dead.	Dead.	Dead.	Dead.	Fell.	<10	U	28	3
87	0687	Ash (Common)	*Fraxinus excelsior*	13	280	1	4	5	5	4	4	3	West	SM	Fair	Fair	Single stem forming spreading crown.	None.	10+	C1	34	3
88	0688	Elm	*Ulmus sp.*	12	130	1	1	1	1	1	N/a	N/a	N/a	Dead.	Dead.	Dead.	Dead.	Fell.	<10	U	7	2
89	0689	Wych elm	*Ulmus glabra*	15	412	3	4	5	5	5	5	3	South	EM	Fair	Fair	Three stems forming spreading crown, from old stone boundary.	None.	20+	B2	72	5
90	0690	Ash (Common)	*Fraxinus excelsior*	22	960	1	9	9	6	10	5	3	East	M	Fair	Fair	Three ivy clad leaders from 3m forming broad spreading crown.	None.	20+	B1	408	11
91	0691	Ash (Common)	*Fraxinus excelsior*	15	180	1	4	4	3	3	4	4	West	EM	Poor	Fair	Two leaders from 2m forming suppressed crown, dieback.	Fell.	<10	U	14	2
92	0692	Ash (Common)	*Fraxinus excelsior*	13	260	1	3	4	2	3	3	2	South	EM	Poor	Fair	Two leaders from 2m forming suppressed crown, dieback, stone roadside wall has collapsed at base.	Fell.	<10	U	28	3
93	0693	Sycamore	*Acer pseudoplatanus*	18	789	3	6	7	5	6	3	3	South	M	Fair	Fair	Multistem from base forming spreading crown, from old stone boundary, overhead cables.	None.	20+	B1	290	10
94	0694	Sycamore	*Acer pseudoplatanus*	16	532	2	4	4	5	5	2	2	West	EM	Fair	Fair	Two stems from base forming spreading crown, from old stone boundary, overhead cables.	None.	20+	B1	125	6
95	0695	Sycamore	*Acer pseudoplatanus*	18	775	4	7	7	6	6	1	1	South	M	Fair	Fair	Multistem from base forming spreading crown, from old stone boundary, overhead cables.	None.	20+	B1	272	9
96	0696	Ash (Common)	*Fraxinus excelsior*	14	420	1	6	7	5	6	2	2	West	EM	Fair	Fair	Single ivy clad stem forming spreading crown.	None.	20+	B1	82	5
97	0697	Sycamore	*Acer pseudoplatanus*	12	350	1	5	5	5	5	1	1	East	EM	Fair	Fair	Multistem group of ash and sycamore forming homogeneous canopy, from old stone boundary.	None.	10+	C2	55	4
98	0698	Hawthorn (Common)	*Crataegus monogyna*	5	300	1	2	2	2	2	1	1	South	M	Fair	Fair	Multistem from 0.5m forming compact crown.	None.	10+	C1	41	4
99	0699	Hawthorn (Common)	*Crataegus monogyna*	5	320	1	2	3	3	2	1	1	East	M	Fair	Fair	Multistem from 0.5m forming compact crown.	None.	10+	C1	48	4
100	0700	Hawthorn (Common)	*Crataegus monogyna*	5	290	1	2	2	2	2	1	1	South	M	Fair	Fair	Multistem from 0.5m forming compact crown.	None.	10+	C1	41	4
101	0701	Ash (Common)	*Fraxinus excelsior*	18	780	1	9	10	8	10	5	5	West	M	Fair	Fair	Single ivy clad stem forming broad spreading crown, dieback and deadwood <50mmø.	Reduce height and radial crown spread by 3m.	10+	C1	272	9
G102	0702	Mixed Species Group	*N/a*	8	270	1	3	3	3	3	0	0	East	M	Fair	Fair	Dense mixed species understorey comprising hawthorn, elm, holly, ash, sycamore and horse chestnut.	None.	20+	B2	34	3

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Stem Dia.	Stem diameter (mm)	SM (Semi-mature)	First third of life expectancy	Fair	Intervention may improve health	Fair	Defects may require intervention	B	Moderate value and conservation	20+	2 Mainly landscape
C.C	Crown clearance (m)	EM (Early mature)	Second third of life expectancy	Poor	Serious ill health or dying	Poor	Dangerous or no remedy	C	Low value and conservation	10+	3 Mainly cultural
L.B.H	Lowest (significant) branch height (m)	M (Mature)	Full age for species					U	Not suitable for retention	<10	
L.B.D	Direction of lowest (significant) branch	OM (Over mature)	Beyond life expectancy & in decline								
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Tree No.	Tag No.	Species	Botanical Name	H (m)	Stem Dia.	No of Stems	Crown Spread (m)				C.C (m)	L.B.H (m)	L.B.D	Age	Physiological	Structural	Comments	Recommendations	U.L.E	Cat.	RPA (m2)	RPA Radial distance (m)
							N	E	S	W												
103	0703	Ash (Common)	*Fraxinus excelsior*	17	480	1	6	5	6	7	2	3	West	EM	Fair	Fair	Single ivy clad stem forming spreading crown.	None.	10+	C1	102	6
104	0704	Sycamore	*Acer pseudoplatanus*	16	737	2	7	8	7	8	1	2	East	M	Fair	Fair	Two ivy clad stems from base forming broad spreading crown.	None.	20+	B1	238	9
105	0705	Ash (Common)	*Fraxinus excelsior*	15	540	1	6	5	5	7	2	3	West	M	Fair	Fair	Two stems from base forming suppressed asymmetric crown, stem over site E has died back to 5m snag.	None.	10+	C1	137	7
106	0706	Horse chestnut	*Aesculus hippocastanum*	19	640	1	4	6	10	7	5	3	South	M	Fair	Fair	Two leaders from 3m forming broad spreading crown.	None.	40+	A1	191	8
107	0707	Horse chestnut	*Aesculus hippocastanum*	20	780	1	7	10	11	9	5	2	South	M	Fair	Fair	Three leaders from 2m forming broad spreading crown.	None.	40+	A1	272	9
108	0708	Lime (Small Leaf)	*Tilia cordata*	21	650	1	5	6	5	8	1	1	East	M	Fair	Fair	Single stem forming spreading crown.	None.	40+	A1	191	8
109	0709	Horse chestnut	*Aesculus hippocastanum*	20	941	2	6	10	10	8	4	4	East	M	Fair	Fair	Two ivy clad stems from base forming broad spreading crown.	None.	40+	A1	408	11
110	0710	Sycamore	*Acer pseudoplatanus*	21	720	1	5	11	6	8	5	3	East	M	Fair	Fair	Three ivy clad leaders from 4m forming broad spreading crown, build up of manure at base of stem.	None.	20+	B1	238	9
111	0711	Sycamore	*Acer pseudoplatanus*	15	380	1	3	6	2	3	4	4	North	EM	Fair	Fair	Single stem forming suppressed crown, build up of manure at base of stem.	None.	10+	C1	64	5
112	0712	Sycamore	*Acer pseudoplatanus*	19	840	1	10	9	6	8	5	5	North	M	Fair	Fair	Single stem forming broad spreading crown, build up of manure at base of stem.	None.	20+	B1	327	10
113	0713	Ash (Common)	*Fraxinus excelsior*	14	320	1	6	5	5	6	5	2	North	EM	Fair	Fair	Single stem forming spreading crown.	None.	10+	C1	48	4
114	0714	Sycamore	*Acer pseudoplatanus*	10	368	2	6	3	2	4	2	2	South	EM	Fair	Fair	Two leaders from 2m forming spreading crown.	None.	10+	C1	64	5
115	0715	Hawthorn (Common)	*Crataegus monogyna*	6	280	1	2	2	2	2	0	0	West	M	Fair	Fair	Multistem from 0.5m forming compact crown.	None.	10+	C1	34	3
116	0716	Ash (Common)	*Fraxinus excelsior*	12	417	2	5	6	5	6	3	2	East	EM	Fair	Fair	Two ivy clad stems from base forming spreading crown.	None.	10+	C1	82	5
W117	0717	Mixed Species Woodland	*N/a*	20	750	1	8	8	8	8	0	0	East	M	Fair	Fair	Dense mixed species woodland comprising sycamore, elm, spruce, ash, hawthorn and beech.	None.	40+	A2	254	9
H118	0718	Mixed Species Hedgerow	*N/a*	8	280	1	2	2	2	2	0	0	South	M	Fair	Fair	Linear mixed species hedgerow comprising hawthorn, elm ash,	None.	20+	B2	34	3
119	0719	Ash (Common)	*Fraxinus excelsior*	12	470	1	6	4	5	6	4	3	West	EM	Fair	Fair	Single ivy clad stem forming spreading crown, from hedgerow.	None.	20+	C1	102	6
120	0720	Elm	*Ulmus sp.*	7	250	1	3	2	1	3	N/a	N/a	N/a	Dead.	Dead.	Dead.	Dead.	Fell.	<10	U	28	3
121	0721	Ash (Common)	*Fraxinus excelsior*	16	540	1	7	7	6	5	2	3	East	M	Fair	Fair	Pair of stems forming broad spreading crown, from hedgerow.	None.	10+	C1	137	7
122	0722	Elm	*Ulmus sp.*	12	374	5	6	6	4	3	N/a	N/a	N/a	Dead.	Dead.	Dead.	Dead.	Fell.	<10	U	64	5
G123	0723	Mixed Species Group	*N/a*	15	300	1	5	5	5	5	3	3	South	EM	Fair	Fair	Multistem ivy clad mixed species group of ash and elm, from hedgerow.	None.	10+	C1	41	4
124	0724	Ash (Common)	*Fraxinus excelsior*	17	497	2	8	5	6	5	2	2	East	EM	Fair	Fair	Two leaders from 1m forming spreading crown, from hedgerow.	None.	10+	C1	113	6
125	0725	Ash (Common)	*Fraxinus excelsior*	17	450	1	3	3	4	3	2	2	South	EM	Fair	Fair	Single ivy clad stem forming compact crown, from hedgerow.	None.	10+	C1	92	5
126	0726	Beech (Common)	*Fagus sylvatica*	15	550	1	9	9	8	7	3	3	South	M	Fair	Fair	Single stem forming broad spreading crown, from hedgerow.	None.	20+	B1	137	7
127	0727	Turkey oak	*Quercus cerris*	22	814	2	9	10	9	9	2	5	East	M	Fair	Fair	Two ivy clad stems from base forming broad spreading crown, from hedgerow.	Crown lift to 5.2m over site.	40+	A1	308	10
128	0728	Beech (Common)	*Fagus sylvatica*	14	480	1	5	7	5	2	3	2	South	EM	Fair	Fair	Single stem forming suppressed crown, from hedgerow.	None.	20+	B1	102	6
129	0729	Ash (Common)	*Fraxinus excelsior*	18	570	1	6	5	6	7	2	3	South	M	Fair	Fair	Two ivy clad stems from 2m forming spreading crown, from hedgerow.	None.	20+	B1	150	7
130	0730	Sycamore	*Acer pseudoplatanus*	15	490	1	5	7	6	3	5	3	South	EM	Fair	Fair	Single ivy clad stem forming suppressed crown, from hedgerow.	None.	20+	B1	113	6
131	0731	Beech (Common)	*Fagus sylvatica*	16	760	1	8	9	9	8	2	2	East	M	Fair	Fair	Single stem forming broad spreading crown, from hedgerow.	Crown lift to 5.2m over site.	40+	A1	254	9
132	0732	Beech (Common)	*Fagus sylvatica*	20	808	2	8	10	9	8	3	2	South	M	Fair	Fair	Two stems from base forming broad spreading crown, from hedgerow.	None.	40+	A1	290	10
133	0733	Elm	*Ulmus sp.*	11	470	1	5	7	6	6	N/a	N/a	N/a	Dead.	Dead.	Dead.	Dead, surrounded by dense vegetation.	Fell.	<10	U	102	6
134	0734	Sycamore	*Acer pseudoplatanus*	12	680	1	8	7	7	6	1	2	South	M	Fair	Fair	Single stem forming spreading crown.	None.	20+	B1	206	8

Reference	23-461-01											
Survey Date	4th and 5th October 2023											
Abreviation	**Definition**	**Age Class**		**Physiological Condition**		**Structural Condition**		**Category**		**U.L.E**	**Sub category**	
H	Height (m)	Y (Young)	Newly planted (<10 yrs old)	Good	No obvious health problems	Good	No visible defects	A	High value and conservation	40+	1	Mainly arboricultural
Stem Dia.	Stem diameter (mm)	SM (Semi-mature)	First third of life expectancy	Fair	Intervention may improve health	Fair	Defects may require intervention	B	Moderate value and conservation	20+	2	Mainly landscape
C.C	Crown clearance (m)	EM (Early mature)	Second third of life expectancy	Poor	Serious ill health or dying	Poor	Dangerous or no remedy	C	Low value and conservation	10+	3	Mainly cultural
L.B.H	Lowest (significant) branch height (m)	M (Mature)	Full age for species					U	Not suitable for retention	<10		
L.B.D	Direction of lowest (significant) branch	OM (Over mature)	Beyond life expectancy & in decline									
U.L.E	Minimum useful life expectancy (yrs)	V (Veteran)	Ancient characteristics or conservation value		Prefix	*G - Group H - Hedgerow W - Woodland P - Tree is on private land *Tree is not on topographical survey and therfore position remains indicitive # Measurements estimated (tree is inaccessible)*						

