9.0 CULTURAL HERITAGE

9.1 Introduction

Golder Associates Ireland Ltd (Golder) has been commissioned to prepare this Environmental Impact Assessment Report (EIAR) on behalf of Laurence Behan, as Applicant for the proposed continuation and extension of quarrying activity ('the Proposed Development') at their existing quarry site at Windmill Hill, Rathcoole, Co. Dublin ('the Site'). This chapter of the EIAR considers the potential effects of the Proposed Development on cultural heritage.

The choice of team members for each study has been informed by the experience of the relevant lead specialist in their area of technical interest. The cultural heritage assessment has been prepared by Conor Ryan (BA Jt. Hons.). Conor is an Associate of the Chartered Institute for Archaeologists (ACIfA) and has more than 6 years' experience in cultural heritage assessment.

This EIAR has been prepared to accompany a planning application to be made under S.37L of the Planning and Development Act, 2000 as amended for the continuation of extraction at an existing quarry at Windmillhill, Rathcoole, Co. Dublin.

The application for further development of the quarry is to be made concurrent with an application for substitute consent for the quarry that is accompanied by an remedial Environmental Impact Assessment Report (rEIAR).

The lands the subject of this EIAR extend to 46.14 ha. that reflect historic operational site information including the extractable area declared under S.261 quarry registration in 2005. The EIA project boundary is generally bounded by the N/M7 to the north and the local Windmillhill Road to the south. The eastern and western EIA project boundaries are demarcated by the Windmillhill townland boundary that consist of field boundaries and the entrance to a dwelling called 'Four Winds' that is within the ownership of the planning applicant to the east; and the former local Steelstown Road to the west.

At the centre of the EIAR project boundary is an existing quarry that covers an area of approximately 28.8 ha. with an average working depth of 173 mAOD. The existing quarry is roughly rectangular in shape with an east – west axis parallel to the N/M7 and local Windmillhill Road. The existing quarry has a centrally located administration and processing plant area over approximately 5 ha.

The further quarrying development proposed involves a lateral northward extension of the current quarry void over approximately 4.1 ha (over a total of 5.16 ha. to accommodate screening berms) west and east of an existing dwelling also in the applicant's ownership and a deepening of the western and eastern side of the laterally extended void to a final working depth of 150 mAOD. The further development proposed is for quarrying only and is over an area of approximately 26.87 ha. The material extracted will be processed at the existing central processing area and the existing quarry access will be utilised.

It is anticipated that extraction of the remaining reserve will occur over 10 to 15 years, depending on market conditions with a further 2 to 5 years for restoration that will remediate the quarry void to agricultural /amenity use and remove the quarry processing plant.

A detailed description of the Site and the Proposed Development can be found in Chapter 2 of this EIAR (Project Description).

9.1.1 Scope

The scope of this cultural heritage assessment comprises a baseline study, effects analysis and impact assessment for the Proposed Development. The baseline is informed by the results of desk-based and archival research.

The impact assessment considers both direct and indirect impacts from the operation and decommissioning (restoration) of the Proposed Development upon cultural heritage assets, and also considers cumulative and combined effects. There is no distinct 'construction' phase to be assessed for the Proposed Development; extraction activity is considered to be 'operation' for the purposes of this assessment. Informed by the results of the impact assessment, an appropriate and proportionate mitigation strategy for the Proposed Development has been developed, with residual effects subsequently assessed.

In lieu of specific guidance from the Institute of Archaeologists of Ireland (IAI), this impact assessment conforms to the guidelines set out by the Chartered Institute for Archaeologists (CIfA, 2020a[1]; 2020b[2]).

For the purposes of this EIAR, the term 'cultural heritage' is used as a collective term to refer to all assets of archaeological, architectural and historical or cultural value. Archaeological heritage typically refers to objects, monuments, buildings, environmental remains or cultural landscapes older than AD 1700, although it can also be used to describe objects, monuments and other tangible remains that date from post-AD 1700[3]. Architectural heritage (or built heritage) refers to structures or buildings (including their contents) of cultural value that are younger than AD 1700. Designed landscapes and gardens dating to post-AD 1700 are also considered to be architectural in this assessment. In both cases, the setting of an asset is considered an integral part of its value.

9.1.2 Site Location and Description

The Site measures approximately 46.14 ha and is located approximately 2.5 km southwest of Rathcoole, Co. Dublin, in the townland of Windmillhill (ITM E 699869, N 725715). It is adjacent to the N7 motorway, approximately 1.5 km from the county boundary with Co. Kildare. The surrounding land is generally rural, agricultural land, particularly to the north, west and south, with greater densities of urban and industrial/commercial development to the east.

9.1.3 Study Area

In order to capture sufficient baseline data to robustly assess direct impacts to cultural heritage assets, the spatial scope of the assessment comprises all the land within the Site (i.e. land situated within the 'EIA Boundary'), together with a buffer of 1 km around the Site to allow the assessment of indirect impacts. This buffer area is considered to be appropriate, given the current use of the Site and the nature of the Proposed Development. The Study Area is shown in Drawing 9.1, (contained in Appendix 9.1).

9.1.4 Chapter Structure

This chapter is divided into the following sections:

- 9.1 – Introduction, which includes details of the assessment scope, study area and structure;
- 9.2 – Policy and Legislation Context, which includes a description of legislation, policy, standards and guidance relevant to cultural heritage;
- 9.3 – Assessment Methodology and Significance Criteria, which presents a description of how the assessment has been undertaken, the consultations that have taken place and includes any assumptions that have been made or limitations that have been encountered;

[1] CIfA (2020a). Standard and guidance for commissioning work or providing consultancy advice on archaeology and the historic environment.

[2] CIfA (2020b). Standard and guidance for historic environment desk-based assessment.

[3] AD 1700 is a point in time used by the National Monuments Service and the National Inventory of Architectural Heritage to distinguish between 'archaeology' and 'architecture'. Although archaeological remains exist that are younger than AD 1700, any buildings, structures or designed landscapes/gardens built during this period are considered in this assessment to be 'architectural'.

- 9.4 – Baseline Conditions, which presents the sources of information used, a detailed breakdown of the assets recorded, a summarised historic map regression and a summarised appraisal of previous archaeological investigations in the study area;
- 9.5 – Characteristics of the Proposed Development, which briefly describes the Proposed Development and those characteristics pertinent to cultural heritage;
- 9.6 – Potential Effects, which summarises the cultural heritage assets considered in the assessment and identifies the sensitivity of those assets. It also presents the potential effects upon these assets as a result of the Proposed Development during operation and decommissioning;
- 9.7 – Mitigation and Monitoring, which presents details of mitigation and monitoring that needs to be adopted to manage the potential effects identified in Section 9.6. It also presents any recommendations for further archaeological investigation that may be required;
- 9.8 – Residual Effects, which presents the residual effects of the Proposed Development, taking account of proposed mitigation;
- 9.9 – Difficulties Encountered, which presents any limitations to the assessment; and
- 9.10 – Summary and Conclusions, which presents a summary of the assessment and final conclusions.

9.2 Legislative and Policy Context

The Minister for Housing, Local Government and Heritage (representing the Department of Housing, Local Government and Heritage) is responsible for the conservation, preservation, protection and presentation of Ireland's cultural heritage. The protection of archaeological heritage is the responsibility of the National Monuments Service (NMS), whilst architectural heritage is the responsibility of the Built Heritage Policy Section (including the Architectural Heritage Advisory Service (AHAS) and National Inventory of Architectural Heritage (NIAH)).

At the national and international level, the key legislation pertinent to this assessment includes:

- The National Monuments Acts, 1930 to 2004;
- The Heritage Act, 1995;
- The Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act, 1999;
- The Planning and Development Acts, 2000 to 2020;
- The Convention concerning the Protection of the World Cultural and Natural Heritage (1972), ratified by the Irish Government in 1991; and
- The European Convention on the Protection of the Archaeological Heritage (Revised) (1992), ratified by the Irish Government in 1997.

Guidelines on the assessment of impacts on, and the protection of, cultural heritage assets in Ireland have been consulted and adhered to for this impact assessment, including:

- Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports (2017) – EPA;
- The Framework and Principles for the Protection of the Archaeological Heritage (1999) - Department of Arts, Heritage, Gaeltacht and the Islands (DAHGI); and

- Architectural Heritage Protection: Guidelines for Planning Authorities (2011) - Department of Arts, Heritage and the Gaeltacht (DAHG).

9.2.1 Legislative Mechanisms of Protection

There are a number of mechanisms for heritage protection in Ireland. Heritage assets can be protected under the National Monuments Acts 1930 to 2004 in four ways:

- The asset is recorded in the Record of Monuments and Places (RMP);
- The asset is registered in the Register of Historic Monuments (RHM);
- The asset is a national monument subject to a Preservation Order (or Temporary Preservation Order); or
- The asset is a National Monument in State Care.

Heritage assets can also be protected under the Planning and Development Act 2000, which requires all Local Authorities to curate and maintain a Record of Protected Structures (RPS). An asset is protected if it is inscribed on a county's RPS. Protected Structures may be archaeological in nature, and so an asset may appear on both the RMP and county RPS.

The 'Convention concerning the Protection of the World Cultural and Natural Heritage' (1972) provides The United Nations Educational, Scientific and Cultural Organization (UNESCO) with the power to inscribe assets of international importance on the World Heritage List as a World Heritage Site. Local authorities and stakeholders are encouraged to protect these sites through the production of Management Plans, which aim to manage the site in a suitable fashion.

Local authorities also have mechanisms by which to protect heritage assets, including the creation of Architectural Conservation Areas (ACAs) and Areas of Archaeological Potential (AAPs) (or equivalents).

The mechanisms of heritage protection described here also afford protection to the setting of cultural heritage assets, as well as the physical assets.

9.2.2 Planning Policy

At the local level, the South Dublin County Development Plan (SDCDP) (2016-2022) guides planning policy in relation to cultural heritage. Chapter 9 of the SDCDP specifically outlines the approach taken by the Local Planning Authority to protecting architectural and archaeological heritage within the planning process, with South Dublin County Council (SDCC) stating their overarching policy is to *"protect, conserve and enhance natural, built and cultural heritage features and restrict development that would have a significant negative impact on these assets"*. Policy areas pertinent to this assessment are summarised in Table 9.1.

Table 9.1: South Dublin County Development Plan (2016 - 2022) Relevant Policies and Objectives - Cultural Heritage

Policy Area	Policy	Objective
Archaeological Heritage	It is the policy of the Council to manage development in a manner that protects and conserves the Archaeological Heritage of the County and avoids adverse impacts on sites, monuments, features or objects of	To favour the preservation in-situ of all sites, monuments and features of significant historical or archaeological interest in accordance with the recommendations of the Framework and Principles for the Protection of Archaeological Heritage, DAHGI (1999), or any superseding national policy document.
		To ensure that development is designed to avoid impacting on archaeological heritage that is of

Policy Area	Policy	Objective
	significant historical or archaeological interest	significant interest including previously unknown sites, features and objects.
		To protect and enhance sites listed in the Record of Monuments and Places and ensure that development in the vicinity of a Recorded Monument or Area of Archaeological Potential does not detract from the setting of the site, monument, feature or object and is sited and designed appropriately.
		To protect and preserve the archaeological value of underwater archaeological sites including associated features and any discovered battlefield sites of significant archaeological potential within the County.
		To protect historical burial grounds within South Dublin County and encourage their maintenance in accordance with conservation principles.
Protected Structures	It is the policy of the Council to conserve and protect buildings, structures and sites contained in the Record of Protected Structures and to carefully consider any proposals for development that would affect the special character or appearance of a Protected Structure including its historic curtilage, both directly and indirectly.	To ensure the protection of all structures (or parts of structures) and the immediate surroundings including the curtilage and attendant grounds of structures contained in the Record of Protected Structures.
		To ensure that all development proposals that affect a Protected Structure and its setting including proposals to extend, alter or refurbish any Protected Structure are sympathetic to its special character and integrity and are appropriate in terms of architectural treatment, character, scale and form. All such proposals shall be consistent with the Architectural Heritage Guidelines for Planning Authorities, DAHG (2011) including the principles of conservation.
		To address dereliction and encourage the rehabilitation, renovation, appropriate use and re-use of Protected Structures.
		To prevent demolition and inappropriate alteration of Protected Structures.
		SLO 3: To secure the preservation of Windmill Hill, Rathcoole (RPS Ref. 358)
Architectural Conservation Areas	It is the policy of the Council to preserve and enhance the historic character and visual setting of	To avoid the removal of structures and distinctive features that positively contribute to the character of Architectural Conservation Areas including buildings,

Policy Area	Policy	Objective
	Architectural Conservation Areas and to carefully consider any proposals for development that would affect the special value of such areas.	building features, shop fronts, boundary treatments, street furniture, landscaping and paving.
		To ensure that new development, including infill development, extensions and renovation works within or adjacent to an Architectural Conservation Area (ACA) preserves or enhances the special character and visual setting of the ACA including vistas, streetscapes and roofscapes.
		To address dereliction and promote appropriate and sensitive reuse and rehabilitation of buildings, building features and sites within Architectural Conservation Areas.
		To reduce and prevent visual and urban clutter within Architectural Conservation Areas including, where appropriate, traffic management structures, utility structures and all signage.
Features of Interest	It is the policy of the Council to secure the identification, protection and conservation of historic items and features of interest throughout the County including street furniture, surface finishes, roadside installations, items of industrial heritage and other stand alone features of interest.	To ensure that development within the County including Council development seeks to retain, refurbish and incorporate historic items and features of interest.
Views and Prospects	It is the policy of the Council to preserve Views and Prospects and the amenities of places and features of natural beauty or interest including those located within and outside the County.	To protect, preserve and improve Views and Prospects of special amenity, historic or cultural value or interest including rural, river valley, mountain, hill, coastal, upland and urban views and prospects that are visible from prominent public places. Windmill Hill is identified as a Prospect to be Preserved and Protected.

SDCC has a heritage management plan (South Dublin County Heritage Plan 2010-2015), which has been consulted for reference, where applicable.

9.3 Assessment Methodology and Significance Criteria

This assessment has been produced in accordance with national and local legislation and policy, as well as best practice guidance. The impact assessment methodology aligns with EPA draft guidelines (EPA, 2017) and has been adapted from the advice provided by the National Roads Authority (NRA), in their Guidelines for the

Assessment of Architectural Heritage Impacts of National Roads Schemes and Guidelines for the Assessment of Archaeological Heritage Impacts of National Roads Schemes (no publication date). These guidelines can be equally applied to other development schemes.

The assessment has been completed using a phased qualitative assessment methodology, as outlined here:

- Cultural heritage assets with the potential to be affected by the Proposed Development are identified and ascribed a 'value', ranging from ''unknown' to 'very high';
- The 'magnitude' of any effects resulting from the Proposed Development upon the identified receptors are established, ranging from 'no change' to 'high' (assuming no mitigation is in place);
- A comparison of the magnitude of effect and receptor value is used to calculate the significance of effect;
- Where required, a mitigation strategy is proposed, with the significance of effect re-calculated (assuming any proposed mitigation is in place) to ascertain the residual effects.

Effects to cultural heritage assets can result from both direct and indirect effects. Direct effects are considered here to be those which result in an immediate, physical impact to an asset, such as ground disturbance. Indirect effects are considered here to include those that occur through an environmental pathway (e.g. air, waterways, and groundwater) or that are secondary (e.g. mitigation measures for a different impact affecting cultural heritage). These indirect effects may be physical but may also affect the setting of an asset. Indirect effects can include, but are not limited to:

- Noise effects;
- Air pollution/dust effects; and
- Visual effects.

Consultation with other specialists, in particular air quality, noise, and landscape and visual, have been undertaken to capture combined effects and provide a holistic assessment of impacts upon cultural heritage assets.

9.3.1 Assessment of Value of Cultural Heritage Assets

The value of a cultural heritage asset can be assessed using the criteria presented in Table 9.2.

Table 9.2: Criteria for Assessing the Value of Cultural Heritage Assets

Value of Asset	Criteria
Very High	■ World Heritage Sites (including nominated sites); ■ Assets of acknowledged international importance; and ■ Assets that can contribute significantly to acknowledged international research objectives.
High	■ Protected Assets (e.g. assets inscribed on the RMP, RHP or RPS); ■ Undesignated assets of recognised quality or importance (e.g. proposed for inclusion on the RMP, ACAs); and ■ Assets that can contribute significantly to acknowledged national research objectives.
Medium	■ Undesignated assets of regional importance or that might contribute to regional research objectives.
Low	■ Undesignated assets of local importance;

Value of Asset	Criteria
	■ Assets compromised by poor preservation and/or poor survival of contextual associations; and ■ Assets of limited value, but with potential to contribute to local research objectives.
Negligible	■ Assets with very little or no surviving cultural interest.
Unknown	■ The importance of the asset cannot be ascertained.

9.3.2 Assessment of Magnitude of Effect

The scale and magnitude of effects on cultural heritage assets can be assessed using the tiered grading system presented in Table 9.3.

Table 9.3: Criteria for Assessing Magnitude of Effect on Cultural Heritage Assets

Magnitude of Effect	Criteria
High	■ Changes to most or all key archaeological/architectural elements, such that the asset is totally altered; and ■ Comprehensive changes to setting.
Medium	■ Changes to many key archaeological/architectural elements, such that the asset is clearly modified; and ■ Considerable changes to setting.
Low	■ Changes to key archaeological/architectural elements, such that the asset is slightly altered; and ■ Slight changes to setting.
Negligible	■ Very minor changes to elements or setting; and ■ Archaeological receptors are altered but no information is lost (through archaeological excavation and recording).
No change	■ No change.

9.3.3 Assessment of Significance of Effects

Using the value of an asset as indicated in Table 9.2, and the magnitude of effect as ascertained from Table 9.3, Table 9.4 indicates how the assessment of the significance of an effect has been concluded.

Table 9.4: Significance of Effect Matrix

		MAGNITUDE OF EFFECT				
		No change	**Negligible**	**Low**	**Medium**	**High**
VALUE OF ASSET	**Very High**	Imperceptible	Slight	Moderate/ Significant	Significant/ Profound	Profound
	High	Imperceptible	Slight	Slight/ Moderate	Moderate/ Significant	Significant/ Profound
	Medium	Imperceptible	Not Significant	Slight	Moderate	Moderate/ Significant
	Low	Imperceptible	Not Significant	Not Significant	Slight	Slight/ Moderate
	Negligible	Imperceptible	Imperceptible	Not Significant	Not Significant	Slight

The methodology outlined in this section is reliant on an element of subjectivity, and so inherently requires a level of professional judgement. It is considered, however, that the criteria described in Table 9.2 and Table 9.3 provide robust and transparent decision-making guidance that can be widely applied to a variety of potential cultural heritage assets.

9.4 Baseline Conditions

The results of the baseline study are presented here as a summarised appraisal of the various disparate data sources. They have been separated into archaeological and architectural assets. For ease of reference, each asset has been assigned a unique ID reference comprising a two-letter prefix ('AR' for archaeological assets and 'BU' for architectural assets), followed by a sequentially increasing number. This allows information from different datasets, each with their own reference systems, to be collated into a single receptor list.

9.4.1 Data Sources

The baseline study comprised a comprehensive desk-based review of existing, remotely available heritage datasets within the Study Area, which has allowed a good understanding of the baseline cultural heritage conditions at and around the Site to be established. Sources of information consulted include:

- The Sites and Monuments Record (SMR), compiled and maintained by the Archaeological Survey of Ireland (ASI) unit of the NMS, for details regarding all known monuments and sites[4];
- The NIAH Building[4] and Garden[5] Surveys, for details regarding buildings, structures, demesnes, designed landscapes and historic gardens of architectural importance;
- The RMP, compiled and maintained by the NMS, for details regarding protected sites;
- The NMS for details regarding national monuments in State care (ownership or guardianship of the Housing, Local Government and Heritage) and for monuments subject to Preservation Orders;

[4] The SMR and NIAH Building Survey datasets are available in a downloadable Geographical Information System (GIS) format.