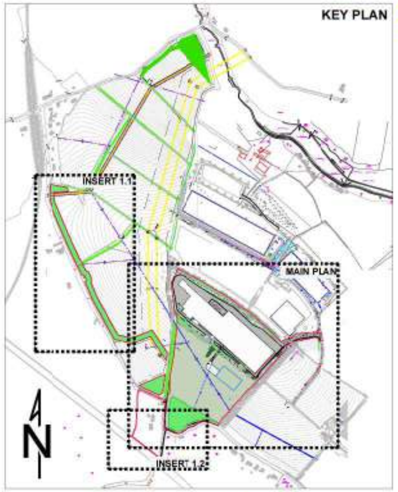
Tree No.	Tag No.	Species	Botanical Name	H (m)	Stem Dia.	No of Stems	Crown Spread (m) N	E	S	W	C.C (m)	L.B.H (m)	L.B.D	Age	Physiological	Structural	Comments	Recommendations	U.L.E	Cat.	RPA (m2)	RPA Radial distance (m)
G135	0735	Mixed Species Group	*N/a*	8	290	1	4	4	4	4	0	0	South	EM	Fair	Fair	Dense mixed species vegetation comprising hawthorn, elm and laurel, surrounded by dense vegetation.	Remove c.57m² to facilitate new gypsum plant buildings.	10+	C2	41	4
136	0736	Sycamore	*Acer pseudoplatanus*	5	150	1	2	2	2	2	1	1	West	Y	Fair	Fair	Multistem from base forming compact crown, from rank grass.	None.	10+	C1	10	2
137	0737	Sitka spruce	*Picea sitchensis*	7	300	1	3	3	3	3	1	1	South	SM	Fair	Fair	Single stem forming compact conical crown, from rank grass.	None.	10+	C1	41	4
H138	0738	Mixed Species Hedgerow	*N/a*	6	270	1	2	2	2	2	0	0	South	M	Fair	Fair	Linear hedgerow with scattered with hawthorn and occasional self-sown saplings of elm, from bank.	None.	10+	C2	34	3
139	0739	Hawthorn (Common)	*Crataegus monogyna*	7	457	3	4	2	4	5	3	2	East	M	Fair	Fair	Three ivy clad stems forming compact crown, from bank.	None.	20+	B1	92	5
140	0740	Hawthorn (Common)	*Crataegus monogyna*	5	340	1	2	1	3	1	3	1	West	OM	Fair	Poor	Two ivy clad stems forming suppressed compact crown, choked with ivy throughout crown, from bank.	None.	10+	C1	55	4
141	0741	Ash (Common)	*Fraxinus excelsior*	14	730	2	8	8	8	7	4	3	South	M	Fair	Fair	Two ivy clad stems forming spreading crown, surrounded by dense vegetation, from bank.	None.	20+	B1	238	9
142	0742	Wych elm	*Ulmus glabra*	8	300	1	6	5	4	5	4	2	West	EM	Fair	Fair	Single stem forming low spreading crown, from bank.	None.	10+	C1	41	4
143	0743	Hawthorn (Common)	*Crataegus monogyna*	6	280	1	3	2	3	1	4	0	South	EM	Fair	Fair	Pair if ivy clad stems forming compact crown, from bank.	None.	10+	C2	34	3
144	0744	Elm	*Ulmus sp.*	8	290	1	2	2	2	2	N/a	N/a	N/a	Dead.	Dead.	Dead.	Dead.	Fell.	<10	U	41	4
145	0745	Lime (Small Leaf)	*Tilia cordata*	14	855	3	8	8	8	8	1	1	South	M	Fair	Fair	Three stems from base forming broad spreading crown, from bank.	None.	40+	A1	327	10
146	0746	Hawthorn (Common)	*Crataegus monogyna*	4	280	1	1	1	2	1	1	0	East	M	Fair	Poor	Two ivy clad stems forming suppressed compact crown, choked with ivy throughout crown, from bank.	None.	10+	C1	34	3
147	0747	Elm	*Ulmus sp.*	6	150	1	3	3	2	3	1	0	West	Dead.	Dead.	Dead.	Dead.	Fell.	<10	U	10	2
148	0748	Hawthorn (Common)	*Crataegus monogyna*	6	270	1	2	2	2	2	1	0	East	M	Fair	Fair	Pair of ivy clad stems forming compact drown, from bank.	None.	10+	C1	34	3
149	0749	Crab apple	*Malus sylvestris*	8	520	1	5	5	5	5	1	2	East	M	Fair	Fair	Two leaders from 3m forming low spreading crown, from bank.	None.	20+	B1	125	6
G150	0750	Mixed Species Group	*N/a*	6	160	1	3	3	3	2	1	0	South	EM	Fair	Fair	Small cluster of multistem hawthorn, elm and plum from bank.	None.	10+	C2	10	2
151	0751	Elm	*Ulmus sp.*	8	220	1	5	3	3	3	N/a	N/a	N/a	Dead.	Dead.	Dead.	Dead.	Fell.	<10	U	23	3
H152	0752	Mixed Species Hedgerow	*N/a*	5	180	1	1	1	1	1	0	0	East	SM	Fair	Fair	Mixed species hedgerow comprising hawthorn, elm, blackthorn and sycamore on raised bank.	Remove to facilitate new gypsum plant buildings.	10+	C2	14	2
153	0753	Sycamore	*Acer pseudoplatanus*	12	460	1	4	6	6	6	1	2	South	EM	Fair	Fair	Single stem forming spreading crown, from bank.	Remove to facilitate new gypsum plant buildings.	20+	B1	92	5
154	0754	Beech (Common)	*Fagus sylvatica*	14	764	2	7	9	7	7	1	1	East	M	Fair	Fair	Two stems from 0.5m forming broad spreading crown, from bank.	Remove to facilitate new gypsum plant buildings.	40+	A1	272	9
155	0755	Crab apple	*Malus sylvestris*	12	490	1	6	5	1	3	3	3	East	M	Fair	Fair	Single stem forming suppressed asymmetric crown, heavy fruiting, from bank.	Remove to facilitate new gypsum plant buildings.	20+	B1	113	6
156	0756	Oak (English)	*Quercus robur*	12	500	1	4	6	6	7	2	2	West	M	Fair	Fair	Two ivy clad leaders from 2m forming spreading crown, from bank.	Remove to facilitate new gypsum plant buildings.	40+	A1	113	6
157	0757	Beech (Common)	*Fagus sylvatica*	15	560	1	7	9	5	7	1	3	East	M	Fair	Fair	Single stem forming spreading crown, from bank.	Remove to facilitate new gypsum plant buildings.	20+	B1	137	7
158	0758	Beech (Common)	*Fagus sylvatica*	16	620	1	7	10	8	7	3	4	South	M	Fair	Fair	Single stem forming broad spreading crown, from bank.	Remove to facilitate new gypsum plant buildings.	40+	A1	177	8
159	0759	Beech (Common)	*Fagus sylvatica*	11	540	1	6	7	5	4	6	4	South	EM	Fair	Fair	Single stem forming asymmetric spreading crown, limb failure at 2m E leaving localised stem cavity, from bank.	Remove to facilitate new gypsum plant buildings.	20+	B1	137	7
160	0760	Elm	*Ulmus sp.*	7	240	1	3	2	1	3	N/a	N/a	N/a	Dead.	Dead.	Dead.	Dead.	Remove to facilitate new gypsum plant buildings.	<10	U	28	3
161	0761	Ash (Common)	*Fraxinus excelsior*	12	435	3	5	6	6	5	1	2	North	EM	Fair	Fair	Three ivy clad stems from base forming spreading crown, from bank.	Remove to facilitate new gypsum plant buildings.	10+	C1	82	5
162	0762	Elder	*Sambucus nigra*	5	302	7	4	4	4	4	1	0	East	M	Fair	Fair	Multistem from baee forming low spreading crown, from bank.	Remove to facilitate new gypsum plant buildings.	10+	C1	41	4
163	0763	Sycamore	*Acer pseudoplatanus*	14	650	1	5	6	6	4	3	4	East	M	Fair	Fair	Single ivy clad stem forming spreading crown, from bank.	Remove to facilitate new gypsum plant buildings.	20+	B1	191	8

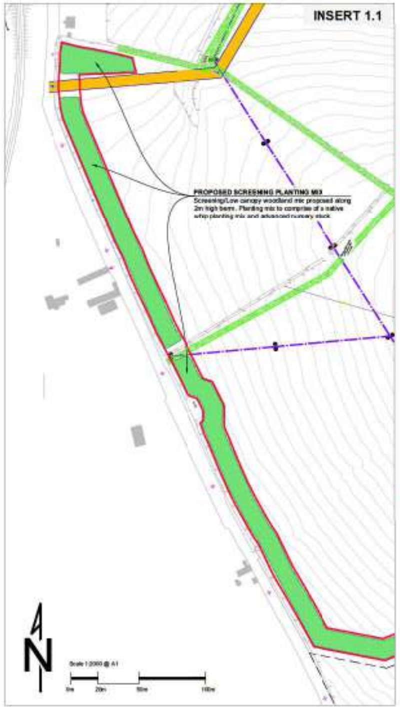
Reference	23-461-01
Survey Date	4th and 5th October 2023

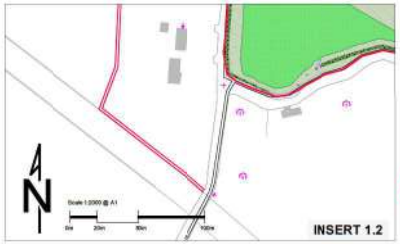
Abreviation	Definition	Age Class		Physiological Condition		Structural Condition		Category			U.L.E	Sub category	
H	Height (m)	Y (Young)	Newly planted (<10 yrs old)	Good	No obvious health problems	Good	No visible defects	A	High value and conservation		40+	1	Mainly arboricultural
Stem Dia.	Stem diameter (mm)	SM (Semi-mature)	First third of life expectancy	Fair	Intervention may improve health	Fair	Defects may require intervention	B	Moderate value and conservation		20+	2	Mainly landscape
C.C	Crown clearance (m)	EM (Early mature)	Second third of life expectancy	Poor	Serious ill health or dying	Poor	Dangerous or no remedy	C	Low value and conservation		10+	3	Mainly cultural
L.B.H	Lowest (significant) branch height (m)	M (Mature)	Full age for species					U	Not suitable for retention		<10		
L.B.D	Direction of lowest (significant) branch	OM (Over mature)	Beyond life expectancy & in decline										
U.L.E	Minimum useful life expectancy (yrs)	V (Veteran)	Ancient characteristics or conservation value		Prefix	*G - Group H - Hedgerow W - Woodland P - Tree is on private land *Tree is not on topographical survey and therfore position remains indicitive # Measurements estimated (tree is inaccessible)*							

Tree No.	Tag No.	Species	Botanical Name	H (m)	Stem Dia.	No of Stems	Crown Spread (m)				C.C (m)	L.B.H (m)	L.B.D	Age	Physiological	Structural	Comments	Recommendations	U.L.E	Cat.	RPA (m2)	RPA Radial distance (m)
							N	E	S	W												
G164	0764	Mixed Species Group	*N/a*	8	250	1	4	4	4	4	0	0	South	SM	Fair	Fair	Mixed species vegetation around derelict ruin, comprises dense ground vegetation with occasional hawthorn and dead elm saplings, multiple failures throughout with dead and failed stems laying on ground.	Remove to facilitate new gypsum plant buildings.	<10	U	28	3
165	0765	Sycamore	*Acer pseudoplatanus*	10	320	1	5	2	2	3	3	3	South	SM	Fair	Fair	Three leaders from 0.5m forming asymmetric crown.	Remove to facilitate new gypsum plant buildings.	10+	C1	48	4
166	0766	Hawthorn (Common)	*Crataegus monogyna*	6	340	1	3	4	3	4	0	0	South	M	Fair	Fair	Multistem from 0.5m forming compact crown surrounded by dense vegetation.	Remove to facilitate new gypsum plant buildings.	10+	C1	55	4
G167	0767	Mixed Species Group	*N/a*	6	330	1	4	4	4	4	0	0	South	M	Fair	Fair	Mixed species group comprising hawthorn and elder surrounded by dense vegetation, opposite entrance of cattle shed.	Remove to facilitate new gypsum plant buildings.	10+	C2	48	4
G168	0768	Mixed Species Group	*N/a*	6	250	1	4	4	4	4	0	0	South	SM	Fair	Fair	Dense mixed species group comprising ash, field maple, hawthorn, hazel, laurel and rowan, small copse E of cattle shed.	Remove to facilitate new gypsum plant buildings.	10+	C2	28	3

APPENDIX 6-4







Registered Landscape Architect

LEGEND

EXISTING SCRUB (317 SQUARE METRES)

EXISTING HEDGEROWS

SCREENING PLANTING MIX (18,030 SQUARE METRES)

SPECIES RICH GRASSLAND MIX (9040 SQUARE METRES)

NOTES

The function of the proposed mitigation planting is primarily for screening and softening of the proposed development, but it will also enhance the ecological corridors within the surrounding area.

Hedgerows (Existing)
Hedgerows to be allowed to grow to a minimum of 8m tall, primarily pruned for width and density.

Screening Planting Mix (c. 18,030sqm)
Screening planting mix to comprise of High Canopy Dominants (<20%), Low-canopy: Sub-dominants (20-25%), Understorey and Fringe: High-Shrubs (20-40%) and Understorey and Edge: Lower-Shrubs (15-25%). Planting to be allowed to grow to reach maturity. Trees to be planted at varying distances from 1.5m x 1.5m to 3.0m x 3.0m. Smaller shrubs to be planted at spacing between 900mm and 1500mm centres depending on species.

Species mix to be finalised in conjunction with the project ecologist. All species to be from certified native stock.

NATIVE HEDGEROW SPECIES:

Botanical name	Common name	Size	%
[illegible]			
Alnus glutinosa	Alder	90-120cm / 8-10cm girth 3m (or standard trees)	60%
[illegible]			
Prunus spinosa	Blackthorn	90-120cm	15%
Ilex aquifolium	Holly	90-120cm	15%
[illegible]			
Rubus fruticosus	Bramble	60-90cm	2.5%
Corylus avellana	Hazel	60-90cm	2.5%
Rosa canina	Dog-rose	60-90cm	2.5%
Euonymus europaeus	Spindle	60-90cm	2.5%

SCREEN PLANTING MIX SPECIES:

Botanical name	Common name	Size	%
High Canopy Dominants			
Quercus Robur	Pedunculate Oak	[illegible]	<20%
Pinus sylvestris	Scots Pine	[illegible]	
Low Canopy Sub-dominants			
Alnus glutinosa	Alder	[illegible]	20-25%
Betula pubescens	Downy Birch	[illegible]	
Prunus avium	Wild Cherry	[illegible]	
[illegible]			
Prunus Padus	Bird Cherry	90-120cm	20-40%
Corylus avellana	Hazel	90-120cm	
Ilex aquifolium	Holly	90-120cm	
Crataegus monogyna	Hawthorn	90-120cm	
[illegible]			
Prunus spinosa	Blackthorn	40-60cm	15-25%
Rosa canina	Dog-rose	40-60cm	
Euonymus europaeus	Spindle	40-60cm	

REVISIONS:

1.	Draft	04/01/2024
2.	Revised redline	28/02/2024
3.		
4.		
5.		
6.		

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Site location:
Gorteens, Slieverue,
COUNTY KILKENNY

Drawing Title:
LANDSCAPE MITIGATION PLAN

Project:
Plasterboard Manufacturing Plant

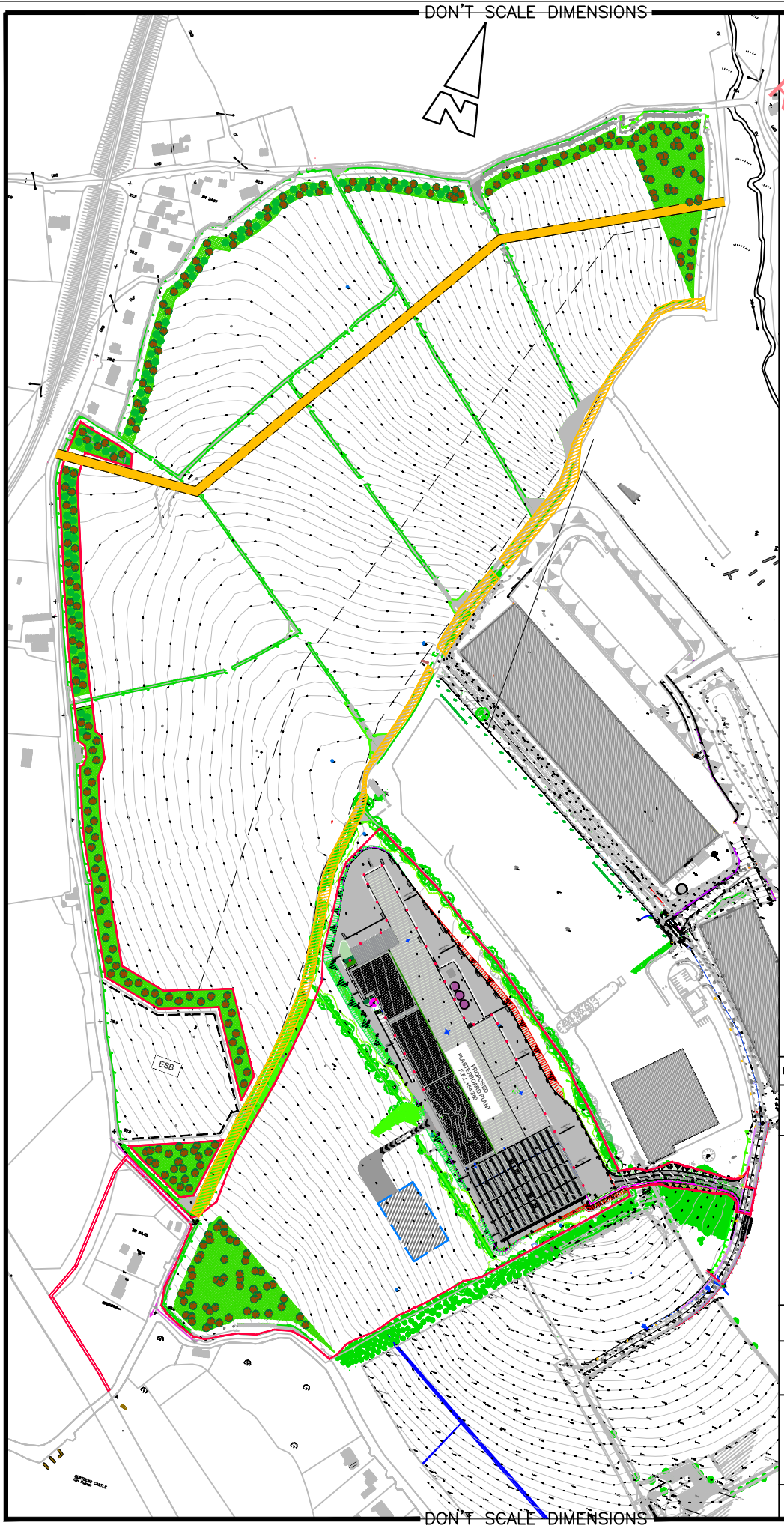
Drawn by:	Checked by:
JD	CD

Drawing Ref:
LD. BLVWGPSM 1.0

Scale:	Date:
1:1000@ A1	FEB 2024

ISSUED

DON'T SCALE DIMENSIONS



DON'T SCALE DIMENSIONS

Health and Safety:

THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS, THE SPECIFICATION AND THE SAFETY AND HEALTH PLAN.

THE APPOINTMENT OF THE PROJECT SUPERVISOR DESIGN PROCESS IS THE CLIENT'S RESPONSIBILITY.

TEMPORARY WORKS PROPOSALS AND/OR METHOD STATEMENTS TO BE SUBMITTED TO THE PSDP AND THE PSCS FOR WORKS WHICH INVOLVE PARTICULAR RISKS.

Notes:

1. NO PART OF THIS DRAWING MAY BE REPRODUCED OR TRANSMITTED IN ANY FORM OR STORED IN ANY RETRIEVAL SYSTEM OF ANY NATURE WITHOUT THE WRITTEN PERMISSION OF MALONE O'REGAN CONSULTING ENGINEERS AS COPYRIGHT HOLDER EXCEPT AS AGREED FOR USE ON THE PROJECT FOR WHICH THE DRAWING WAS ORIGINALLY ISSUED.
2. THE APPOINTMENT OF THE PROJECT SUPERVISOR DESIGN PROCESS IS THE CLIENT'S RESPONSIBILITY.
3. ALL DIMENSIONS IN mm UNLESS NOTED OTHERWISE.
4. THE CONTRACTOR SHALL CHECK ALL DIMENSIONS PRIOR TO COMMENCEMENT OF CONSTRUCTION. DISCREPANCIES SHALL BE REPORTED TO THIS OFFICE IN WRITING.
5. THIS DRAWING TO BE READ IN ACCORDANCE WITH ALL RELEVANT ENGINEERS' DRAWINGS AND SPECIFICATIONS.