[5] The NIAH Garden survey is a work in progress. The desk-based survey (Phases 1 and 2) has been completed, but the field survey (Phase 3) remains incomplete. A policy framework and method of protection remains to be determined.

- The South Dublin County Development Plan (2016-2022) for details regarding the county's RHM, RPS, national monuments in State care (ownership or guardianship of the Local Authority), monuments subject to Preservation Orders, ACAs and AAPs;
- The Kildare County Development Plan (2017 - 2023) for details regarding the county's protected heritage, including the county RPS (relevant where the Study Area extends beyond Co. Dublin into Co. Kildare, to the west);
- UNESCO for details regarding inscribed and tentative World Heritage Sites;
- The topographical files of the National Museum of Ireland (NMI) for details of any finds held in the national archive relevant to the Site;
- The SMR, Excavations Bulletin, and Transport Infrastructure Ireland Digital Heritage Collection for details of previous excavations;
- Ordnance Survey Ireland for historic cartographic and aerial image sources, in order to conduct a map regression
- Pre-existing environmental reports containing information pertinent to the historic environment of the Site; and
- Modern online aerial image sources (e.g. Google Earth, Bing Maps).

9.4.2 Historical background and Archaeological Context

The well-documented archaeological record in the South Dublin area stretches from prehistory through to the modern era, and comprises a wide variety of material culture, with both archaeological and architectural heritage from throughout antiquity evident within the landscape. Early ecclesiastical sites formed the origins of many of the villages in the area, such as Tallaght, Saggart and Rathfarnham, whilst the manorial agricultural landscape of the area, which developed under the Normans in the 13th century, prevails across large areas. Industrialisation from the 17th century onwards, particularly around established villages, and the advent of aviation in the early to mid-20th century have also shaped the modern landscape.

9.4.3 Archaeological Heritage

Sites and Monuments Record and the Record of Monuments and Places

There are 13 archaeological assets from the SMR recorded within the Study Area, as shown in Drawing 9.1, (contained in Appendix 9.1), of which 5 are located within the Site (AR-01 to AR-05). The details of all 13 assets are summarised in Table 9.5, with full details presented in the Cultural Heritage Gazetteer (Appendix 9.2). The assets located within the Site include the extant remains of a circular windmill (AR-01, shown in Figure 9.1), considered to be circa 18th century in origin. The remains stand at two storeys high and are constructed of irregularly coursed masonry. It is believed the existing windmill was built upon the former location of 15th century windmill, which is the assumed origin of the townland name. The other four assets within the Site are located in close proximity to AR-01 and comprise a group of potentially prehistoric features identified primarily through regional scale LiDAR (Light Detecting and Ranging) studies (Davis, 2014); a burial cairn, ring-ditch, hillfort and ceremonial enclosure.

Figure 9.1: Remains of circular windmill, AR-01

To the northwest of the Site there are seven assets, clustered into three groups. The first, comprising one asset (AR-06), is a cave site recorded in the 19th century and interpreted as a potential souterrain, although the record entry describes that modern interpretations suggest the asst is likely a natural feature. The second group, comprising two assets (AR-07 and AR-08), are the remains of Colmanstown Castle and the associated field system. The castle was demolished in 1960. The third group (AR-09, AR-10 and AR-11) comprise a church and graveyard, with an earlier ecclesiastical enclosure at the same location.

The other two assets (AR-12 and AR-13), located to the south and southeast of the Site respectively, comprise a prehistoric ring-barrow and a holy well, dedicated to St. Catherine.

Table 9.5: Archaeological Assets within Study Area

Golder ID	SMR Ref	Easting (ITM95)	Northing (ITM95)	Asset Description	Included (or Proposed for Inclusion) on RMP	Distance to Site	Value
AR-01	DU021-038----	699846	725586	Windmill	Yes*	0 m	High
AR-02	DU021-113----	699846	725592	Cairn - burial cairn	No	0 m	Medium
AR-03	DU021-114----	699839	725583	Ring-ditch	No	0 m	Medium
AR-04	DU021-115----	699852	725580	Ceremonial enclosure	No	0 m	Medium
AR-05	DU021-116----	699823	725571	Hillfort	No	0 m	Medium
AR-06	DU020-010----	698690	725751	Souterrain	Yes	760 m (northwest)	High

Golder ID	SMR Ref	Easting (ITM95)	Northing (ITM95)	Asset Description	Included (or Proposed for Inclusion) on RMP	Distance to Site	Value
AR-07	DU020-011001-	699259	726195	Castle - tower house	Yes	440 m (northwest)	High
AR-08	DU020-011002-	699260	726191	Field system	Yes	440 m (northwest)	High
AR-09	DU020-009001-	699406	726232	Church	Yes*	380 m (northwest)	High
AR-10	DU020-009002-	699406	726234	Graveyard	Yes*	380 m (northwest)	High
AR-11	DU020-009004-	699406	726234	Ecclesiastical enclosure	Yes*	380 m (northwest)	High
AR-12	DU021-039----	699795	725014	Barrow - ring-barrow	Yes	315 m (south)	High
AR-13	DU021-040----	701178	725429	Ritual site - holy well	Yes	860 m (southeast)	High

*also included on the SDCC RPS.

Record of Protected Structures

Four of the archaeological assets recorded within the Study Area are listed on the SDCC RPS. The extant remains of an 18th century windmill (AR-01), which are located within the Site, are listed on the RPS (RPS ref. 358) and are also the subject of planning policy objective SLO 3, specifically *"to secure the preservation of Windmill Hill, Rathcoole (RPS Ref. 358)"*. The church, graveyard and potential enclosure at Colmanstown (AR-09, AR-10 and AR-11) are also included on the SDCC RPS (RPS ref. 341).

Preservation Orders

None of the assets within the Study Area are subject to a Preservation Order. The nearest asset to the Site that is subject to a Preservation Order is an unclassified cairn (SMR ref: DU024-002001--) located in Crockaunadreenagh, approximately 2 km to the southeast of the Site.

National Monuments in State Care

A national monument is defined by the National Monuments Act, 1930 as an asset 'the preservation of which is a matter of national importance by reason of the historical, architectural, traditional, artistic or archaeological interest attaching thereto'. A National Monument in State Care is one in the ownership or guardianship of the Minster for Housing, Local Government and Heritage or a Local Authority.

The nearest National Monument in State care is the church at Oughterard, Kildare (SMR ref: KD015-007005-), located 14.3 km northeast of the Site.

Register of Historic Monuments

There is no RHM disclosed for SDCC. The nearest monument to the Site that is inscribed on a county-level RHM is the medieval settlement in Kilteel, Kildare (comprising SMR ref: KD020-005----, KD020-006----, KD020-007002-- to KD020-0070010-, and KD020-008----), located approximately 3.9 km to the south of the Site.

Areas of Archaeological Potential

The Site is not located within an AAP. The nearest AAP is the Rathcoole AAP, located approximately 1.3 km northeast of the Site.

World Heritage Sites and Tentative List

There are no World Heritage Sites recorded within the Study Area. The nearest World Heritage Site to the Site is Brú na Bóinne (Archaeological Ensemble of the Bend of the Boyne), located 45 km to the north. The Royal Sites of Ireland, comprising five individual sites in Ireland (Cashel, Dún Ailinne, the Hill of Uisneach, the Rathcroghan Complex and the Tara Complex) as well as Navan Fort in Northern Ireland (UK), is listed on the Tentative List for Ireland for consideration for inclusion on the World Heritage List. Dún Ailinne, the seat of the kings of Leinster, is located approximately 25 km southwest of the Site.

Topographical Files

A remote search was conducted of the topographical files archive at the NMI for all entries recorded in the 17 townlands that are within 1 km of the Site. The search returned 15 entries, all of which are recorded in Colmanstown in the vicinity of AR-11 to the north of the Site. The entries comprise 13 pottery finds made in 1999 and a copper buckle and clasp, both found in 1982. All 15 entries were chance finds were made by members of the public.

9.4.4 Architectural Heritage

National Inventory of Architectural Heritage

A total of eight architectural assets listed on the NIAH Building Survey are recorded within the Study Area, although none lie within the Site. There are no assets listed on the NIAH Garden Survey that are within the Study Area. Details of architectural assets within the Study Area are summarised in Table 9.6 and their locations are shown in Drawing 9.1, (contained in Appendix 9.1), with full details presented in the Cultural Heritage Gazetteer (Appendix 9.2).

Table 9.6: Architectural Assets within Study Area

Golder ID	NIAH ref	Easting (ITM95)	Northing (ITM95)	Asset Description (Asset Date)	Asset listed on RPS?	Distance to Site	Value
BU-01	11213007	700300	726202	Keatingspark House (1870 – 1900)	Yes (RPS ref. 344)	208 m (northeast)	High
BU-02	11213008	701135	726085	Farm house (1800 – 1840)	Yes (RPS ref. 347)	768 m (east)	High
BU-03	11218001	701462	725816	Woodfield House (1880 – 1900)	Yes (RPS ref. 355)	1,050 m (east)	High
BU-04	11218002	701328	725410	Mount Carmel (1890 – 1910)	No	1,006 m (southeast)	Medium
BU-05	11218003	700786	725072	House (1810 – 1840)	No	760 m (southeast)	Medium
BU-06	11218003	700764	725058	House (1810 – 1840)	No	760 m (southeast)	Medium
BU-07	11217002	699192	724995	Steelstown Lodge gate lodge (1875 – 1880)	Yes (RPS ref. 368)	527 m (southwest)	High
BU-08	11218004	700545	724667	House (1800 – 1840)	No	1,000 m (south)	Medium

Record of Protected Structures

Four of the eight architectural assets recorded within the Study Area are included on the SDCC RPS:

- BU-01, BU-02, BU-03 and BU-07.

Architectural Preservation Areas

The Site is not within an ACA. The nearest ACA to the Site is the Rathcoole ACA, located approximately 1.6 km northeast of the Site.