LEGEND

PROPOSED CURRENT WOODLAND PANTING

PROPOSED FUTURE WOODLAND PANTING

ECOLOGICAL CORRIDOR

Rev.	Description	Date	Drawn	Chkd	Appr

MALONE O'REGAN CONSULTING ENGINEERS

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Client: GABM LIMITED

Job: PLASTERBOARD MANUFACTURING FACILITY AT GORTEENS, CO. KILKENNY

Drawing: LANDSCAPING MASTERPLAN

Job No	Drg No	Stage	Revision	Scale
W23008	DIAGRAM 2	PL	P	A4 1:5000

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APPENDIX 6-5

GUIDANCE FOR THE CREATION OF ARTIFICIAL SETTS

INTRODUCTION

The flow diagram of the badger Policy Guidance Note describes the circumstances under which it may be necessary to construct an artificial badger sett. Although such structures are not complicated, careful consideration needs to be given to aspects of sett location, design and construction. The information which follows provides appropriate guidance in these respects and, if adhered to, will improve the likelihood of a successful outcome. A suitably qualified ecological clerk of works should oversee the process from the start, i.e. from design to installation. A period of monitoring will be required in order to determine use of the artificial sett by badgers. The duration and frequency of monitoring will be site-specific, depending on when and if badgers colonise, and will be agreed between the ecological clerk of works, SNH and the client.

REASONS FOR CONSTRUCTING AN ARTIFICIAL BADGER SETT

There are two reasons for the construction of an artificial sett:

- To facilitate the relocation of badgers within their existing territory in those cases where a main or annexe sett is to be destroyed.

- To facilitate the release of badgers into new areas i.e. the translocation of badgers outside of their territory.

This guidance is concerned with the former circumstance i.e. those situations in which badgers are to be relocated within their existing territory as a consequence of main or annexe sett loss due to development.

Main and annexe setts are normally the most important setts within a badger territory. The removal of any badger sett is only possible under licence. In most situations such a licence will stipulate that replacement artificial setts must be provided. Where badgers are present in low density, or where the status or functionality of setts is difficult to establish, subsidiary or outlying setts may also assume a pivotal role in badger social organisation. Where this is suspected, the construction of artificial setts should also be considered an appropriate mitigation measure where such setts are to be lost to development.

SELECTION OF SITE

Many criteria must be considered with respect to the location of an artificial sett, particularly when the sett is to be provided as an alternative

to a natural sett that will be destroyed and where badgers will be excluded.

- **Social Group Territory**

Badgers are territorial; therefore, any alternative artificial sett must be located within the appropriate social group territory. If there is any uncertainty, the construction of the sett must be preceded by a territorial bait marking survey.

- **Proximity to Existing Setts.**

Badgers must be able to locate the replacement sett without any difficulty. A site must be selected as close to the existing sett(s) and/or area of badger activity as is practicable. However, the site must not be so close to the new development that disturbance could distract badgers from using it.

- **Size of Site.**

The size of the site required for artificial sett construction will depend upon the size of the natural sett which it replaces. Regardless of the artificial sett size, a minimum area of 30m radius should be demarcated from the outlying holes of the artificial sett to prevent damage and disturbance. An area 10m x 10m would accommodate a small artificial sett comprising two entrances with tunnels leading to at least two chambers. Small artificial setts, even though physically capable of accommodating the appropriate number of badgers excluded from larger setts, generally tend not to work. Therefore, it is important to construct a structure with adequate chambers and tunnels which replicates as much as possible the bulk of the natural sett it replaces. A mechanical digger is normally used to prepare the site and the amount of soil excavated during this procedure can necessitate a construction area considerably larger than the dimensions of the artificial sett itself.

- **Profile of the Sett.**

The exact shape of the sett can be varied to accommodate local topography. For example, sett footprints can be adapted to fit into long thin strips of ground or, within woodland, can be designed to integrate with existing trees. Sett design is flexible.

- **Gradient of the Site.**

It is important that there is sufficient drainage to avoid the artificial sett becoming flooded. Soil type plays a part in this. However, it is also important to ensure that tunnels slope away from the sett chambers such that water flows towards the sett entrances. It is also important to ensure a depth of at least one metre of soil above the chambers. There are two ways this can be achieved. The preferred way is to build the sett on or into a sloping site with the pipes emerging at the lowest point. If this is not possible, the whole sett can be covered with a mound of soil.

- **Timing of Sett Construction.**

The licensed destruction of an occupied sett will necessitate the exclusion of the resident badgers, again under license. In order to ensure that the excluded badgers have an alternative sett to go to, and that they are familiar with the artificial sett, timing is critical. The artificial sett should therefore be constructed at least 6 months prior to exclusion. An exclusion of a main or breeding sett will generally only be licensed to occur between the end of June and the end of November.

SETT DESIGN: GENERAL PRINCIPLES

- **Chamber Design**

The chambers should always be constructed at the end of branches off the main pipe run as badgers like the security of a defendable 'end' situation. Chambers are constructed using concrete slabs with either concrete or breeze blocks or alternatively wood and plastic. The basic design of the chamber reflects the shape and size of the materials used for construction. Thus, 3' x 2' concrete paving slabs can be used in association with 6" bed concrete. Alternatively, wood chambers typically measure 450mm to 750mm square. Completed chambers should always be filled generously with dry hay or straw.

- **Tunnels.**

The tunnels are constructed from 12" (300mm) diameter pipes throughout - reduced at entrances to 9" (225mm) pipes. The 9" pipes at the entrances restrict the size of any dog that could enter into the sett, but allow badgers easy access. Pipes can be of clay or concrete, collared or not, and of any length that can be obtained. However it should be remembered that long pipes are difficult to handle and make curves more difficult to construct. Preferred pipes are clay at 1500mm long with collars. These are the lightest and easiest to handle, fit together well and

make the straightness of the trenches less critical. One, or possibly two, pipe branches with one branch left open to the surrounding soil allows the badgers to excavate and expand the sett if they wish. Plastic piping, 250mm – 300mm in diameter, can also be used and is easy to handle. If preferred, a mixture of all material types could be used.

- **Construction.**

A mechanical digger is usually used to excavate the sett. Chambers and pipe runs should be buried at a depth of at least 1250mm. Pipe trenches should be excavated using a 600mm wide digger bucket.

Normal Health and Safety guidelines apply, particularly with respect to working in trenches. Therefore, trench sides should be sloped back or stepped to comply with guidelines.

The time taken to construct an artificial sett is determined by how well the construction has been organised. Assuming that all materials and labour are readily available (including an excavator driver), the sett can be constructed, backfilled and landscaped within two to four days.

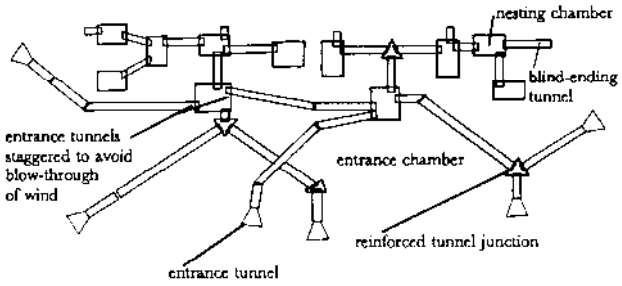
SPECIFIC SETT DESIGNS

Details of two types of design are considered below. Both are modular in construction and can be readily adapted to suit site and size requirements. The size of either design type should reflect the size and status of the sett which is to be replaced.

The Type 1 design probably more closely replicates the chamber conditions found within a natural sett. The Type 2 design benefits from an easier build, additional durability and security from persecution or interference. In all cases, badgers should have time to familiarize with replacement setts, which should be in position at least six months prior to any natural sett exclusion.

Type 1 Design

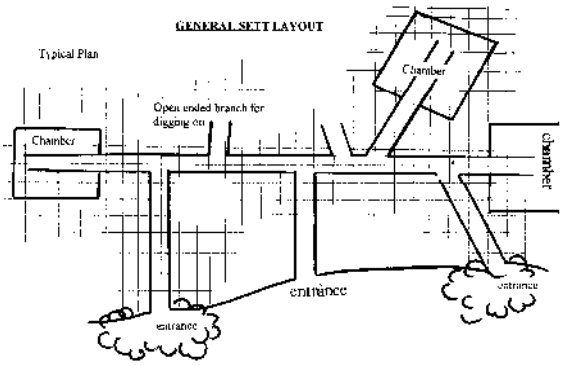
Comprising 450mm to 750mm square or similarly sized rectangular nest chambers constructed of wood and with a height of 300mm to 450mm. The chambers are connected by a 300mm to 400mm diameter plastic pipe tunnel system.



Above: plan of a medium size Type 1 Design artificial sett. *Right:* Type 1 Design artificial sett under construction, A97, Aberchirder, Scotland (Grampian Badger Surveys for Aberdeenshire Council 2000).

Type 2 Design

Comprising concrete block and paving slab nesting chambers with 225mm-300mm diameter clay or concrete piping tunnel system.



Above: plan of a small size Type 2 Design artificial sett. *Right:* Type 2 Design artificial sett at completion, Tarbot Hill, Aberdeen, Scotland Grampian Badger Surveys for Shanks Waste Solutions 1998).

QUANTITIES, LABOUR & COSTS

Typical materials, equipment, labour and costs required to construct a Type 2 Design artificial sett with three chambers are listed below. Costs for a Type 1 Design are likely to be of a similar order. Specific costs will depend on site characteristics, materials used etc.

Materials

- Thirty eight 3' x 2' concrete paving slabs.
- One hundred 18" x 9" x 6" (bed) concrete blocks
- Eight 12" (300mm) diameter clayware pipes, c.1500mm long.
- Two 9" (225mm) diameter clayware pipes, 1500mm long.
- Two 12" (300mm) diameter clayware right angle junctions.
- Hay or straw sufficient to fill the chambers.
- Soil: may need to be imported for the purpose of covering and landscaping the completed artificial sett.

Pipes can be seconds, with or without collars. 1500mm long pipes are easiest to use; longer ones become very heavy to handle and shorter ones more expensive and difficult to use. Right angle junctions are easiest to use but if these are not available, 120 degree angles will suffice.

Machinery

A mechanical digger (JCB or a 360 degree excavator) is generally suitable for sett construction.

Shovels, picks and hand tools are required. A masonry cutting saw may be beneficial where pipes or block work need to be cut to size.

Labour & Time

Minimum: two men (excluding digger operator) for a minimum of two days will be required for the construction of one artificial sett. It will be essential to ensure that all materials are on site prior to starting if this timetable is to be met.

Cost

Budget for a minimum of c. £4,500 per 3-chambered sett, excluding labour.

APPENDIX 6-6

Date 21/02/2024

W23008 Gypsum Board External Lighting Design

XPE110

Table of Contents

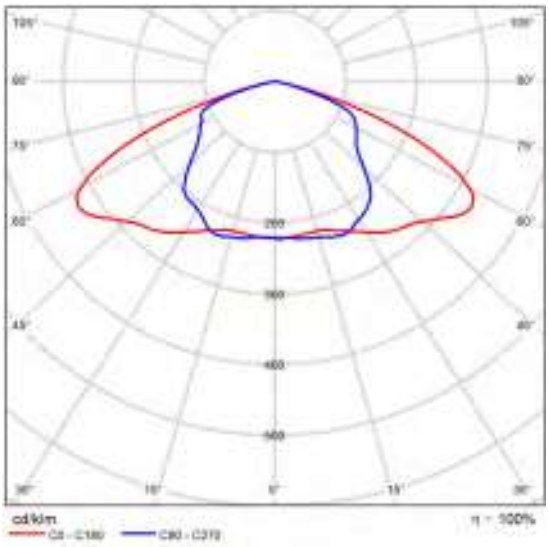
Product data sheets

Site 1

Product data sheet

Disano Illuminazione S.p.A - 1714 Cripto medium - symmetric 3000K CRI 80 73W CLD Grey9006

Article No.	413041-39
P	46.0 W
Φ_{Lamp}	6763 lm
$\Phi_{Luminaire}$	6763 lm
η	100.00 %
Luminous efficacy	147.0 lm/W
CCT	1750 K
CRI	60



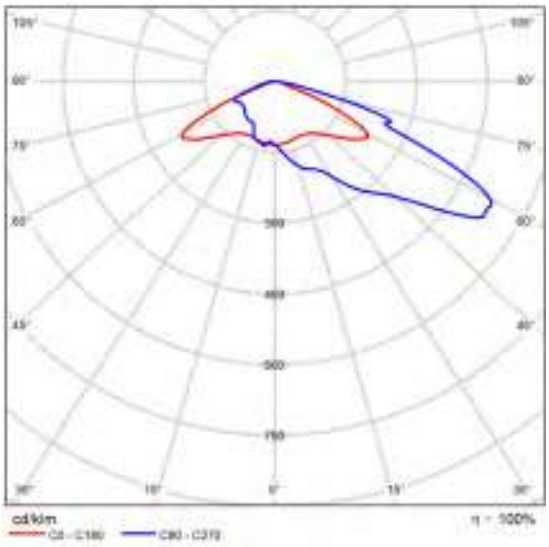
Polar LDC

Housing: in die-cast aluminium, with cooling fins.Optics: in high-performance PMMA resistent to high temperatures and UV rays.Diffuser: tempered glass, 4 mm thick, resistant to thermal shock and impact (UNI EN 12150-1:2001).Coating: pre-treatment of metal surface, polyester powder coating to ensure resistance to corrosion and salt spray fogs, UV stabilised.Special coating: upon request: available with coating tested to withstand corrosion tests in agressive artificial atmospheres (UNI EN ISO 9227) or marine environments (sea front).Heat Sink: the heat sink is designed and made to allow the LEDs to operate at temperatures capable of ensuring excellent performance/output and long service life.LED: 80%: 80000h (L80B10) Low flicker: luminaire with very low flicker: evenly distributed light for greater visual safety.Photobiological risk: exempt risk group according to EN62471.: EN60598-1. With degree of protection according to EN60529.Equipment: - with galvanised and painted bracket - cable for electrical connection - EN 61547 compliant surge protection - silicone rubber gasket - external screws and bolts in stainless steel.Temperature Chart (Description): -20 °C ÷ +40 °COn request: - protection of up to 10kV - AMBER LED 2200K subcode -73 - CLD-D (1-10V) wiring, subcode -12 - CLD-D-D (DALI) wiring, subcode -0041 - possibility of central light management or with external presence/light sensors.

Product data sheet

Disano Illuminazione S.p.A - 3483 LED AMBER Nocturnal Animals 1750K CRI60 CLD 39 W Grafite

Article No.	331050-44002551
P	39.0 W
Φ_{Lamp}	3641 lm
$\Phi_{Luminaire}$	3641 lm
η	100.00 %
Luminous efficacy	93.4 lm/W
CCT	1750 K
CRI	60



Polar LDC

Housing: EN-AB 47100 die-cast aluminium and designed with a very small surface exposed to wind. Cooling fins integrated in the cover. The lid can be removed to access the electrical components.Attachment: in die-cast aluminium for poles with a diameter between min. 46 mm and max. 76 mm, adjustable from -20° to +10° for hockey stick attachment; and from 0° to +20° for mast-top attachment. Tilt pitch 5°.Optics: in high-performance PMMA resistent to high temperatures and UV rays.Diffuser: extra-clear, tempered glass, 4 mm thick, resistant to thermal shock and impact (UNI-EN 12150-1:2001).Coating: pre-treatment of metal surface, polyester powder coating to ensure resistance to corrosion and salt spray fogs, UV stabilised.Special coating: upon request: available with coating tested to withstand corrosion tests in agressive artificial atmospheres (UNI EN ISO 9227) or marine environments (sea front) .Heat Sink: the heat sink is designed and made to allow the LEDs to operate at temperatures capable of ensuring excellent performance/output and long service life.Low flicker: luminaire with very low flicker: evenly distributed light for greater visual safety.Photobiological risk: exempt risk group according to EN62471.: EN60598-1. With degree of protection according to EN60529. Registered Design DM/100271.Laboratory tests: compliant with third-party certified vibration tests pursuant

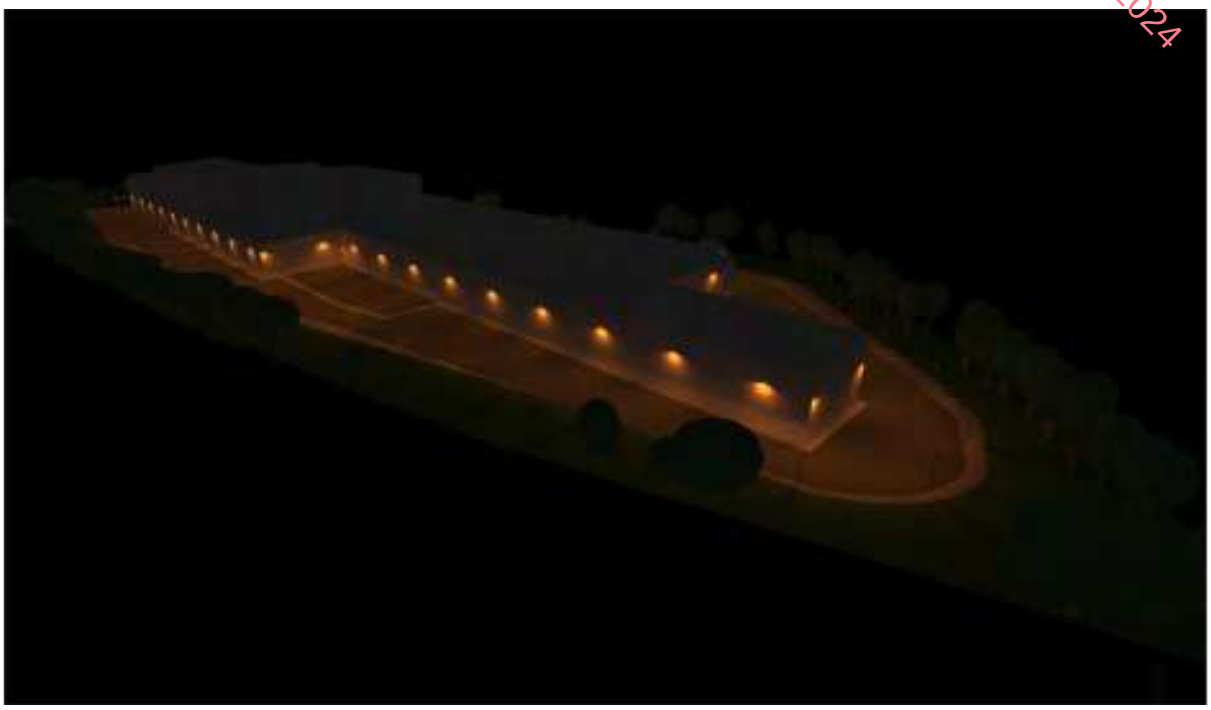
Product data sheet

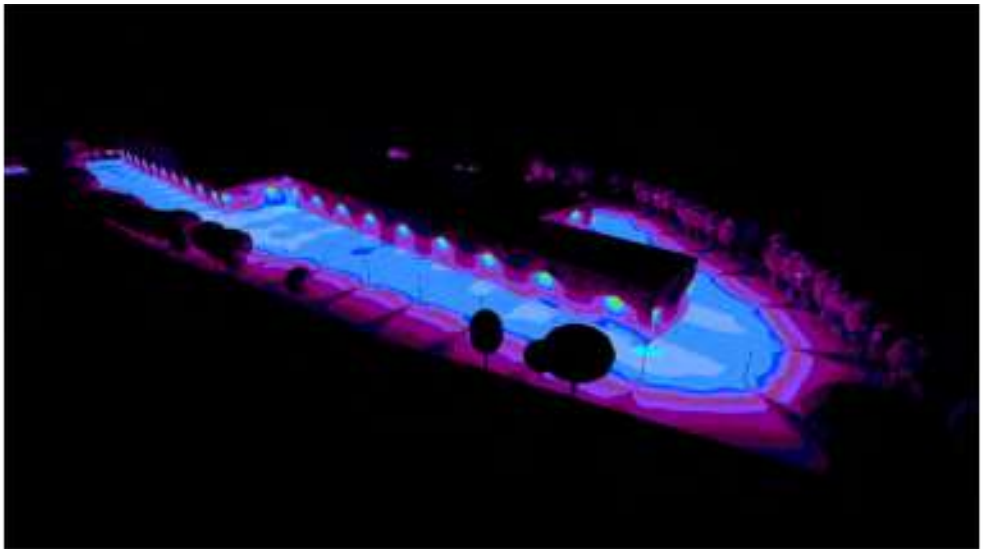
Disano Illuminazione S.p.A - 3483 LED AMBER Nocturnal Animals 1750K CRI60 CLD 39 W Grafite

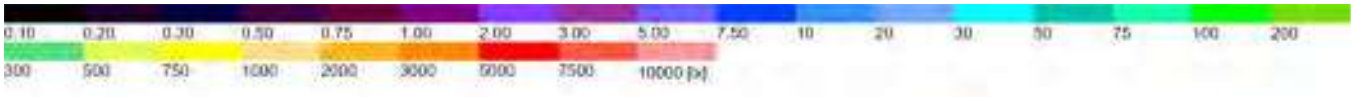
to ANSI C136.31: Street Lighting - Luminaire Vibration. Test level: 3.0G Level 2 for bridge/overpass applications.Equipment: - IP67 quick connector. - anti-condensation valve. - temperature controller with auto-reset. - EN 61547 compliant surge protection. - ADVANCED PROG built-in functions.On request: - virtual midnight device, subcode -30 - Nema Socket, subcode -40 (cap to be ordered separately) - Zhaga Socket, subcode -0054 (cap included)

Site 1

Images







Site 1

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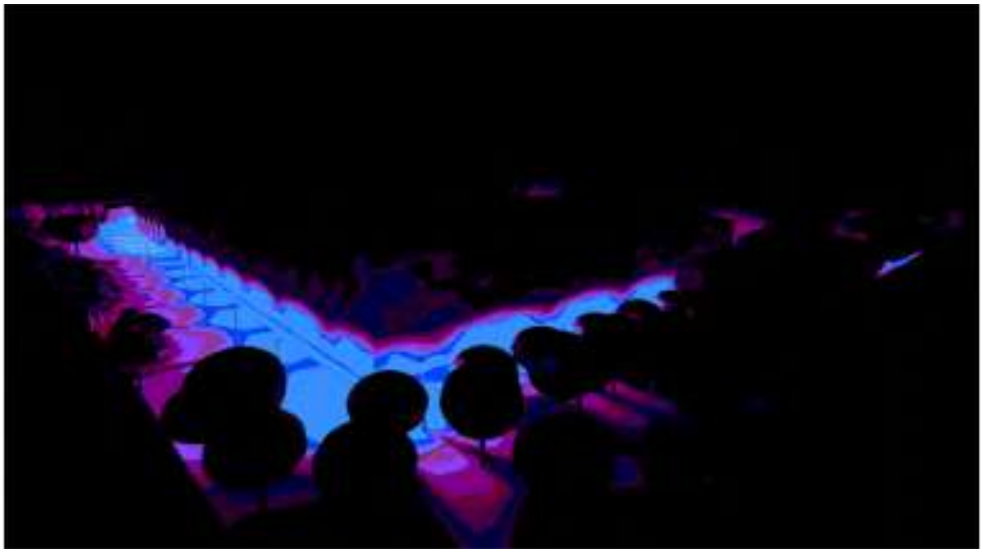

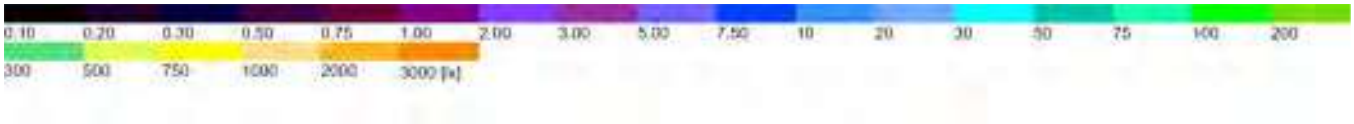

Site 1

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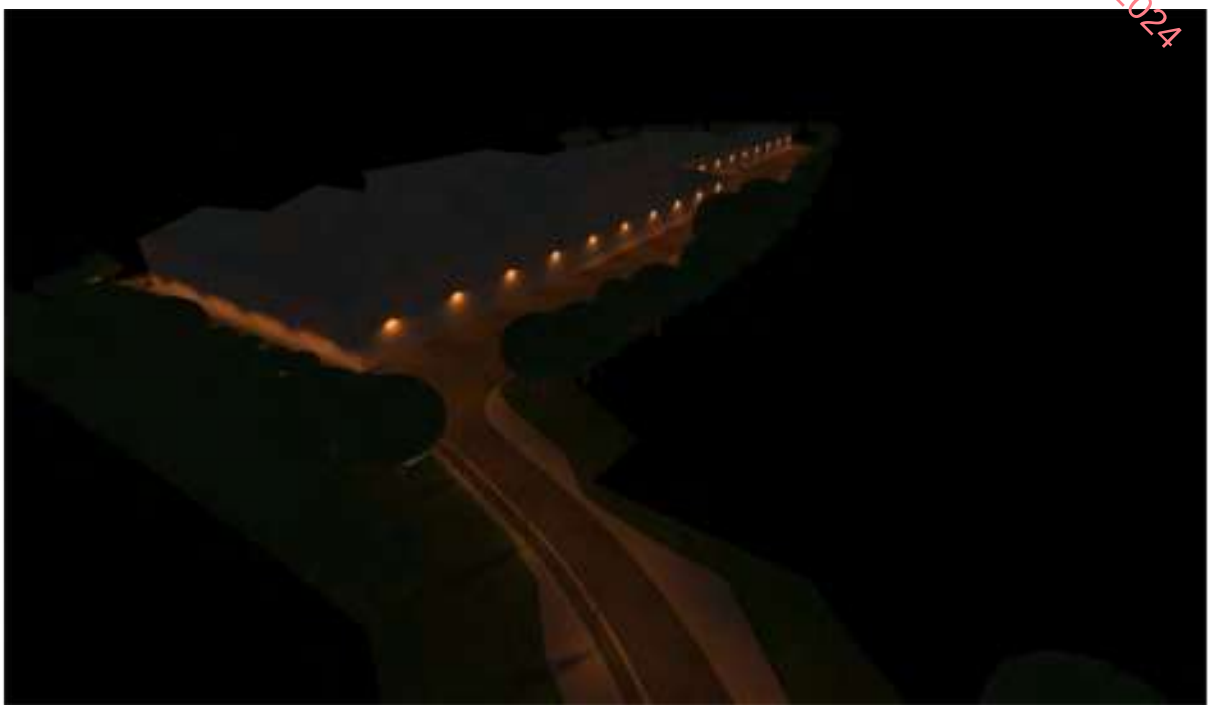

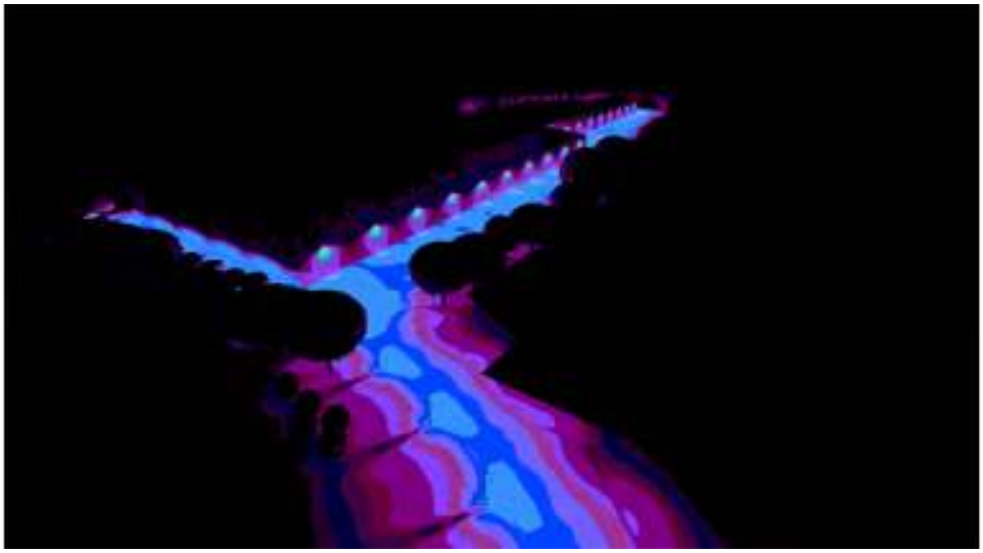

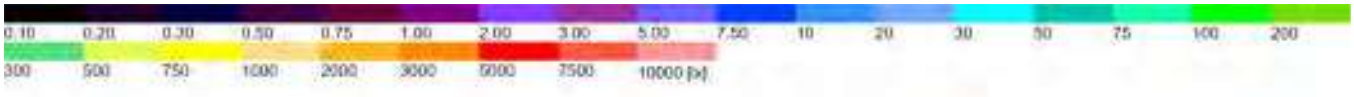

Site 1

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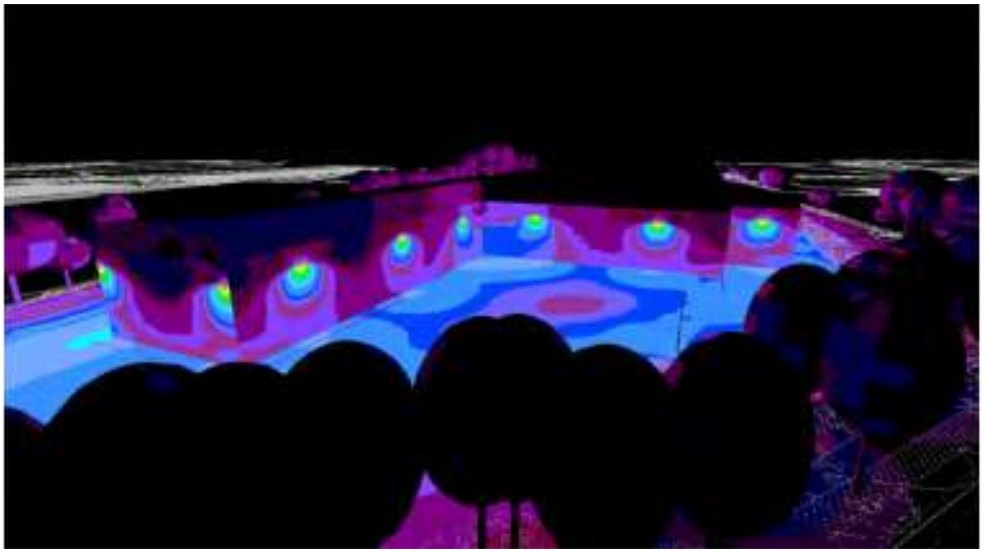

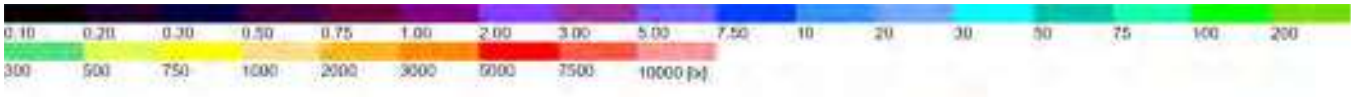

Site 1

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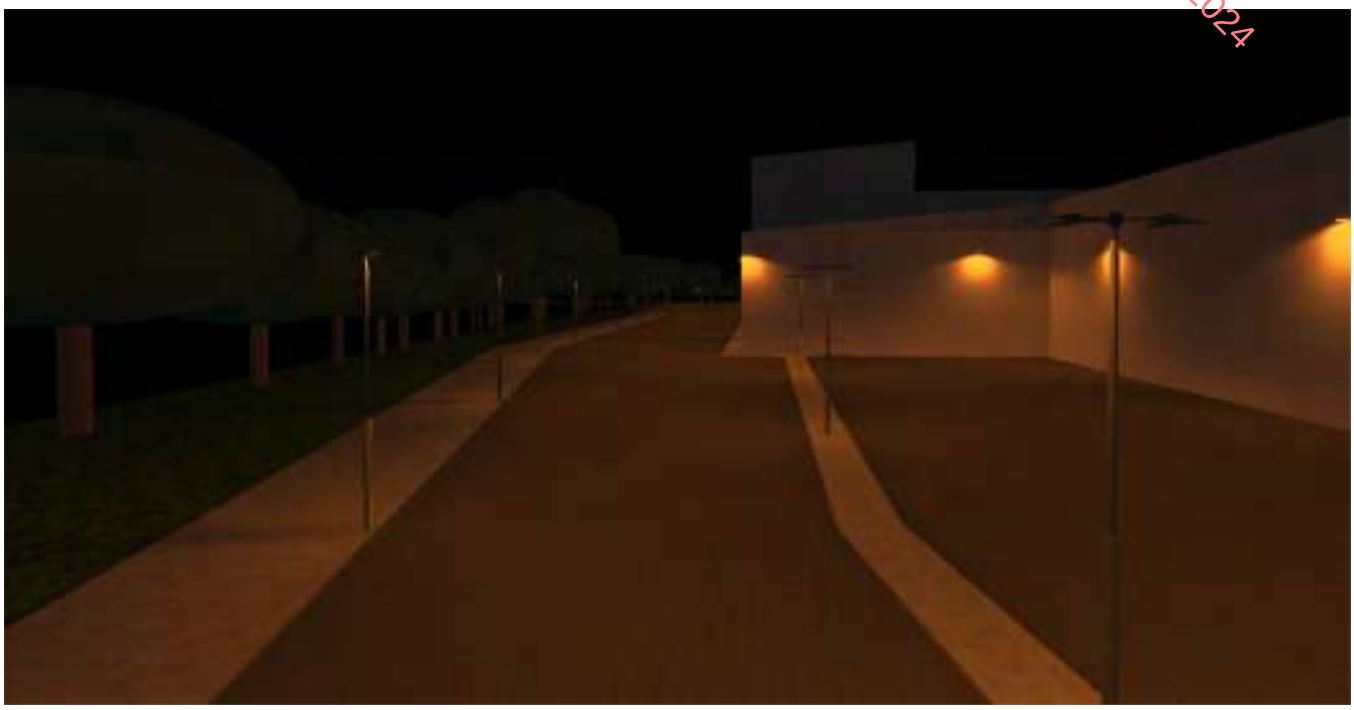