9.4.5 Previous Studies and Archaeological Investigations

Geophysical survey was undertaken in 2018 within the undisturbed southern area of the Site, outside the existing quarry area (Target, 2018; Appendix 9.3), including the locations of AR-01 to AR-05. A complex of potential archaeological features were identified from this survey, particularly around the location of AR-01 and in the southwestern area of the Site (areas M1 and M2 in Target (2018), Appendix 9.3), with no anomalies of archaeological significance in the southeastern areas (areas M3 and M4 in Target (2018), Appendix 9.3). Anomalies in area M3 were considered likely to be of geological origin. The interpretation of the geophysical results aligns with previous, wider scale LiDAR studies, suggesting the area around AR-01 was a prehistoric hillfort, potentially built upon an earlier funerary monument (Target, 2018; Davis, 2014). The extent of archaeological features identified at the Site by this survey are presented in Figures 5 to 7 in Appendix 9.3.

Four other previous archaeological investigations are recorded within the Study Area, three of which were associated with road widening and improvement activities along the N7 motorway. Geophysical survey and trial trenching along the route of the N7 undertaken in 2003 and 2004 revealed two sites of archaeological potential in Bustyhill and Steelstown to the northwest and southwest of the Site, which were both excavated under licence in 2004 (Duffy, 2010 and Duffy, 2011, respectively).

The Bustyhill excavation (Duffy, 2010) to the northwest revealed a potential enclosure site with two entrances, although due to their depth and layout they are considered to potentially form part of the field system, rather than a ringfort or other earthwork construction. Two pits were also identified and dated to the early medieval period.

The Steelstown excavation (Duffy, 2011) to the southwest revealed a potential late Neolithic period structure, indicated by pits and postholes, as well as large amounts of lithics and Grooved Ware pottery sherds in the fill. A fragment of a polished stone axe was also identified. Burnt remains, first identified during trial trenching, were also confirmed, with an Iron Age/early medieval furnace revealed at the location. The interpretation of the Site as either domestic or ritual remains unclear. Excavation undertaken in 2005 at a neighbouring location, however, identified a curvilinear ditch interpreted as an enclosure for a cemetery, consisting of four cremation pit burials containing worked flint, pottery and metal work (Excavations Bulletin ref: 2005:532). It is suggested the two sites may be linked, although the results of radiocarbon dating samples are not available to confirm.

The other excavation in the Study Area was undertaken in 2004 at AR-06 and the entry concludes that the asset is not a souterrain, as recorded on the SMR and RMP (Excavations Bulletin ref: 2004:0474).

9.4.6 Historic Map Regression and Aerial Imagery

Historic mapping and aerial imagery for the Site is available from Ordnance Survey Ireland, including:

- 6 Inch Colour and Black & White – 1829-1841;
- 25 Inch Black & White – 1897-1913;
- Aerial photography (black and white) – 1991;
- Aerial photography (black and white) – 1994;

- Aerial photography (black and white - orthorectified) – 1995;
- Aerial photography (colour - orthorectified) – 2000; and
- Aerial photography (colour - orthorectified) – 2005.

The 6" map, dating from the early- to mid-19th century, depicts the Site as largely undeveloped agricultural land within a wider rural landscape. The original farmhouse is indicated in its current location and the modern-day field and road system layout is easily discernible. Two small areas along the western boundary of the Site are recorded as quarries, as well to the south. AR-01 is labelled as 'Windmill Stump' and AR-06 to AR-10 are clearly labelled the northwest of the Site.

The 25" map, dating from the turn of the 20th century, is equally recognisable when compared to modern aerial imagery and shows that the Site remained largely undeveloped throughout this period. The areas of quarrying previously depicted along the western boundary are shown to have extended eastwards across the Site, following the alignment of a field boundary. AR-01 is indicated on the map but is not labelled. The locations of AR-07 to AR-10 are indicated with labels.

Aerial photography from 1991 is the next available imagery, which documents large scale quarrying and stockpiling activity over the majority of the central area of the Site, with the western end undisturbed. Expansion westwards is documented in aerial imagery from 1994 and 1995. The southern area, where AR-01 to AR-05 are located, remains undisturbed throughout this period. The extent of the quarry in 1995 is shown to be smaller as it is at present, with limited eastwards expansion. The original farm buildings and field layout are still discernible. In the wider area, the rural landscape is still evident, although westward urban expansion from Rathcoole is also documented, with significant residential development along the route of the N7 motorway. The double hedgerow at the western end of the Site demarcate the former alignment of a small road, oriented north-south, known as Tierney's Lane, which was closed in the 1960s.

The steady expansion eastwards, westwards and downwards of the quarry is documented in aerial photographs from 2000 and 2005. The southern area of the Site remains undisturbed, with the focus on eastwards expansion. The 2005 imagery indicates the quarry had not reached its current extent at that time. Modern aerial imagery indicates that eastwards expansion continued until at least 2009. Throughout this period, a rural landscape persists in the surrounding Study Area.

9.4.7 Field Visit Results and Observations

Due to travel restrictions associated with the COVID-19 pandemic, no cultural heritage specific site visit was undertaken. Efforts have been made to access physical archives remotely, whilst photographs and observations from other practitioners who have visited the site have been consulted in the completion of this impact assessment.

9.4.8 Undiscovered Archaeological Remains

Based upon the presence of sub-surface archaeological remains within the Site that have only been identified in recent years through non-invasive surveying techniques, combined with the range and density of archaeological assets within the Study Area, it is not unreasonable to consider that there is potential for undiscovered archaeological remains to exist at the Site.

9.5 Characteristics of the Proposed Development

The Proposed Development comprises the continued extraction of materials within the existing quarry footprint, as well as the expansion of quarrying activity into two previously undeveloped locations to the northwest and northeast (as shown on Drawing 9.1, Appendix 9.1). The depth will vary across the Site, with the lowest point at approximately 120 m AOD.

Ultimately, the quarry pit will be restored through infilling, revegetation and the establishment of a water body, but the scale of extraction means original topography of the Site will not be restored to pre-quarrying levels.

9.5.1 Characteristics of Significance for Cultural Heritage

The total area of the EIA boundary is 46.14 ha, with 5.19 ha of additional extraction proposed within previously undeveloped areas. Works within the existing quarry footprint are not expected to have any direct impact on cultural heritage assets, but proposed extraction works within the 5.19 ha of additional undeveloped land have the potential to disturb ground; this the most pertinent characteristic of the development in terms of assessing impact to cultural heritage.

Visual changes to the landscape, both from quarrying activity during operation and from the restoration of the Site also have the potential to impact cultural heritage, in particular the setting of assets. Dust and noise generating activities from extraction also have the potential to impact upon cultural heritage assets.

9.6 Potential Effects

Using the assessment methodology described in Section 9.3, the effects of the Proposed Development upon cultural heritage assets have been assessed. Due to the nature of the Proposed Development (i.e. progressive quarrying), all effects have been considered as occurring during the operational phase, with no discrete construction phase considered. Decommissioning, comprising the restoration of the Site, has also been assessed.

9.6.1 Operation Phase

There are no known cultural heritage assets within the existing quarry footprint or in the proposed additional extraction areas, and so no direct effects are predicted to known designated or non-designated assets. Known assets within the Site, comprising AR-01, AR-02, AR-03, AR-04 and AR-05, are located outside the existing quarry footprint to the south. There is no additional extraction proposed in this area, and so no direct effects are predicted to occur at these five assets.

There is potential for undiscovered archaeological remains to exist within the Site, including the previously undeveloped additional extraction areas. If such remains do exist beneath the surface in these additional extraction areas, then there is potential for them to be directly affected by ground disturbance during extraction.

The proximity of AR-01, AR-02, AR-03, AR-04 and AR-05 to the existing quarry means there is likely to be impacts upon the setting of these assets due to noise and dust emissions and visual changes. This, however, is reflective of the baseline situation as the quarry is already operational and so the current setting is already impacted by noise and dust emissions and visual changes. The Proposed Development would therefore not result in a change of setting, but rather a continuation of the existing, impacted setting.

The air quality and noise assessments indicate that there will be no significant effects during operation of the Proposed Development. As such, no indirect effects on the setting of cultural heritage assets outside the Site within the Study Area are predicted as a result of air and nose emissions from the Proposed Development.

The landscape and visual assessment has identified a number of visual effects that have the potential to affect the 16 cultural heritage assets outside the Site within the wider Study Area. Intervisibility between the Site and the ten assets to the south and east is possible, but the Proposed Development is unlikely to result in additional visual changes to setting of these assets, which do not have views into the quarry pit or of the exposed rockface. Rather, the Proposed Development would represent a continuation of the existing, impacted setting. Proposed boundary planting is expected to reduce intervisibility at these assets and so in the medium term, whilst the visual changes cannot be reversed, it is likely that the setting of these assets will be improved.

Six assets located to the northwest of the Site (AR-06 to AR-11) have clear views towards the quarry pit and exposed rockface. It is expected that boundary planting and landscaping will obscure views of the additional extraction areas, and so the Proposed Development would result in no change, with a continuation of the existing, impacted setting.

Table 9.7 presents the potential operation phase effects on cultural heritage assets.

Table 9.7: Potential Effects - Operation Phase

Golder ID	Description of Effect	Magnitude of Effect	Asset value	Significance of Effect (before mitigation)
AR-01	Indirect effects to setting	No change	High	Imperceptible
AR-02	Indirect effects to setting	No change	Medium	Imperceptible
AR-03	Indirect effects to setting	No change	Medium	Imperceptible
AR-04	Indirect effects to setting	No change	Medium	Imperceptible
AR-05	Indirect effects to setting	No change	Medium	Imperceptible
Potential Undiscovered Archaeological Remains	Damage or loss of asset through quarrying activity	High	Very High	Profound adverse*
AR-06	Indirect effects to setting (visual)	No change	High	Imperceptible
AR-07	Indirect effects to setting (visual)	No change	High	Imperceptible
AR-08	Indirect effects to setting (visual)	No change	High	Imperceptible
AR-09	Indirect effects to setting (visual)	No change	High	Imperceptible
AR-10	Indirect effects to setting (visual)	No change	High	Imperceptible
AR-11	Indirect effects to setting (visual)	No change	High	Imperceptible
AR-12	Indirect effects to setting (visual)	Low	High	Slight positive
AR-13	Indirect effects to setting (visual)	Low	High	Slight positive
BU-01	Indirect effects to setting (visual)	Low	High	Slight positive
BU-02	Indirect effects to setting (visual)	Low	High	Slight positive
BU-03	Indirect effects to setting (visual)	Low	High	Slight positive
BU-04	Indirect effects to setting (visual)	Low	Medium	Slight positive
BU-05	Indirect effects to setting (visual)	Low	Medium	Slight positive
BU-06	Indirect effects to setting (visual)	Low	Medium	Slight positive

Golder ID	Description of Effect	Magnitude of Effect	Asset value	Significance of Effect (before mitigation)
BU-07	Indirect effects to setting (visual)	Low	High	Slight positive
BU-08	Indirect effects to setting (visual)	Low	Medium	Slight positive

*this is a conservative scenario, assuming very high value archaeological remains do exist within the Proposed Development.