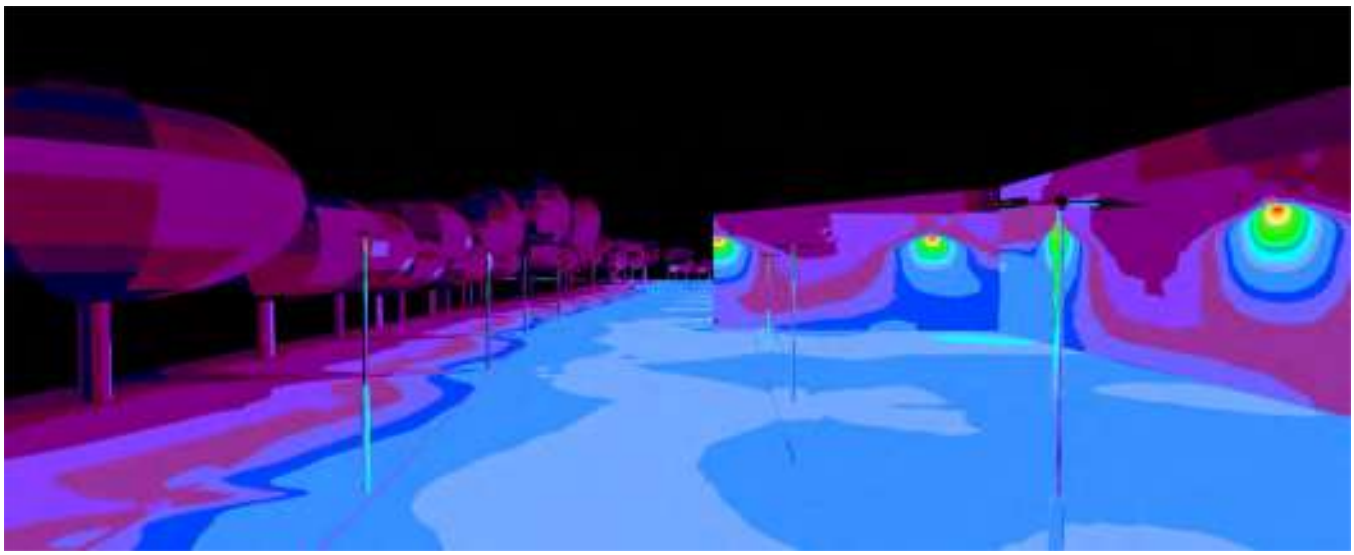

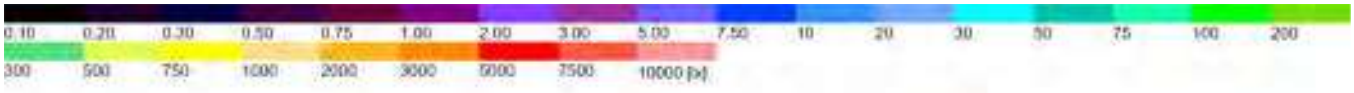

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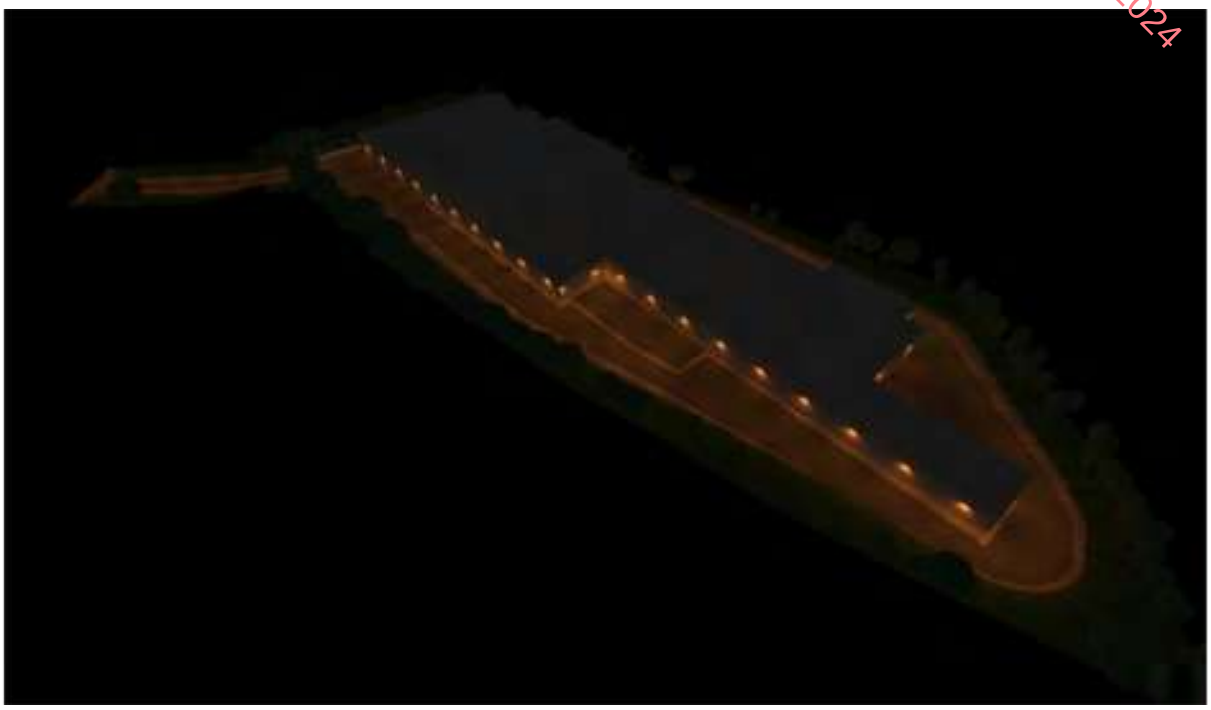

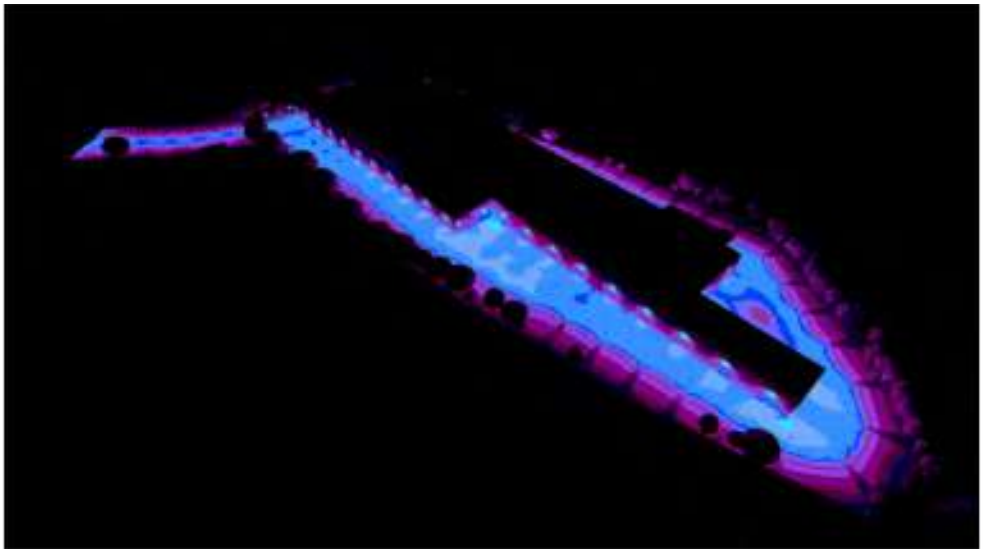

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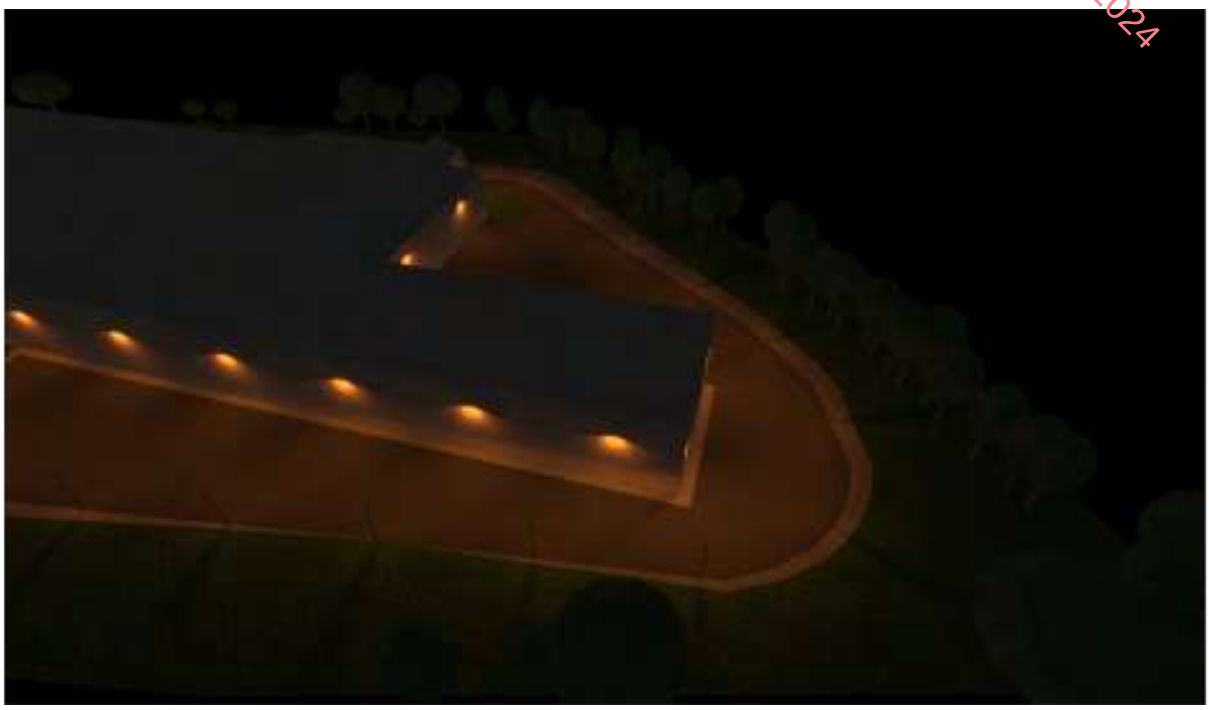

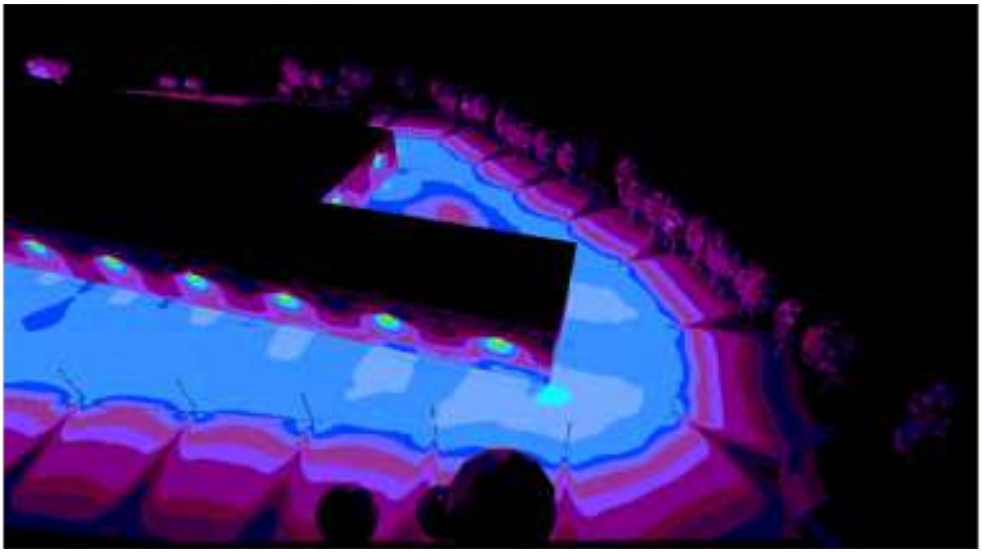

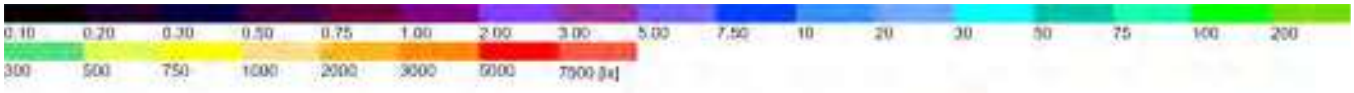

Site 1

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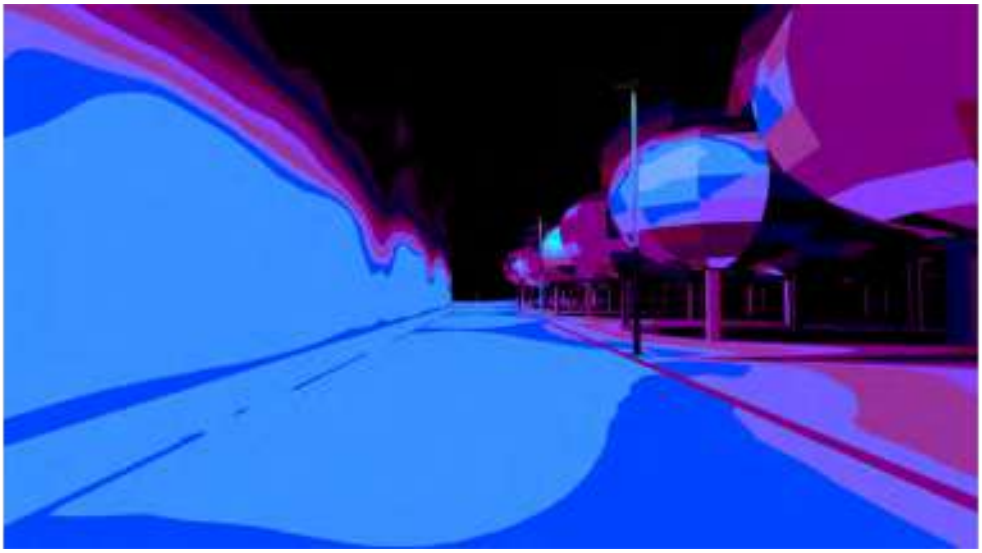
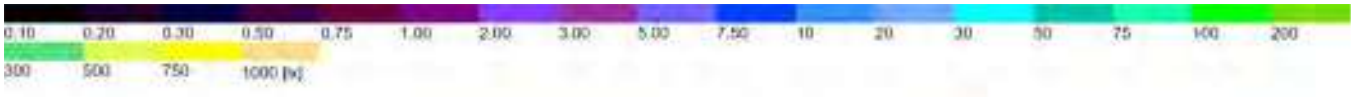
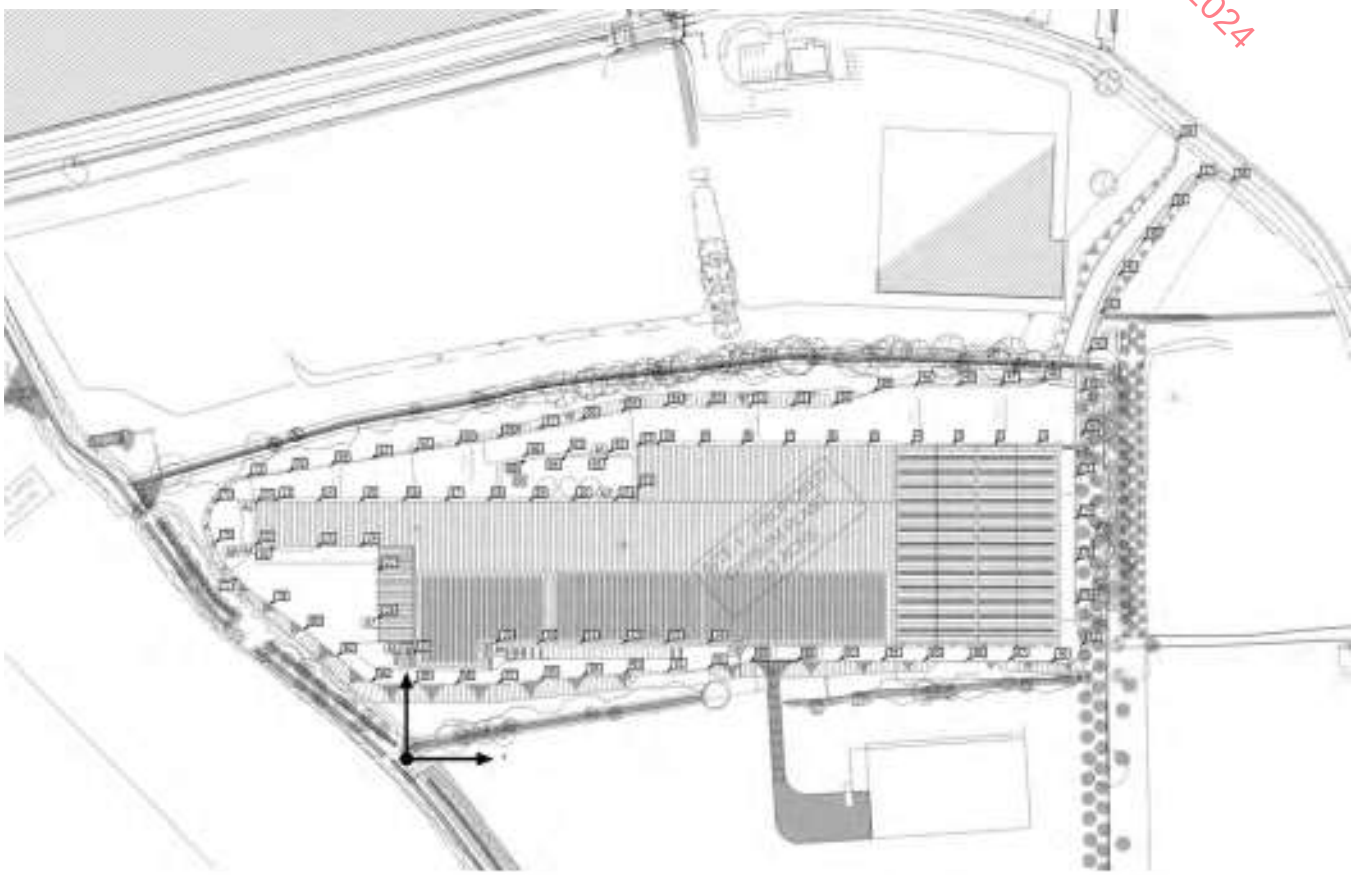