9.6.2 Decommissioning Phase

Ground disturbance will be limited to operational activities, and so no direct effects are predicted as a result of decommissioning.

Once quarrying activity ends and the Site is restored, the effects of air and noise emissions on the setting of the five assets in close proximity to the quarry pit (AR-01, AR-02, AR-03, AR-04 and AR-05) will also end. This will reflect an improvement compared to the existing setting. Restoration works cannot entirely restore the landscape as it was prior to extraction, and so there will still be visual changes to the setting of these assets. The proposed restoration, however, will seek to revegetate and rehabilitate the exposed quarry, which will reduce the visual impact upon setting compared to the existing conditions. The proposed restoration will also reduce visual impacts upon the setting of cultural heritage assets in the wider Study Area compared to existing conditions.

The air quality and noise assessments indicate that there will be no significant effects during decommissioning of the Proposed Development. As such, no indirect effects on the setting of cultural heritage assets outside the Site within the Study Area are predicted as a result of air or noise emissions from the Proposed Development.

Table 9.8 presents the potential decommissioning phase effects on cultural heritage assets.

Table 9.8: Potential Effects - Decommissioning Phase

Golder ID	Description of Effect	Magnitude of Effect	Asset value	Significance of Effect (before mitigation)
AR-01	Indirect effects to setting	Low	High	Slight positive
AR-02	Indirect effects to setting	Low	Medium	Slight positive
AR-03	Indirect effects to setting	Low	Medium	Slight positive
AR-04	Indirect effects to setting	Low	Medium	Slight positive
AR-05	Indirect effects to setting	Low	Medium	Slight positive
AR-06	Indirect effects to setting (visual)	Low	High	Slight positive
AR-07	Indirect effects to setting (visual)	Low	High	Slight positive
AR-08	Indirect effects to setting (visual)	Low	High	Slight positive
AR-09	Indirect effects to setting (visual)	Low	High	Slight positive
AR-10	Indirect effects to setting (visual)	Low	High	Slight positive

Golder ID	Description of Effect	Magnitude of Effect	Asset value	Significance of Effect (before mitigation)
AR-11	Indirect effects to setting (visual)	Low	High	Slight positive
AR-12	Indirect effects to setting (visual)	Low	High	Slight positive
AR-13	Indirect effects to setting (visual)	Low	High	Slight positive
BU-01	Indirect effects to setting (visual)	Low	High	Slight positive
BU-02	Indirect effects to setting (visual)	Low	High	Slight positive
BU-03	Indirect effects to setting (visual)	Low	High	Slight positive
BU-04	Indirect effects to setting (visual)	Low	Medium	Slight positive
BU-05	Indirect effects to setting (visual)	Low	Medium	Slight positive
BU-06	Indirect effects to setting (visual)	Low	Medium	Slight positive
BU-07	Indirect effects to setting (visual)	Low	High	Slight positive
BU-08	Indirect effects to setting (visual)	Low	Medium	Slight positive

9.6.3 'Do-Nothing' Scenario

If the Proposed Development weren't to be developed, i.e. the 'do-nothing' scenario, there would be no change to the existing baseline as described in Section 9.4. There would be no adverse impacts to cultural heritage assets as a result of the Proposed Development during operation, however the Site would also not be restored, and so the slight positive impacts resulting from the improved setting of assets in close proximity to the quarry pit and in the wider Study Area during decommissioning would not be realised.

9.7 Mitigation and Management

9.7.1 Operation Phase

To mitigate for the potential presence of undiscovered archaeological remains within the additional extraction areas, it is recommended that a phased approach is implemented. Initially, a geophysical survey of the two additional extraction areas will be undertaken. The results of this geophysical survey will then inform the further development of the mitigation strategy, including the need for further intrusive archaeological investigation. If required, this may range from archaeological supervision of soil stripping work by a licensed archaeologist, to trial trenching and targeted evaluation, to broader, more extensive archaeological excavation.

To ensure the protection of assets AR-01, AR-02, AR-03, AR-04 and AR-05 from inadvertent direct impacts, the area will be clearly demarcated and the presence, significance and protections afforded to these assets will be communicated to all staff working on site, as part of their environmental induction.

9.7.2 Decommissioning Phase

No cultural heritage specific mitigation is proposed during decommissioning.

9.7.3 Monitoring

Beyond the phased archaeological mitigation strategy, no long-term or on-going monitoring for cultural heritage is proposed.

9.8 Residual Effects

9.8.1 Operation Phase

The residual effects of the Proposed Development during operation are presented in Table 9.9.

Table 9.9: Residual Effects - Operation Phase

Golder ID	Description of Effect	Magnitude of Effect	Asset value	Significance of Effect (after mitigation)
AR-01	Indirect effects to setting	No change	High	Imperceptible
AR-02	Indirect effects to setting	No change	Medium	Imperceptible
AR-03	Indirect effects to setting	No change	Medium	Imperceptible
AR-04	Indirect effects to setting	No change	Medium	Imperceptible
AR-05	Indirect effects to setting	No change	Medium	Imperceptible
Potential Undiscovered Archaeological Remains	Damage or loss of asset through quarrying activity	Negligible	Very High	Slight adverse*
AR-06	Indirect effects to setting (visual)	No change	High	Imperceptible
AR-07	Indirect effects to setting (visual)	No change	High	Imperceptible
AR-08	Indirect effects to setting (visual)	No change	High	Imperceptible
AR-09	Indirect effects to setting (visual)	No change	High	Imperceptible
AR-10	Indirect effects to setting (visual)	No change	High	Imperceptible
AR-11	Indirect effects to setting (visual)	No change	High	Imperceptible
AR-12	Indirect effects to setting (visual)	Low	High	Slight positive

Golder ID	Description of Effect	Magnitude of Effect	Asset value	Significance of Effect (after mitigation)
AR-13	Indirect effects to setting (visual)	Low	High	Slight positive
BU-01	Indirect effects to setting (visual)	Low	High	Slight positive
BU-02	Indirect effects to setting (visual)	Low	High	Slight positive
BU-03	Indirect effects to setting (visual)	Low	High	Slight positive
BU-04	Indirect effects to setting (visual)	Low	Medium	Slight positive
BU-05	Indirect effects to setting (visual)	Low	Medium	Slight positive
BU-06	Indirect effects to setting (visual)	Low	Medium	Slight positive
BU-07	Indirect effects to setting (visual)	Low	High	Slight positive
BU-08	Indirect effects to setting (visual)	Low	Medium	Slight positive

*this is a conservative scenario, assuming very high value archaeological remains do exist within the Proposed Development.

9.8.2 Decommissioning Phase

The residual effects of the Proposed Development during decommissioning are presented in Table 9.10.

Table 9.10: Residual Effects - Decommissioning Phase

Golder ID	Description of Effect	Magnitude of Effect	Asset value	Significance of Effect (after mitigation)
AR-01	Indirect effects to setting	Low	High	Slight positive
AR-02	Indirect effects to setting	Low	Medium	Slight positive
AR-03	Indirect effects to setting	Low	Medium	Slight positive
AR-04	Indirect effects to setting	Low	Medium	Slight positive
AR-05	Indirect effects to setting	Low	Medium	Slight positive
AR-06	Indirect effects to setting (visual)	Low	High	Slight positive
AR-07	Indirect effects to setting (visual)	Low	High	Slight positive
AR-08	Indirect effects to setting (visual)	Low	High	Slight positive

Golder ID	Description of Effect	Magnitude of Effect	Asset value	Significance of Effect (after mitigation)
AR-09	Indirect effects to setting (visual)	Low	High	Slight positive
AR-10	Indirect effects to setting (visual)	Low	High	Slight positive
AR-11	Indirect effects to setting (visual)	Low	High	Slight positive
AR-12	Indirect effects to setting (visual)	Low	High	Slight positive
AR-13	Indirect effects to setting (visual)	Low	High	Slight positive
BU-01	Indirect effects to setting (visual)	Low	High	Slight positive
BU-02	Indirect effects to setting (visual)	Low	High	Slight positive
BU-03	Indirect effects to setting (visual)	Low	High	Slight positive
BU-04	Indirect effects to setting (visual)	Low	Medium	Slight positive
BU-05	Indirect effects to setting (visual)	Low	Medium	Slight positive
BU-06	Indirect effects to setting (visual)	Low	Medium	Slight positive
BU-07	Indirect effects to setting (visual)	Low	High	Slight positive
BU-08	Indirect effects to setting (visual)	Low	Medium	Slight positive

9.9 Cumulative Effects

Due to the nature of the Proposed Development and the likely effects described, the potential for cumulative effects to occur is limited to indirect effects to the setting of cultural heritage assets within the Study Area. There are no extractive or sizeable industries in the surrounding Study Area and so no cumulative effects are expected to occur.

9.10 Difficulties Encountered

A key limitation is that the assessment methodology cannot account for cultural heritage assets that are not recorded in the available data sources. Previously unrecorded assets, such as sub-surface archaeological remains, which do not present any diagnostic features, would not necessarily be identified by the desk-study.

Information has been used from a range of sources to determine baseline cultural heritage conditions. This assessment is therefore limited by the availability and reliability of these data sources.

Travel restrictions and public health safety measures associated with the COVID-19 pandemic meant a cultural heritage specific site visit was not undertaken, restricting opportunities for assessing indirect impacts to setting (particularly with regards to visual effects). This has been overcome using photographs and observations collected by other practitioners during site visits, and through close collaboration with other relevant specialists (e.g. air quality, noise and landscape and visual).

9.11 Summary and Conclusions

A continuation and expansion of quarrying activity at the Windmill Hill quarry site is proposed. A detailed study has been undertaken to determine the cultural heritage baseline conditions and a full impact assessment of the Proposed Development has been completed.

Whilst no known designated or non-designated cultural heritage assets, either within the Site and the Study Area, are predicted to be directly affected by the proposed quarrying activity, the potential for undiscovered archaeological remains to exist at the Site is acknowledged. As such, there is potential for a profound adverse effect. A phased mitigation strategy to address this direct impact to undiscovered archaeological remains is proposed, with geophysical survey of the two additional extraction areas the first phase. This will inform the development of the mitigation strategy, in particular the scope and scale of any intrusive archaeological works that may be required.

Clear demarcation and communication of known cultural heritage assets within the Site to all staff members is also proposed to be included in all site environmental inductions.

Indirect effects to setting are expected to be occur to the 5 assets within the Site (AR-01 to AR-05) and the 16 assets within the wider Study Area. During operation, the setting is expected to remain unchanged compared to the existing baseline for the many of these assets, resulting in imperceptible effects. Boundary planting is likely to result in slight positive effects at the assets located to the south and east of the Site. During decommissioning, when the setting is expected to improve compared to the existing baseline, a slight positive effect is predicted for all assets.

9.12 References

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APPENDIX 9.1

Drawing – Cultural Heritage Assets and Study Area

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725000

AR-09
AR-10
AR-11
AR-07
AR-08
AR-06
AR-03
AR-02
AR-01
AR-05
AR-04
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BU-03
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BU-04
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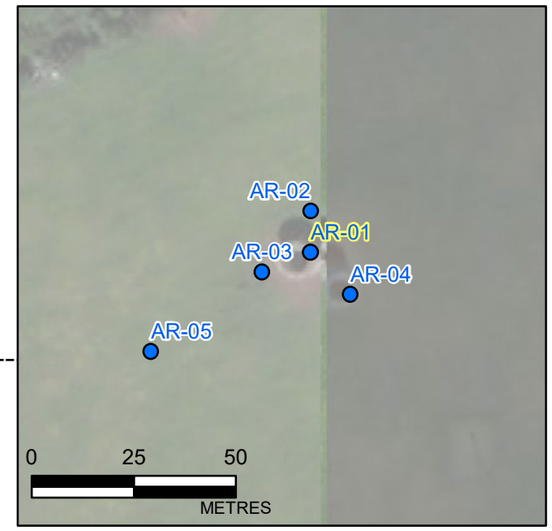
AR-12
BU-07
BU-08



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LEGEND

- Archaeological Asset
- Architectural Asset
- Proposed Additional Extraction Areas
- EIA Boundary
- Study Area

NOTE(S)
YELLOW HIGHLIGHT INDICATES ASSET IS LISTED ON SDCC RPS

REFERENCE(S)
1. COORDINATE SYSTEM: IRENET95 IRISH TRANSVERSE MERCATOR
2. SERVICE LAYER CREDITS: SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
3. SITES AND MONUMENTS RECORD DATA CREATED AND MAINTAINED BY THE NATIONAL MONUMENT SERVICE.
4. NATIONAL INVENTORY OF ARCHITECTURAL HERITAGE BUILDING AND GARDEN SURVEY DATA CREATED AND MAINTAINED BY THE NATIONAL INVENTORY OF ARCHITECTURAL HERITAGE.

CLIENT
L. BEHAN AGGREGATES & RECYCLING LTD

PROJECT
WINDMILL HILL QUARRY EIAR

TITLE
CULTURAL HERITAGE ASSETS AND STUDY AREA

CONSULTANT
GOLDER

YYYY-MM-DD	2021 MAR 04
DESIGNED	CR
PREPARED	CR
REVIEWED	PW
APPROVED	PW

PROJECT NO.	CONTROL	REV.	DRAWING
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APPENDIX 9.2

Cultural Heritage Gazetteer

CULTURAL HERITAGE GAZETTEER

1.0 ARCHAEOLOGICAL ASSETS

Golder ID	SMR Reference	Description	Easting (ITM)	Northing (ITM)	Townland	RMP	Sensitivity/Value
AR-01	DU021-038----	Windmill	699846	725586	WINDMILLHILL	Yes	High
AR-02	DU021-113----	Cairn - burial cairn	699846	725592	WINDMILLHILL	No	Medium
AR-03	DU021-114----	Ring-ditch	699839	725583	WINDMILLHILL	No	Medium
AR-04	DU021-115----	Ceremonial enclosure	699852	725580	WINDMILLHILL	No	Medium
AR-05	DU021-116----	Hillfort	699823	725571	WINDMILLHILL	No	Medium
AR-06	DU020-010----	Souterrain	698690	725751	BUSTYHILL	Yes	High
AR-07	DU020-011001-	Castle - tower house	699259	726195	COLMANSTOWN	Yes	High
AR-08	DU020-011002-	Field system	699260	726191	COLMANSTOWN	Yes	High
AR-09	DU020-009001-	Church	699406	726232	COLMANSTOWN	Yes	High
AR-10	DU020-009002-	Graveyard	699406	726234	COLMANSTOWN	Yes	High
AR-11	DU020-009004-	Ecclesiastical enclosure	699406	726234	COLMANSTOWN	Yes	High
AR-12	DU021-039----	Barrow - ring-barrow	699795	725014	NEWTOWN LOWER	Yes	High
AR-13	DU021-040----	Ritual site - holy well	701178	725429	CROCKSHANE	Yes	High

2.0 ARCHITECTURAL ASSETS

Golder ID	NIAH Reference	Building Name	Original Use	Date	Easting (ITM)	Northing (ITM)	Townland	RPS	Sensitivity
BU-01	11213007	Keatingspark House	House	1870 - 1900	700300	726202	KEATINGSPARK	Yes	High
BU-02	11213008		Farm house	1800 - 1840	701135	726085	CROCKSHANE	Yes	High
BU-03	11218001	Woodfield House	House	1880 - 1900	701462	725816	CROCKSHANE	Yes	High
BU-04	11218002	Mount Carmel	House	1890 - 1910	701328	725410	CROCKSHANE	No	Medium
BU-05	11218003		House	1810 - 1840	700786	725072	CARRIGEEN	No	Medium
BU-06	11218003		House	1810 - 1840	700764	725058	CARRIGEEN	No	Medium
BU-07	11217002	Steelstown Lodge	Gate lodge	1875 - 1880	699192	724995	STEELSTOWN	Yes	High
BU-08	11218004		House	1800 - 1840	700545	724667	CARRIGEEN	No	Medium

APPENDIX 9.3

Geophysical Survey

Geophysical Survey Report

Proposed quarry development at Windmillhill, Rathcoole, South County Dublin

Detection License
18R0211

Client
Byrne Mullins & Associates

On behalf of
L. Behan Aggregates & Recycling Ltd.

Date
November 2018

Project
TAG1800IE39

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TARGET REPORT 1800IE39

PROPOSED QUARRY DEVELOPMENT AT WINDMILLHILL, RATHCOOLE, SOUTH COUNTY DUBLIN

PROJECT BACKGROUND

Geophysical survey was undertaken at the site of a proposed quarry development situated in Windmillhill townland, c.2.4km SW of Rathcoole in South County Dublin, at the southern edge of an existing quarry located c.0.9km NE of Junction 5 on the N7. The site lies directly N of a minor road serving Rathcoole and Steeltown/Newtown Lower, and extends over c.13 hectares of land, traversing 4 adjacent fields. An 18th century windmill, recorded monument and place (RMP) DU021-038, lies within the site boundary to the NW.

This geophysical survey forms part of a pre-planning archaeological assessment, and it was commissioned by Byrne Mullins & Associates on behalf of L. Behan Aggregates & Recycling Ltd. The survey objectives were to identify the location, form and extent of buried archaeological remains, where present within the site boundary, and to advise further archaeological works, which may be required prior to the proposed development of the site.

Coordinates 699961 725516 (ITM central coordinate)

Townland Windmillhill

County South County Dublin

Landuse Pasture

Landscape, soils geology Hilltop (215m O.D) occupied by clayey drift with siliceous stones of the Drumkeeran (0700DK) association, with bedrock comprising of calcareous greywacke siltstone and shale of the Carrighill Formation (Irish National Soils Map, 1:250,000k, V1b, 2014; Geological Survey Ireland Spatial Resources, Public Data Viewer Series).

Archaeology DU021-038 represents the only RMP situated within the site boundary. The site does, however, encompass lands deemed to have a high archaeological potential as defined during the course of previous developments, and a recent UCD LIDAR study of the Dublin Mountains (Davis, 2014). The UCD LIDAR study, in particular, reports the discovery of a cairn on which DU021-038 and its 15th century predecessor are located; two sub-circular enclosures; and three suspected barrows within the site boundary. The following extract from the National Monuments Service SMR Database provides details of DU021-038 and further RMPs within the wider landscape:

SMR No.	Class	Townland	ITM Easting	ITM Northing
DU020-009001-	Church	Colmanstown	699406	726232
DU020-009002-	Graveyard	Colmanstown	699406	726234
DU020-009004-	Ecclesiastical enclosure	Colmanstown	699406	726234
DU020-010----	Souterrain	Bustyhill	698690	725751
DU020-011001-	Castle - tower house	Colmanstown	699259	726195
DU020-011002-	Field system	Colmanstown	699260	726191
DU021-038----	Windmill	Windmillhill	699846	725586
DU021-039----	Barrow - ring-barrow	Newtown Lower	699795	725014

Fieldwork	31st October – 1st November 2018	**Detection license**	18R0211
Report issue	18th November 2018	**Client**	Byrne Mullins & Associates on behalf of L. Behan Aggregates & Recycling Ltd.
Author	John Nicholls MSc	**Techniques**	High resolution magnetic gradiometry and electromagnetic induction (EMI)

1 SURVEY METHODOLOGY

1.1 Survey methodology, coverage and data collection

1.1.1 High resolution magnetic gradiometry was undertaken at the site investigating all available lands within the proposed development boundary, completing a c.10.5 hectares of survey in 4 fields (M1-M4). The magnetic gradiometer survey employed an advanced multichannel fluxgate gradiometer system combined with cm precision GPS. Magnetic gradiometer and GPS data were recorded simultaneously at rates of 75Hz and 1Hz respectively, conducting parallel instrument traverses 3.2m in width across the site.