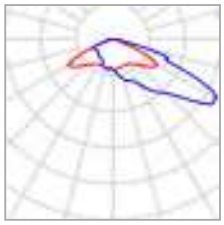
Site 1

Luminaire layout plan



Site 1

Luminaire layout plan



Manufacturer	Disano Illuminazione S.p.A
Article No.	331050-44002551
Article name	3483 LED AMBER Nocturnal Animals 1750K CRI60 CLD 39 W Grafite
Fitting	1x led_3483_64

P	39.0 W
$\Phi_{Luminaire}$	3641 lm

Individual luminaires

X	Y	Mounting height	Luminaire
327.284 m	263.041 m	6.100 m	36
335.886 m	246.134 m	6.100 m	37
350.202 m	244.944 m	6.100 m	38
324.683 m	233.900 m	6.100 m	39
313.142 m	219.781 m	6.100 m	40
302.743 m	205.480 m	6.100 m	41
295.031 m	189.796 m	6.100 m	42
289.416 m	172.837 m	6.100 m	43
269.627 m	160.058 m	6.100 m	44
233.934 m	158.672 m	6.100 m	45
215.934 m	158.671 m	6.100 m	46
251.934 m	158.667 m	6.100 m	47

Site 1

Luminaire layout plan

X	Y	Mounting height	Luminaire
198.291 m	156.077 m	6.100 m	48
286.718 m	155.976 m	6.100 m	49
181.241 m	150.448 m	6.100 m	50
163.331 m	149.952 m	6.100 m	51
145.331 m	149.920 m	6.100 m	52
127.331 m	149.888 m	6.100 m	53
109.331 m	149.857 m	6.100 m	54
91.509 m	147.710 m	6.100 m	55
73.912 m	143.924 m	6.100 m	56
56.314 m	140.139 m	6.100 m	57
286.731 m	137.976 m	6.100 m	58
38.693 m	136.521 m	6.100 m	59
20.952 m	133.491 m	6.100 m	60
3.189 m	130.585 m	6.100 m	61
85.623 m	129.621 m	6.100 m	62
67.623 m	129.613 m	6.100 m	63
67.605 m	128.548 m	6.100 m	64
85.609 m	128.536 m	6.100 m	65
49.802 m	128.061 m	6.100 m	66
-14.579 m	127.704 m	6.100 m	67
49.990 m	127.022 m	6.100 m	68
-32.352 m	124.877 m	6.000 m	69
-50.154 m	122.212 m	6.000 m	70
284.464 m	119.976 m	6.100 m	71

Site 1

Luminaire layout plan

X	Y	Mounting height	Luminaire
-67.956 m	119.554 m	6.000 m	72
-81.900 m	108.934 m	6.000 m	73
284.457 m	101.976 m	6.100 m	74
-81.679 m	91.565 m	6.000 m	75
284.444 m	83.976 m	6.100 m	76
-72.054 m	76.718 m	6.000 m	77
284.439 m	65.976 m	6.100 m	78
-58.168 m	65.289 m	6.000 m	79
-43.702 m	54.579 m	6.000 m	80
286.961 m	48.282 m	6.100 m	81
-29.667 m	43.329 m	6.000 m	82
183.862 m	41.399 m	6.100 m	83
201.862 m	41.387 m	6.100 m	84
219.862 m	41.379 m	6.100 m	85
237.862 m	41.365 m	6.100 m	86
255.862 m	41.353 m	6.100 m	87
165.955 m	41.070 m	6.100 m	88
146.233 m	41.061 m	6.000 m	89
273.844 m	40.757 m	6.100 m	90
128.454 m	38.249 m	6.000 m	91
110.549 m	36.517 m	6.000 m	92
92.590 m	35.956 m	6.000 m	93
74.647 m	34.521 m	6.000 m	94
56.705 m	33.086 m	6.000 m	95

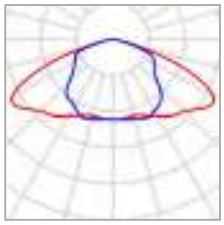
Site 1

Luminaire layout plan

X	Y	Mounting height	Luminaire
-15.205 m	32.601 m	6.000 m	96
38.761 m	31.657 m	6.000 m	97
20.746 m	31.525 m	6.000 m	98
2.747 m	31.517 m	6.000 m	99

Site 1

Luminaire layout plan



Manufacturer	Disano Illuminazione S.p.A
Article No.	413041-39
Article name	1714 Cripto medium - symmetric 3000K CRI 80 73W CLD Grey9006
Fitting	1x Lux_mu1714_3k

P	46.0 W
$\Phi_{Luminaire}$	6763 lm

10 x Disano Illuminazione 1714 Cripto medium - symmetric 3000K CRI 80 73W CLD Grey9006

Type	Line arrangement
1st luminaire (X/Y/Z)	106.441 m / 133.249 m / 8.000 m
X-direction	10 pcs., Centre - centre, Distances not equal
Arrangement	A1

X	Y	Mounting height	Luminaire
250.441 m	133.465 m	8.000 m	1
268.441 m	133.429 m	8.000 m	2
232.441 m	133.429 m	8.000 m	3
214.441 m	133.429 m	8.000 m	4
196.441 m	133.249 m	8.000 m	5
178.441 m	133.249 m	8.000 m	6
160.441 m	133.249 m	8.000 m	7
142.441 m	133.249 m	8.000 m	8
124.441 m	133.249 m	8.000 m	9
106.441 m	133.249 m	8.000 m	10

9 x Disano Illuminazione 1714 Cripto medium - symmetric 3000K CRI 80 73W CLD Grey9006

Site 1

Luminaire layout plan

Type	Line arrangement
1st luminaire (X/Y/Z)	-55.651 m / 109.284 m / 8.100 m
X-direction	9 pcs., Centre - centre, Distances not equal
Arrangement	A2

X	Y	Mounting height	Luminaire
-55.651 m	109.284 m	8.100 m	13
-37.651 m	109.290 m	8.100 m	14
-19.651 m	109.297 m	8.100 m	15
-1.651 m	109.304 m	8.100 m	16
16.349 m	109.310 m	8.100 m	17
34.349 m	109.317 m	8.100 m	18
52.349 m	109.323 m	8.000 m	19
70.349 m	109.330 m	8.000 m	20
88.349 m	109.337 m	8.000 m	21

2 x Disano Illuminazione 1714 Cripto medium - symmetric 3000K CRI 80 73W CLD Grey9006

Type	Line arrangement
1st luminaire (X/Y/Z)	98.169 m / 114.740 m / 8.000 m
X-direction	2 pcs., Centre - centre, 18.000 m
Arrangement	A3

X	Y	Mounting height	Luminaire
98.169 m	114.740 m	8.000 m	11
98.188 m	132.740 m	8.000 m	12

2 x Disano Illuminazione 1714 Cripto medium - symmetric 3000K CRI 80 73W CLD Grey9006

Type	Line arrangement
1st luminaire (X/Y/Z)	-63.920 m / 90.789 m / 8.000 m
X-direction	2 pcs., Centre - centre, 18.000 m
Arrangement	A4

X	Y	Mounting height	Luminaire
-63.920 m	90.789 m	8.000 m	22
-63.904 m	108.789 m	8.000 m	23

Site 1

Luminaire layout plan

6 x Disano Illuminazione 1714 Cripto medium - symmetric 3000K CRI 80 73W CLD Grey9006

Type	Line arrangement
1st luminaire (X/Y/Z)	37.861 m / 49.246 m / 8.000 m
X-direction	14 pcs., Centre - centre, Distances not equal
Arrangement	A5

X	Y	Mounting height	Luminaire
37.861 m	49.246 m	8.000 m	29
55.861 m	49.232 m	8.000 m	30
73.861 m	49.219 m	8.000 m	31
91.861 m	49.206 m	8.000 m	32
109.861 m	49.192 m	8.000 m	33
127.861 m	49.140 m	8.000 m	34

1 x Disano Illuminazione 1714 Cripto medium - symmetric 3000K CRI 80 73W CLD Grey9006

Type	Line arrangement
1st luminaire (X/Y/Z)	-2.911 m / 44.386 m / 8.100 m
X-direction	1 pcs., Centre - centre, 10.274 m
Arrangement	A6

X	Y	Mounting height	Luminaire
-2.911 m	44.386 m	8.100 m	35

2 x Disano Illuminazione 1714 Cripto medium - symmetric 3000K CRI 80 73W CLD Grey9006

Type	Line arrangement
1st luminaire (X/Y/Z)	-11.911 m / 80.077 m / 8.000 m
X-direction	2 pcs., Centre - centre, 20.345 m
Arrangement	A7

X	Y	Mounting height	Luminaire
-11.911 m	80.077 m	8.000 m	27
-11.911 m	59.731 m	8.000 m	28

3 x Disano Illuminazione 1714 Cripto medium - symmetric 3000K CRI 80 73W CLD Grey9006

Site 1

Luminaire layout plan

Type	Line arrangement
1st luminaire (X/Y/Z)	-55.865 m / 90.275 m / 8.103 m
X-direction	3 pcs., Centre - centre, Distances not equal
Arrangement	A8

X	Y	Mounting height	Luminaire
-19.865 m	90.243 m	8.000 m	24
-37.865 m	90.259 m	8.001 m	25
-55.865 m	90.275 m	8.103 m	26

Site 1

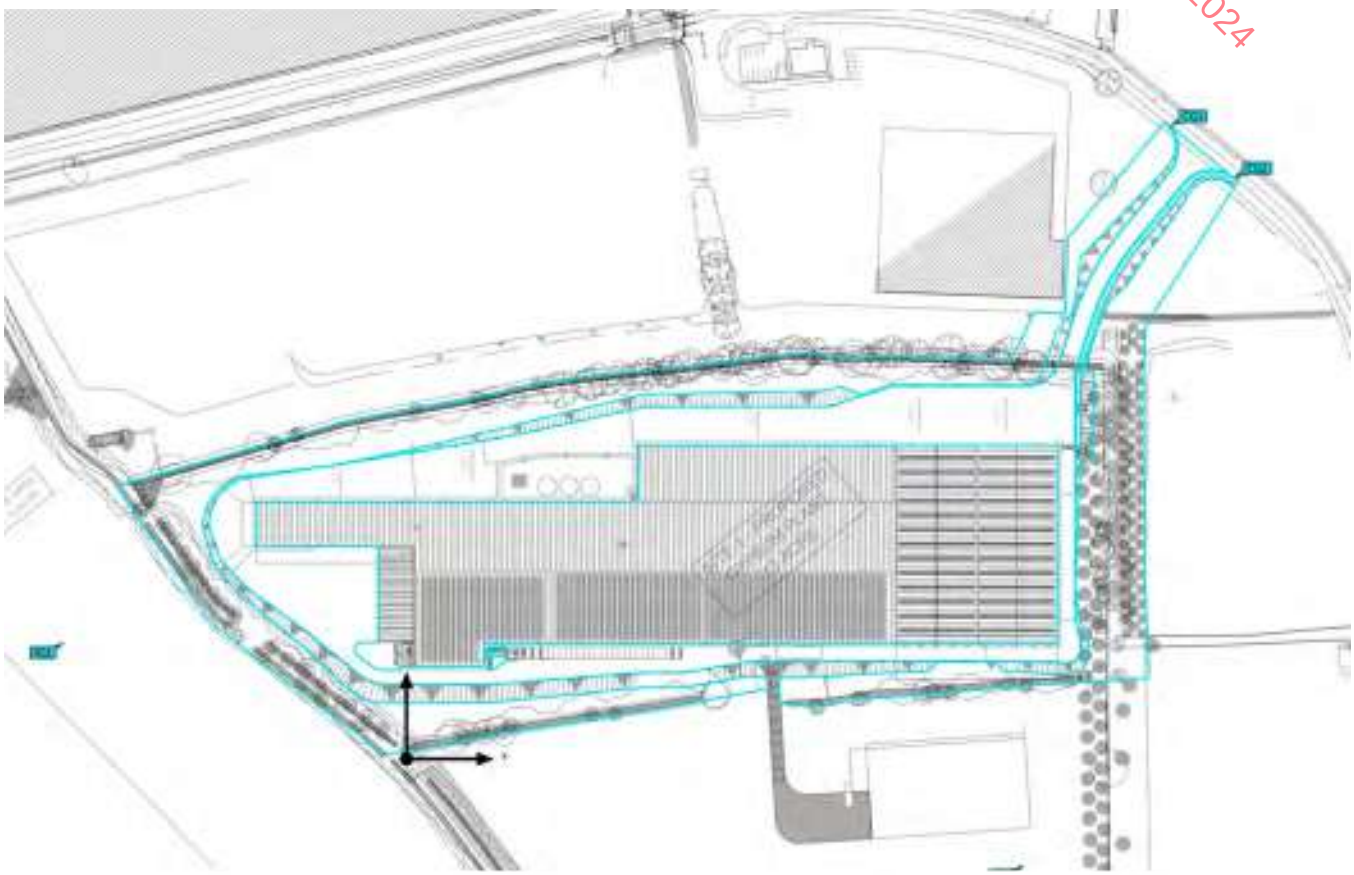
Luminaire list

Φ_{total}	P_{total}	Luminous efficacy
469729 lm	4106.0 W	114.4 lm/W

pcs.	Manufacturer	Article No.	Article name	P	Φ	Luminous efficacy
64	Disano Illuminazione S.p.A	331050-44002551	3483 LED AMBER Nocturnal Animals 1750K CRI60 CLD 39 W Grafite	39.0 W	3641 lm	93.4 lm/W
35	Disano Illuminazione S.p.A	413041-39	1714 Cripto medium - symmetric 3000K CRI 80 73W CLD Grey9006	46.0 W	6763 lm	147.0 lm/W

Site 1 (Light scene 1)

Calculation objects



Site 1 (Light scene 1)

Calculation objects

Surface result objects

Properties	Ø	min	max	U_o (g_1)	g_2	Index
Green Area 1 Perpendicular illuminance (adaptive) Height: 0.000 m	1.48 lx	0.020 lx	13.9 lx	0.014	0.001	RS1
Green Area 1 Luminance Height: 0.000 m	0.026 cd/m²	0.000 cd/m²	0.25 cd/m²	0.00	0.00	RS1
Green Area 2 Perpendicular illuminance (adaptive) Height: -0.000 m	0.88 lx	0.001 lx	10.2 lx	0.001	0.000	RS2
Green Area 2 Luminance Height: -0.000 m	0.016 cd/m²	0.000 cd/m²	0.18 cd/m²	0.00	0.00	RS2

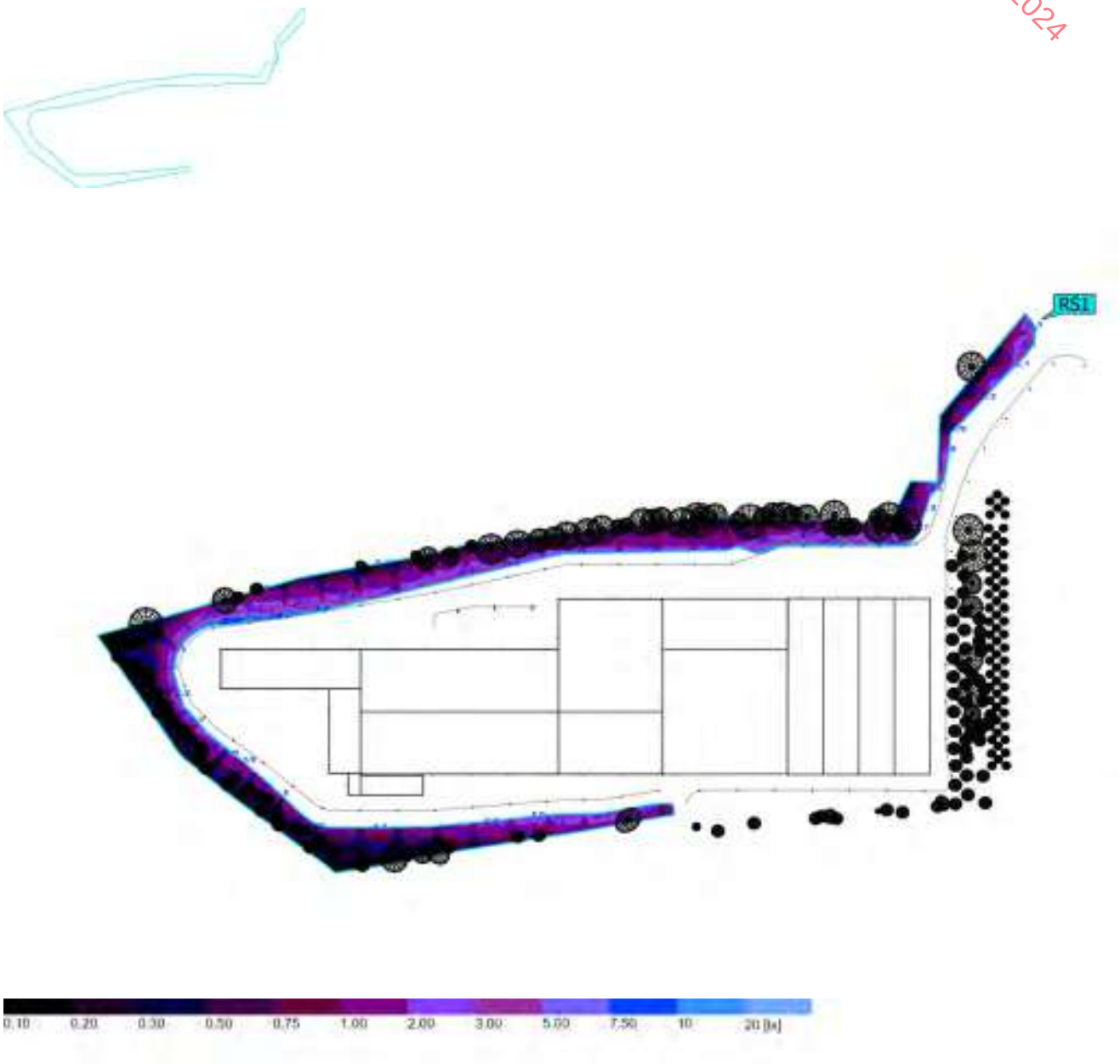
Calculation surfaces

Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Calculation Area Perpendicular illuminance Height: 0.100 m	14.9 lx	3.42 lx	37.4 lx	0.23	0.091	CG1
Pedestrian Walkway Perpendicular illuminance Height: 0.100 m	8.88 lx	4.79 lx	13.9 lx	0.54	0.34	CG2

Utilisation profile: DIALux presetting (5.1.4 Standard (outdoor transportation area))

Site 1 (Light scene 1)

Green Area 1

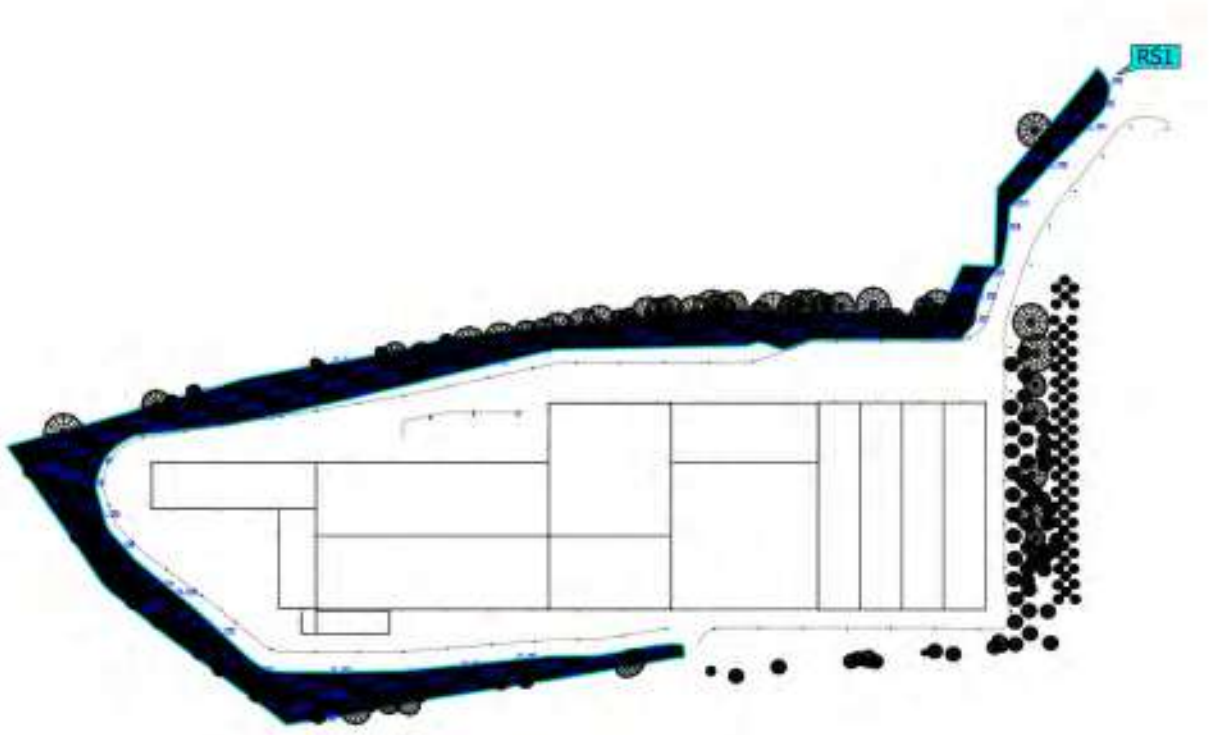


Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Green Area 1 Perpendicular illuminance (adaptive) Height: 0.000 m	1.48 lx	0.020 lx	13.9 lx	0.014	0.001	RS1

Utilisation profile: DIALux presetting (5.1.4 Standard (outdoor transportation area))

Site 1 (Light scene 1)

Green Area 1

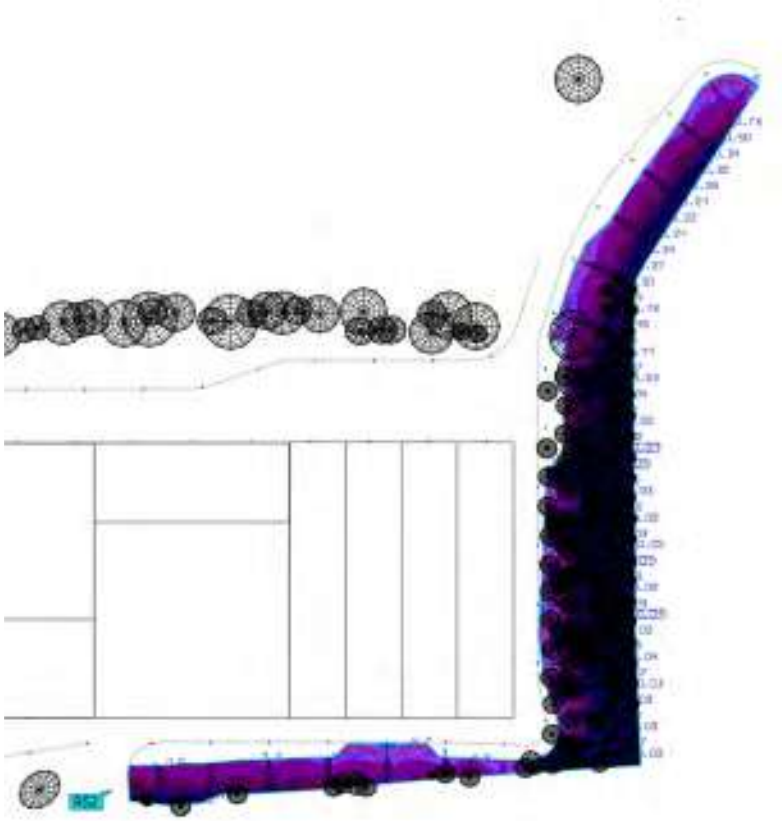


Properties	Ø	min	max	U_o (g_1)	g_2	Index
Green Area 1 Luminance Height: 0.000 m	0.026 cd/m²	0.000 cd/m²	0.25 cd/m²	0.00	0.00	RS1

Utilisation profile: DIALux presetting (5.1.4 Standard (outdoor transportation area))

Site 1 (Light scene 1)

Green Area 2

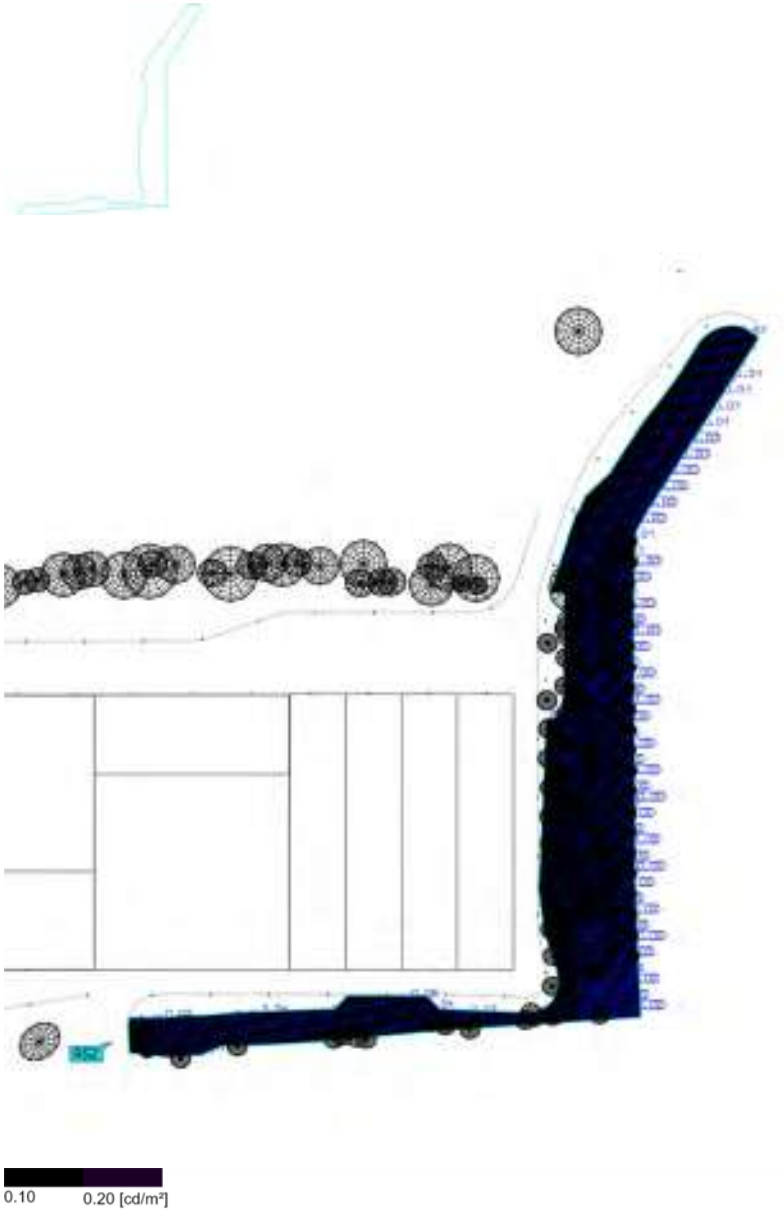


Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Green Area 2 Perpendicular illuminance (adaptive) Height: -0.000 m	0.88 lx	0.001 lx	10.2 lx	0.001	0.000	RS2

Utilisation profile: DIALux presetting (5.1.4 Standard (outdoor transportation area))

Site 1 (Light scene 1)

Green Area 2

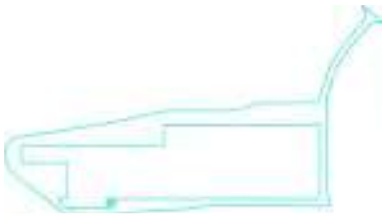


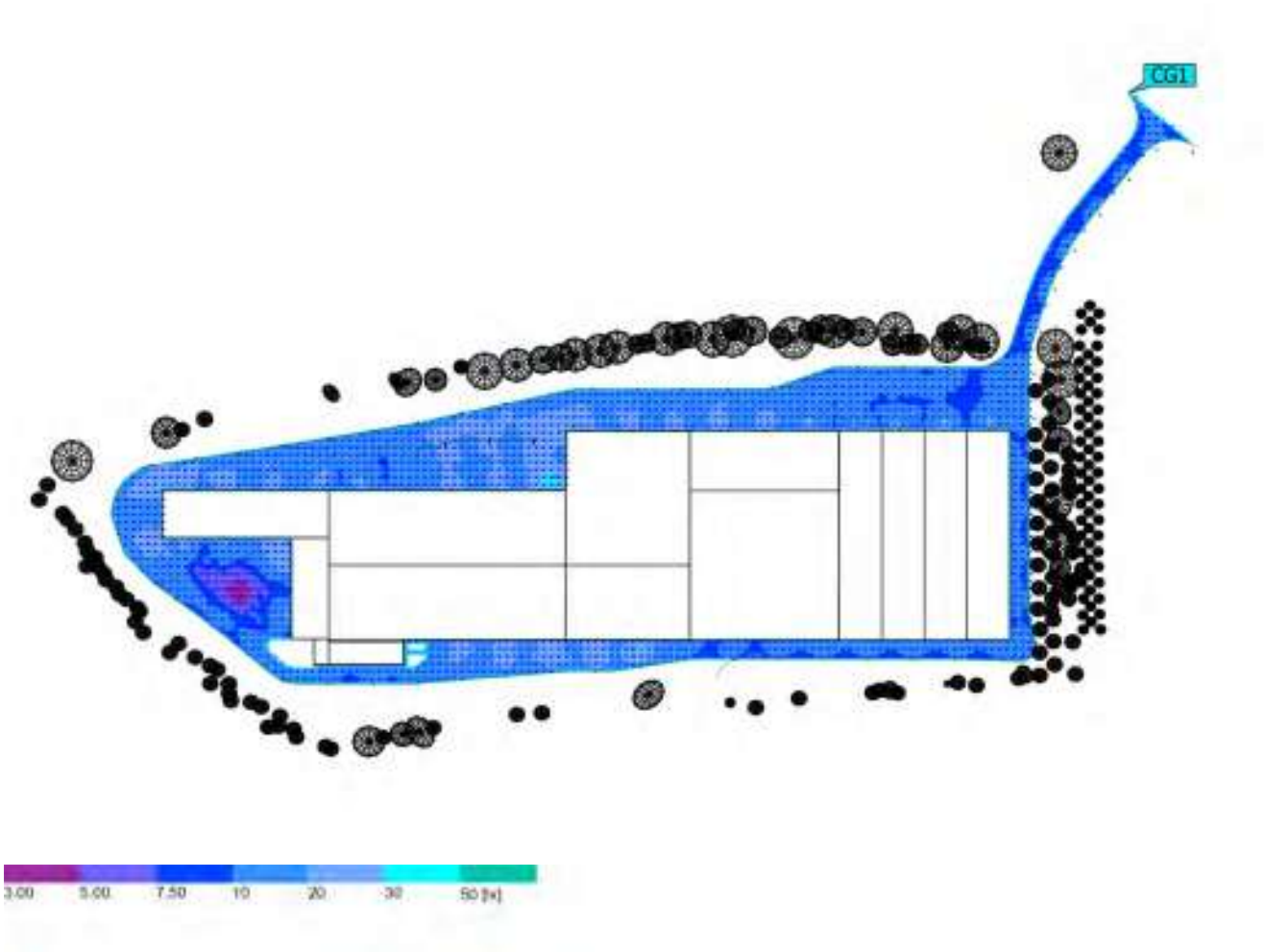
Properties	Ø	min	max	U_o (g_1)	g_2	Index
Green Area 2 Luminance Height: -0.000 m	0.016 cd/m²	0.000 cd/m²	0.18 cd/m²	0.00	0.00	RS2

Utilisation profile: DIALux presetting (5.1.4 Standard (outdoor transportation area))

Site 1 (Light scene 1)