1.1.2 Targeted EMI survey was also undertaken in magnetic gradiometer area M2 focusing on the enclosure and suspected barrow remains noted from previous UCD LIDAR study, completing a total 1.24 hectares of EMI in 2 areas (EMI1-EMI2). The EMI survey employed a sled mounted conductivity meter combined with cm precision GPS, recording quadrature (apparent conductivity -mSm) and in-phase (apparent magnetic susceptibility -ppt) data and GPS measurements simultaneously at rates of 10Hz and 1Hz respectively, conducting parallel instrument traverses 1m in width across EMI1-2.

1.2 Survey instrumentation

1.2.1 Details of the instrumentation employed for this geophysical survey are provided below:

Technique	Sensor spacing	Sample rate	Instrumentation	Instrument sensitivity/precision
Magnetic (fluxgate) gradiometry	0.40m	75Hz	Foerster Ferex CON650 Archaeology fluxgate gradiometers, 10-channel data logger	<75pT/√Hz at 1Hz (650mm baseline)
EMI	1m	10Hz	CMD MiniExplorer conductivity meter	Vertical dipole orientation (0.5m, 1.0m, and 1.8m depth range)
GPS	3.60m -MAG, 1m -EMI	1Hz	Trimble R10 GPS (VRS system)	<0.1m (vertical & horizontal)

1.3 Data processing

1.3.1 Survey data were processed using in-house, open-source and commercial software. Following GPS, magnetic gradiometer and EMI measurements on site survey data were processed as follows:

Process	Technique	Description
1a	Magnetic gradiometry	Zero median drift correction to balance data from entire sensor array
1b	EMI	Smoothed overall drift function (running average) using a window width of 30 readings
2	Gridding of corrected data via nearest neighbour interpolation	
3	Greyscale generation at optimum range & export to tiff-format (.tiff & .wld)	

1.3.2 To assure integrity of the processed data, and maintain close correlation with the original raw on-site measurements, no additional smoothing, low or high pass filters were applied proceeding steps 1a-3.

1.4 Data display

1.4.1 Figure 1 presents a site location diagram at a scale of 1:5000 displaying the boundary of the proposed development, location of 18th century windmill DU021-038, and extent of magnetic gradiometer and EMI surveys.

1.4.2 Figures 2-4 display the results from magnetometer survey in M1-M4 presented as greyscale images at scales of 1:2000 and 1:1500.

1.4.3 Figure 5-7 present an interpretation of the results from magnetic gradiometer survey in M1-M4 at scales of 1:2000 and 1:1500.

1.4.4 Figures 8-10 display the results from EMI survey in EMI1-EMI2 presented as greyscale images of quadrature (apparent conductivity -mSm) and in-phase (apparent magnetic susceptibility -ppt) data (vertical dipole depth ranges 0.5m – 1.8m) at a scale of 1:1250.

1.4.5 Figure 11 provides an interpretation of the results from EMI survey in EMI1-EMI2 at a scale of 1:1250.

2 GENERAL CONSIDERATIONS & COMPLICATING FACTORS

2.1 Access & ground conditions

2.1.1 Ground conditions at the site were generally suitable for geophysical survey, the investigation area comprising mostly accessible level pasture land. Survey was precluded in M1 to the SW by outcropping geology, and in M4 to the NE by a cattle crush and poor terrain.

2.1.2 At the start of fieldwork c.3ha of the site, to the NE in both M2 and M4, was no longer available to geophysical survey, these locations having since been incorporated into the existing quarry.

2.2 Modern interference

2.2.1 Numerous small-scale ferrous responses are evident in the results from survey in M1-M4 and in EMI1. Ferrous responses are a common occurrence in magnetic survey data, and in most cases represent modern metal debris contained within the topsoil.

2.2.2 Large-scale ferrous responses are also evident in the results from survey in M2-M4. these deriving form survey in proximity to existing field boundaries, metal fencing and other modern surfaces bordering the investigation perimeter. A large ferrous response visible in the results from M2 and EMI1, c.30m S of DU021-038, corresponds to interference from a telegraph pole. Where subtle variations associated with buried archaeological remains may be present in proximity to large-scale ferrous responses such as these, they will likely remain beyond detection due to the range of interference encountered.

2.2.3 The route of a buried cable/service, possibly relating to the telegraph pole, is also evident in the results from M2/EMI1, and visible as a linear ferrous response extending in a south-easterly direction from the edge of the existing quarry.

2.2.4 High voltage overhead power cables traverse the south-western portion of the site and have contributed large-scale magnetic interference across c.60% of M1, with further interference noted to the SW in M2. Where subtle variations associated with buried archaeological remains may be present in proximity to this magnetic disturbance, these responses will likely remain beyond detection due to the range of interference encountered.

2.3 Former landuse

2.3.1 Remains of former cultivation are evident in the results from magnetic gradiometer survey in M2-M4, and visible as a series of closely spaced parallel linear anomalies aligned approximately NW-SE.

3 MAGNETIC GRADIOMETRY RESULTS

3.1 M1

3.1.1 The results from survey in M1 are dominated by large-scale magnetic disturbance deriving from high voltage overhead power cables traversing M1 NW-SE. Where subtle variations in response associated with buried archaeological remains may be present in this location, they will likely remain beyond detection due to the range of interference encountered.

3.1.2 One strongly magnetic positive response (1) has been recorded NW of survey centre in M1. Interpretation of this anomaly is tentative given its location within broad a region of magnetic disturbance deriving from high voltage power cables traversing this portion of the site. An archaeological interpretation should not be entirely dismissed. A possible archaeological origin for small-scale positive anomaly 2 at the eastern edge of M1 should also not be ignored, although a natural soil/geological or modern ferrous interpretation is expected for this response.

3.1.3 No further responses of note are indicated by the results from survey in M1.

3.2 M2

3.2.1 The remains of 2 circular enclosures (3-4) recorded immediately NE and SW of DU021-038 are evident to the N in M2. These measure c.25m in diameter, and comprise a series of concentric fragmented positive/negative curving responses containing further small-scale anomalies of likely significance. These enclosures are located in a broad region of increased magnetic response, and partially overlie the location of the suspected cairn referred to by the previous UCD LIDAR study.

3.2.2 Two large, external and overlapping enclosures (5-6) encompassing responses 3-4, extending over a total c.2.5ha across the north-western portion of M1, are also evident in the results. Enclosure 5 comprises a poorly defined series of positive/negative linear responses and trends, which are reniform in character and measure c.215m NE-SW by 114m NW-SE. Enclosure 6, which is roughly circular in form, is defined by a series of narrow and weakly magnetic curving responses and trends, and measures c. 170m in diameter. Two converging ditches (7-8) extend through the eastern interior of enclosure 6, with a further outer enclosure ditch (9) indicated to the E. Responses 5-6 correspond to the enclosure features identified by the previous UCD LIDAR study.

3.2.3 Numerous responses of likely archaeological significance have been recorded in association with enclosure/ditch remains 3-9. These comprise small-scale positive anomalies, irregular patterns of response, and weak trends. The most notable of these include strongly magnetic responses 10 and weak curvilinear trend 11 to the SW of enclosure 3; a cluster of potential pit/posthole features (12) to the NE of enclosure 4; and linear responses 13 to the E of enclosure 3. The potential that curvilinear response 11 represents a weakly magnetic circular enclosure should also be considered.

3.2.4 To the SE of survey centre in M2 a series of weakly magnetic curving trends (14) highlight the location of a possible further enclosure, c.23m in diameter, with a small-scale poorly defined positive (15) of potential significance at the interior. Response 14 corresponds to the location of a suspected bowl barrow identified by the previous UCD LIDAR study.

3.2.5 The results from survey in M2 also display an abundance of weakly magnetic anomalies, small-scale positive responses and linear trends, most notably a series of rectilinear responses (16) to the SW. Given the immediate archaeological context the potential that these represent linear remains, posthole and pit locations possibly associated with enclosures 3-6 should not be ignored. However, a natural soil/geological, recent landuse or modern ferrous origin for some of these responses should also be considered. A NE-SW band of natural soil/geological variation is evident at the southern limit of enclosure 6, and corresponds to a distinct change in topography noted at the time of fieldwork.

3.3 M3

3.3.1 No responses of definite archaeological character are indicated by the results from survey in M3. Small-scale positives of potential note and weak linear trends are evident in the results NW (17) and NE (18) of

survey centre, and to the SW (19). An archaeological interpretation for these anomalies is tentative, and a natural soil/geological or modern ferrous origin should not be dismissed.

3.3.2 No further responses of note have been recorded from magnetic gradiometer survey in M3.

3.4 M4

3.4.1 No responses of archaeological significance have been recorded from magnetic gradiometer survey in M4. The results from this survey location are dominated by modern ferrous and patterns of former cultivation.

4 EMI RESULTS

4.1 EMI1

4.1.1 The results from survey in EMI1 highlight the locations of the two enclosures recorded immediately NE and SW of DU021-038 by the magnetic gradiometer survey (3-4), which partially overlie the location of the suspected cairn referred to by the previous UCD LIDAR study. These are mostly evident in the apparent magnetic susceptibility results from the vertical dipole 0.5m depth range, and visible as two circular/curvilinear features (A & B), which measure c.24m in diameter. Response A is encompassed by a broad region of high conductivity/low magnetic susceptibility, potentially representing remains of the cairn referred to in the previous UCD LIDAR study, although interpretation remains uncertain.

4.1.2 Remnants of two external enclosures beyond A-B, which were also recorded by the magnetic gradiometer survey in M1 (5-6), and noted by the previous UCD LIDAR study, are evident in EMI1 as linear response C, which extends NW of survey centre on NE-SW alignment; and weak curving trends D, located W of survey centre heading to the SE.