Calculation Area



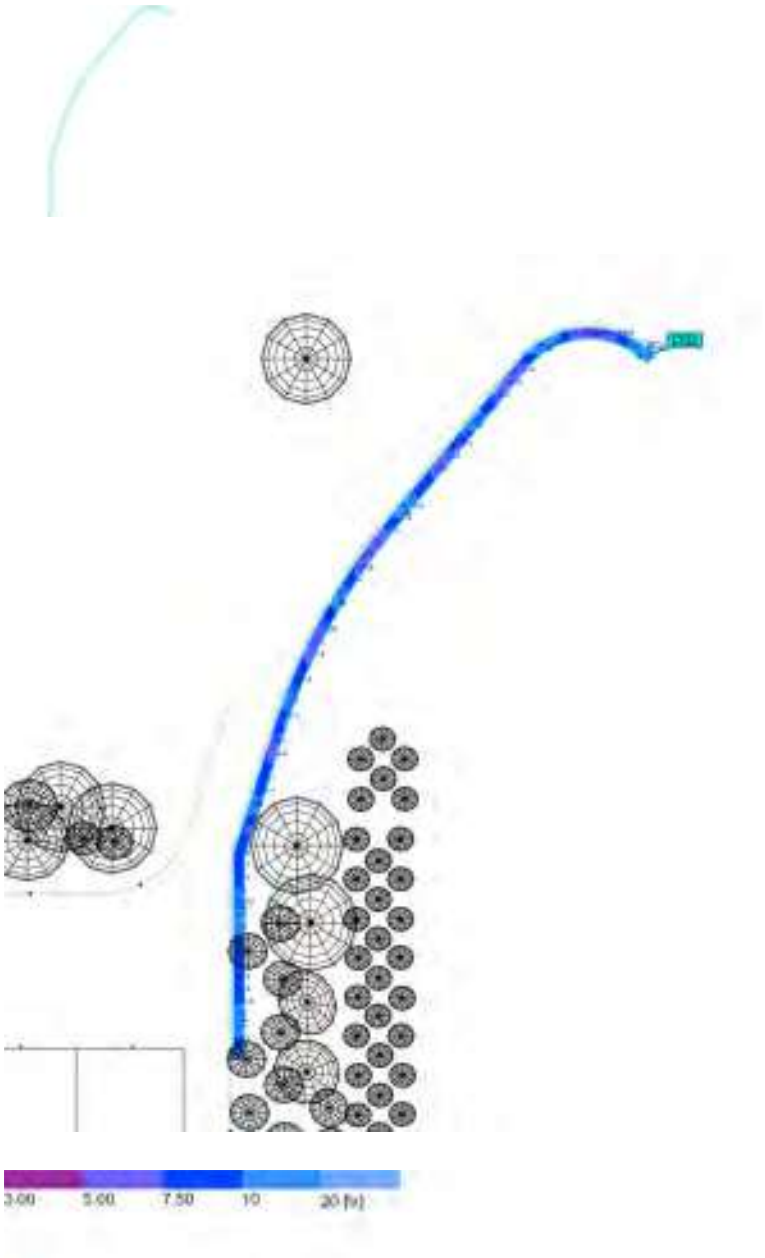


Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Calculation Area Perpendicular illuminance Height: 0.100 m	14.9 lx	3.42 lx	37.4 lx	0.23	0.091	CG1

Utilisation profile: DIALux presetting (5.1.4 Standard (outdoor transportation area))

Site 1 (Light scene 1)

Pedestrian Walkway



Properties	Ē	E_{min}	E_{max}	U_o (g_1)	g_2	Index
Pedestrian Walkway Perpendicular illuminance Height: 0.100 m	8.88 lx	4.79 lx	13.9 lx	0.54	0.34	CG2

Utilisation profile: DIALux presetting (5.1.4 Standard (outdoor transportation area))

Glossary

A

A	Formula symbol for a surface in the geometry

B

Background area	The background area borders the direct ambient area according to DIN EN 12464-1 and reaches up to the borders of the room. In larger rooms, the background area is at least 3 m wide. It is located horizontally at floor level.

C

CCT	(Engl. correlated colour temperature) Body temperature of a thermal radiator which serves to describe its light colour. Unit: Kelvin [K]. The lesser the numerical value the redder; the greater the numerical value the bluer the light colour. The colour temperature of gas-discharge lamps and semi-conductors are termed "correlated colour temperature" in contrast to the colour temperature of thermal radiators. Allocation of the light colours to the colour temperature ranges acc. to EN 12464-1: Light colour - colour temperature [K] warm white (ww) < 3,300 K neutral white (nw) ≥ 3,300 – 5,300 K daylight white (dw) > 5,300 K
Clearance height	The designation for the distance between upper edge of the floor and bottom edge of the ceiling (in the completely furnished status of room).
Control group	A group of luminaires that are dimmed and controlled together. For each lighting scene, a control group provides its own dimming value. All luminaires within a control group share this dimming value. The control groups with their luminaires are automatically determined by DIALux on the basis of the created light scenes and their luminaire groups.
CRI	(Engl. colour rendering index) Designation for the colour rendering index of a luminaire or a lamp acc. to DIN 6169: 1976 or CIE 13.3: 1995. The general colour rendering index Ra (or CRI) is a dimensionless figure that describes the quality of a white light source in regards to its similarity with the remission spectra of defined 8 test colours (see DIN 6169 or CIE 1974) to a reference light source.

Glossary

D

Daylight autonomy	Describes what percentage of the daily working time the required illuminance is met by daylight. The nominal illuminance is used from the room profile, unlike described in EN 17037. The calculation is not done in the centre of the room but at the placed sensor measuring point. A room is considered sufficiently supplied with daylight if it achieves at least 50% daylight autonomy.
Daylight factor	Ratio of the illuminance achieved solely by daylight incidence at a point in the inside to the horizontal illuminance in the outer area under an unobstructed sky. Formula symbol: D (Engl. daylight factor) Unit: %
Daylight quotient effective area	A calculation surface within which the daylight quotient is calculated.

E

Energy evaluation	Based on an hourly calculation procedure for daylight in indoor spaces, considering the project geometry and any existing daylight control systems. Orientation and location of the project are also considered. The calculation uses the specified system power of the luminaires to determine the energy demand. A linear relationship between power and luminous flux in the dimmed state is assumed for daylight-controlled luminaires. Times of use and nominal illuminance are determined from the usage profiles of the spaces. Switched-on luminaires that are explicitly excluded from control also consider the specified times-of-use. The daylight control systems use a simplified control logic that closes them at an outdoor horizontal illuminance of 27,500lx. The calendar year 2022 is used as a reference only. It is not a simulation of this year. The reference year is only used to assign the days of the week to the calculated results. The changeover to summer time is not considered. The reference sky type used is the average sky described in CIE 110 without direct sunlight. The method was developed together with the Fraunhofer Institute for Building Physics and is available for review by the Joint Working Group 1 ISO TC 274 as an extension of the previous annual regression-based method.
Eta (η)	(light output ratio) The light output ratio describes what percentage of the luminous flux of a free radiating lamp (or LED module) is emitted by the luminaire when installed. Unit: %

Glossary

G

g_1	Often also U_o (Engl. overall uniformity) Designates the overall uniformity of the illuminance on a surface. It is the quotient from E_{min} to $\bar{E}$ and is required, for instance, in standards for illumination of workstations.
g_2	Actually it designates the "non-uniformity" of the illuminance on a surface. It is the quotient of E_{min} to E_{max} and is generally only relevant for certifying the emergency lighting acc. to EN 1838.

I

Illuminance	Describes the ratio of the luminous flux that strikes a certain surface to the size of this surface (lm/m^2 = lx). The illuminance is not tied to an object surface. It can be determined anywhere in space (inside or outside). The illuminance is not a product feature because it is a recipient value. Luxometers are used for measuring. Unit: Lux Abbreviation: lx Formula symbol: E
Illuminance, adaptive	For the determining of the middle adaptive illuminance on a surface, this is rastered "adaptively". In the area of large illuminance differences within the surface, the raster is subdivided finer; within lesser differences, a rougher classification is made.
Illuminance, horizontal	Illuminance that is calculated or measured on a horizontal (level) surface (this can be for example a table top or the floor). The horizontal illuminance is usually identified by the formula letter E_h.
Illuminance, perpendicular	Illuminance that is calculated or measured plumb-vertical to a surface. This needs to be taken into account for tilted surfaces. If the surface is horizontal or vertical, then there is no difference between the perpendicular and the horizontal or vertical illuminance.
Illuminance, vertical	Illuminance that is calculated or measured on a vertical surface (this can be for example the front of some shelves). The vertical illuminance is usually identified by the formula letter E_v.

L

LENI	(Engl. lighting energy numeric indicator) Lighting energy numeric indicator acc. to EN 15193 Unit: kWh/(m^2 * a)

Glossary

LLMF	(Engl. lamp lumen maintenance factor)/acc. to CIE 97: 2005 Lamp flux maintenance factor that takes the luminous flux reduction into account of a luminaire or an LED module in the course of the operating time. The lamp flux maintenance factor is specified as a decimal digit and can have a maximum value of 1 (no luminous flux reduction existing).
LMF	(Engl. luminaire maintenance factor)/acc. to CIE 97: 2005 Luminaire maintenance factor that takes the soiling into account of the luminaire in the course of the operating time. The luminaire maintenance factor is specified as a decimal digit and can have a maximum value of 1 (no soiling existing).
LSF	(Engl. lamp survival factor)/acc. to CIE 97: 2005 Lamp survival factor that takes the total failure into account of a luminaire in the course of the operating time. The lamp survival factor is specified as a decimal digit and can have a maximum value of 1 (no failures existing within the time concerned or prompt replacement after the failure).
Luminance	Dimension for the "brightness impression" that the human eye has of a surface. The surface itself can emit light thereby or light striking it can be reflected (emitter value). It is the only photometric value that the human eye can perceive. Unit: Candela per square metre Abbreviation: cd/m^2 Formula symbol: L
Luminous efficacy	Ratio of the emitted luminous flux Φ [lm] to the absorbed electrical power P [W] Unit: lm/W. This ratio can be formed for the lamp or LED module (lamp or module light output), the lamp or module with control gear (system light output) and the complete luminaire (luminaire light output).
Luminous flux	Dimension for the total light output that is emitted from one light source in all directions. It is thus an "emitter value" that specifies the entire emitting output. The luminous flux of a light source can only be determined in a laboratory. A difference is made between the lamp or LED module luminous flux and the luminaire luminous flux. Unit: Lumen Abbreviation: lm Formula symbol: Φ
Luminous intensity	Describes the intensity of the light in a certain direction (emitter value). The luminous intensity is a matter of the luminous flux Φ that is emitted in a certain spherical angle Ω. The radiation characteristics of a light source are presented graphically in a light distribution curve (LDC). The luminous intensity is an SI base unit. Unit: Candela Abbreviation: cd Formula symbol: I

Glossary

M

Maintenance factor	See MF
MF	(Engl. maintenance factor)/acc. to CIE 97: 2005 Maintenance factor as decimal number between 0 and 1 that describes the ratio of the new value of a photometric planning parameter (e.g. of the illuminance) to a maintenance value after a certain time. The maintenance factor takes into account the soiling of luminaires and rooms as well as the luminous flux reduction and the failure of light sources. The maintenance factor is taken into account either overall or determined in detail acc. to CIE 97: 2005 by the formula RMF x LMF x LLMF x LSF.

P

P	(Engl. power) Electric power consumption Unit: watt Abbreviation: W

R

$R_{(UG)}$ max	Measure of the psychological glare in indoor spaces. In addition to the luminance of luminaires, the level of the $R_{(UG)}$ value also depends on the observer position, the viewing direction and the ambient luminance. The calculation is made according to the table method, see CIE 117. Among other things, EN 12464-1:2021 specifies maximum permissible $R_{(UG)}$- values $R_{(UGL)}$ for various indoor workplaces.
Reflection factor	The reflection factor of a surface describes how much of the striking light is reflected back. The reflection factor is defined by the colour of the surface.
RMF	(Engl. room maintenance factor)/acc. to CIE 97: 2005 Room maintenance factor that takes the soiling into account of the space encompassing surfaces in the course of the operating time. The room maintenance factor is specified as a decimal digit and can have a maximum value of 1 (no soiling existing).

S

Surrounding area	The ambient area directly borders the area of the visual task and should be planned with a width of at least 0.5 m according to DIN EN 12464-1. It is at the same height as the area of the visual task.

Glossary

U

UGR (max)	(unified glare rating) Measure for the psychological glare effect in interiors. In addition to luminaire luminance, the UGR value also depends on the position of the observer, the viewing direction and the ambient luminance. Among other things, EN 12464-1 specifies maximum permissible UGR values for various indoor workplaces.
UGR observer	Calculation point in the room, for the DIALux the UGR value is determined. The location and height of the calculation point should correspond to the typical observer position (position and eye level of the user).

V

Visual task area	The area that is needed for carrying out the visual task in accordance with DIN EN 12464 -1. The height corresponds with the height at which the visual task is executed.

W

Wall zone	Circumferential area between working plane and walls which is not taken into account for the calculation.
Working plane	Virtual measuring or calculation surface at the height of the visual task that generally follows the room geometry. The working plane may also feature a wall zone.

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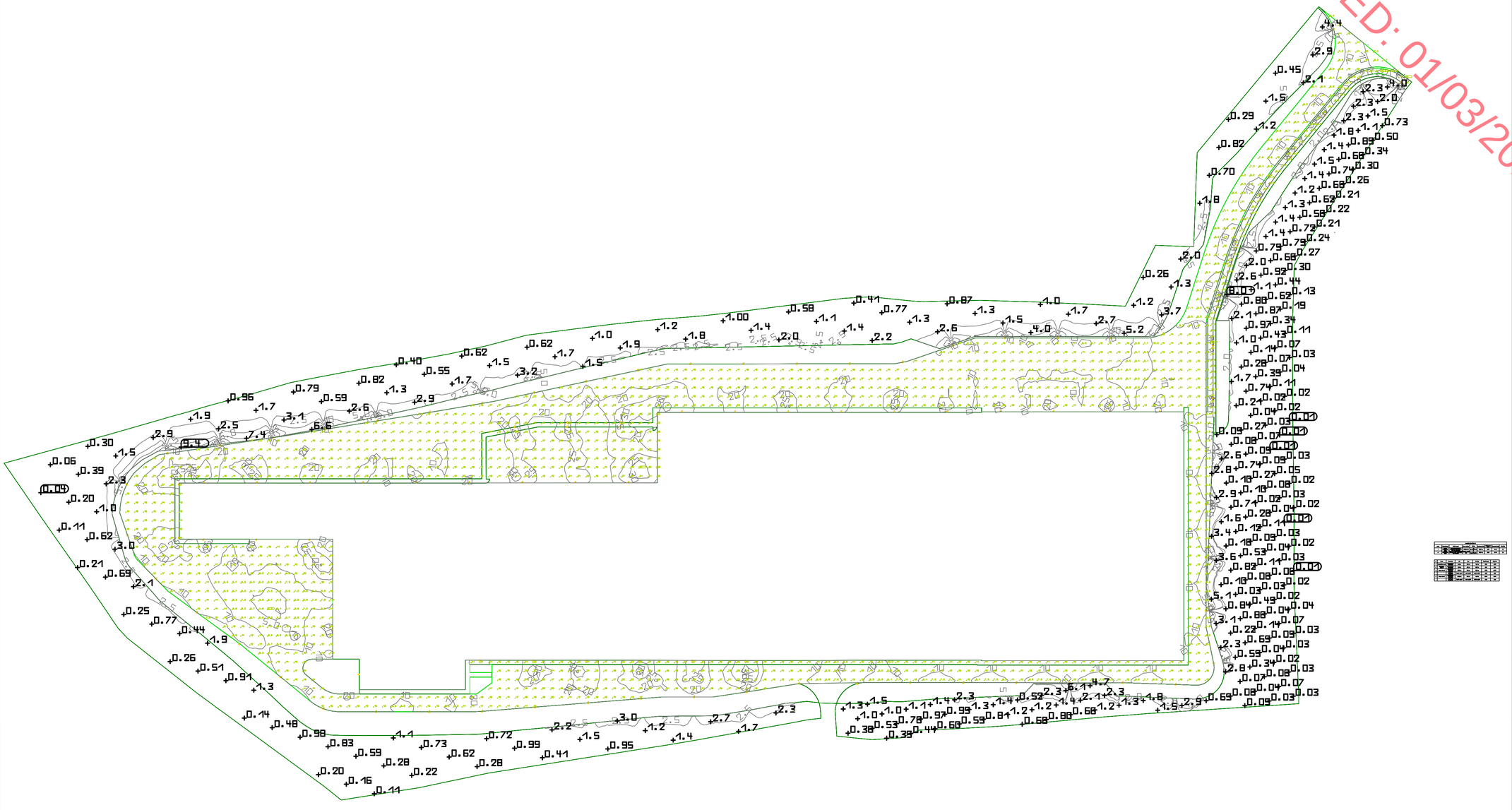

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Client **CLIENT**
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Job **JOB**
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Drawing **DRAWING**
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Job No	Drg No	Stage	Revision	Scale
JOBNO	DRGNO	STAGE	REV	A1 SCALE A3 SCALE

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