4.1.3 Additional responses of potential note in EMI1 include strongly magnetic positive anomaly E, at the northern survey edge overlapping with enclosure response C; and a curving trend (F), representing remains of a possible further barrow referred to in the previous UCD LIDAR study.

4.1.4 Numerous poorly defined anomalies have also been recorded in EMI1. The exact origin of these remains uncertain. Whilst an archaeological interpretation for these anomalies poorly defined anomalies should not be entirely dismissed, they are mostly expected to derive from near surface variations in underlying soils and/or geology.

4.1.5 The route of a suspected buried cable/service, which was recorded by magnetic gradiometer survey in M2, is also apparent NE of survey centre in EMI1.

4.2 EMI2

4.2.1 Curving trends G at survey centre in EMI2 correspond to the weakly magnetic enclosure remains recorded to the SE in magnetic gradiometer area M2 (14), and highlight the location of a suspected barrow also referred to in the UCD LIDAR study.

4.2.2 No further responses of note have been recorded from EMI survey in EMI2.

5 CONCLUSION

5.1 The results from magnetic gradiometer survey and targeted EMI survey within the site boundary have recorded a substantial and highly significant complex of archaeological remains, which extends across the central portion of the proposed quarry development. This complex includes two enclosures, which border the upstanding remains of 18th century windmill DU021-038, and these enclosures are encompassed by two larger outer enclosures, the most substantial of which is c170m in diameter. The remains of at least one further enclosure, which a previous UCD LIDAR study suggests represents a probable bowl barrow, have also been recorded in locations M2/EMI2, in proximity to a minor road which forms the southern site boundary.

5.2 Multiple further responses of archaeological significance have also been recorded, the majority extending through magnetic gradiometer area M2.

5.3 The results from this geophysical survey largely correspond to the findings from the previous UCD LIDAR study, which concluded that the remains identified at Windmillhill represent part of a hillfort, likely centred on an earlier prehistoric funerary monument (Davis, 2014).

5.4 The potential significance of a number of poorly defined responses recorded in M1 and M3 should not be entirely ignored, although these anomalies are largely expected to derive from a combination of natural soil/geological variation, recent landuse and/or modern ferrous debris.

5.5 Elsewhere, the results from survey highlight remains of former cultivation, the route of a buried cable/service and an area of natural soil/geological variation.

*** This conclusion must be read in conjunction with the detailed discussion of the results included in the main section of this report.**

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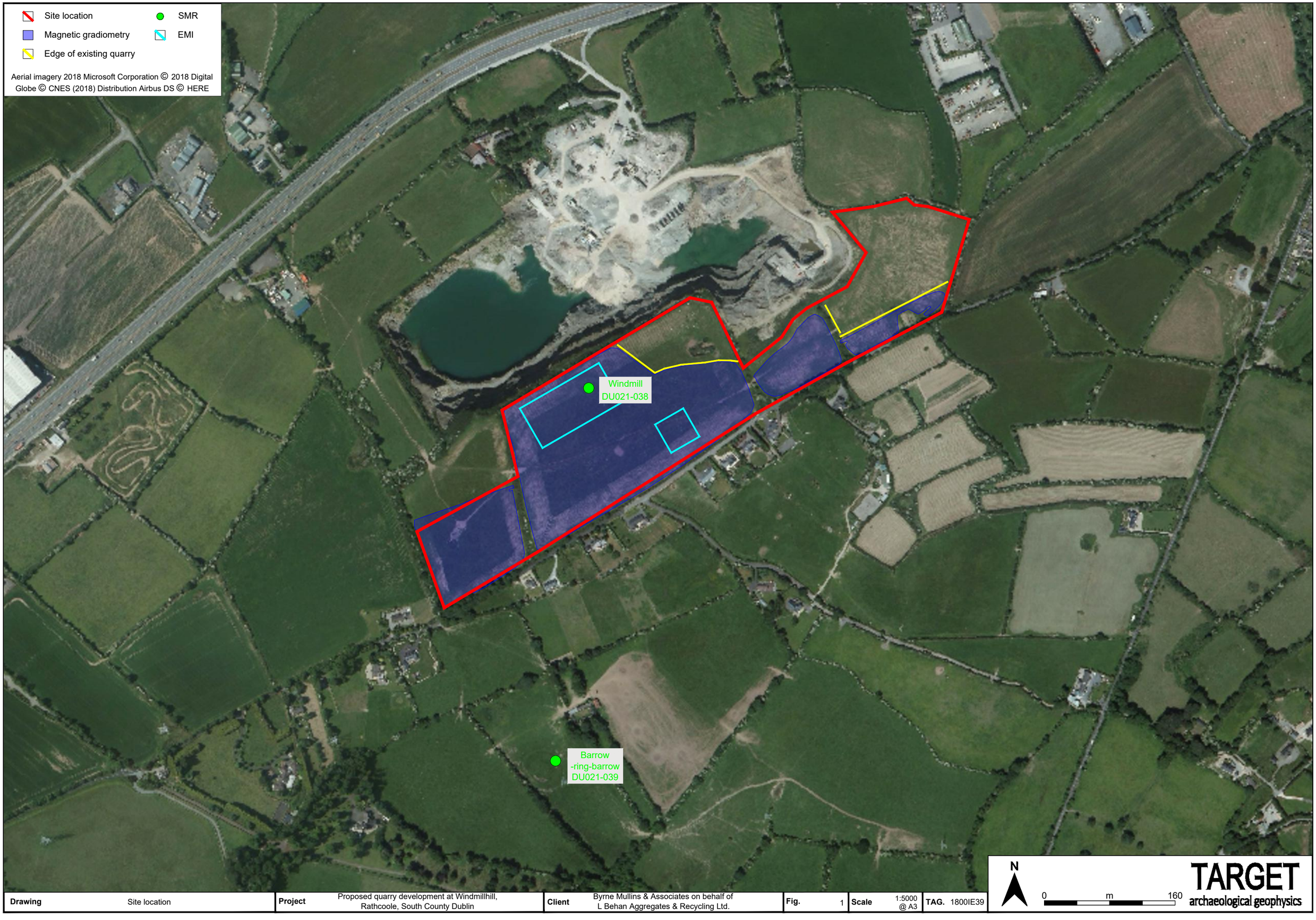
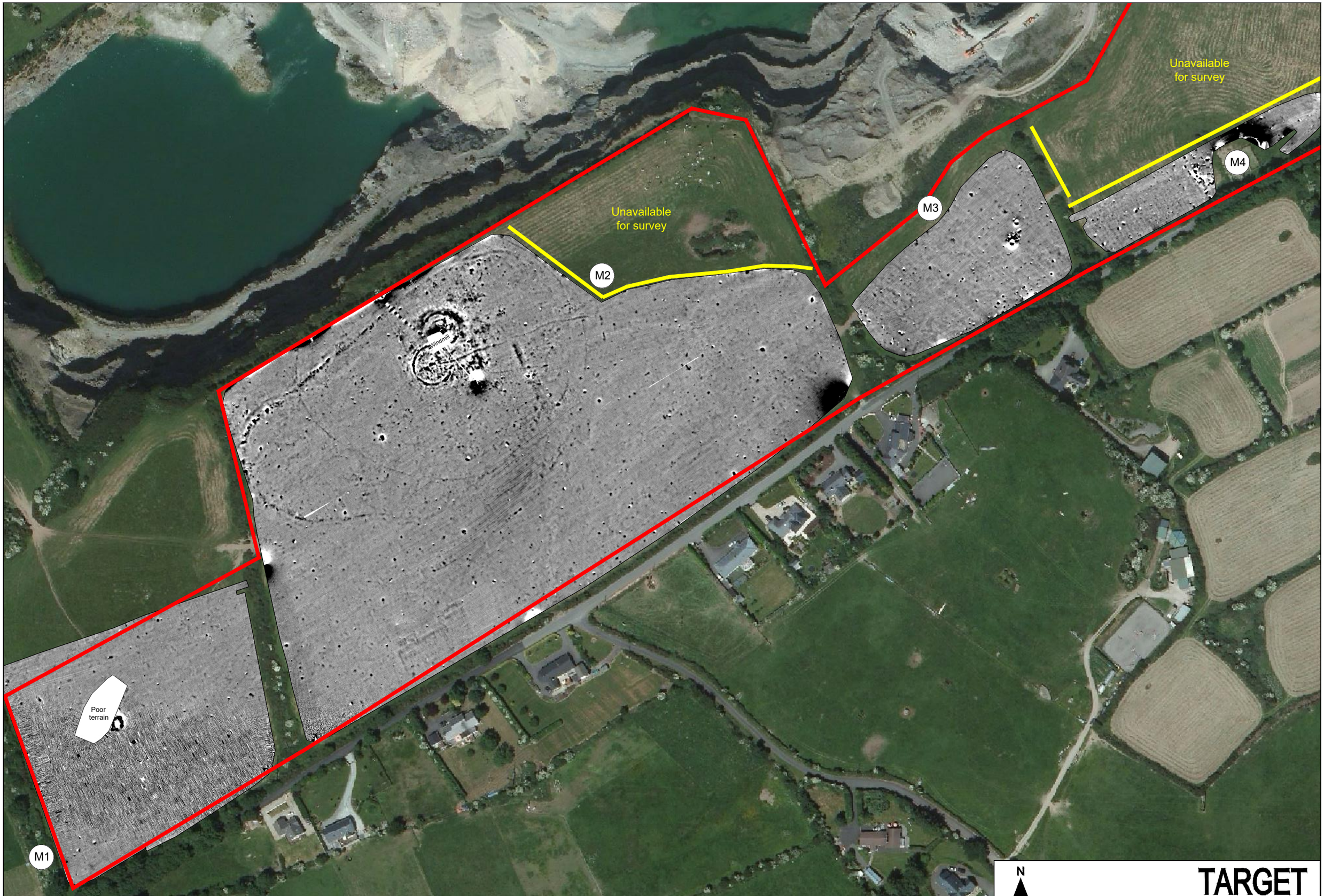
LIST OF FIGURES

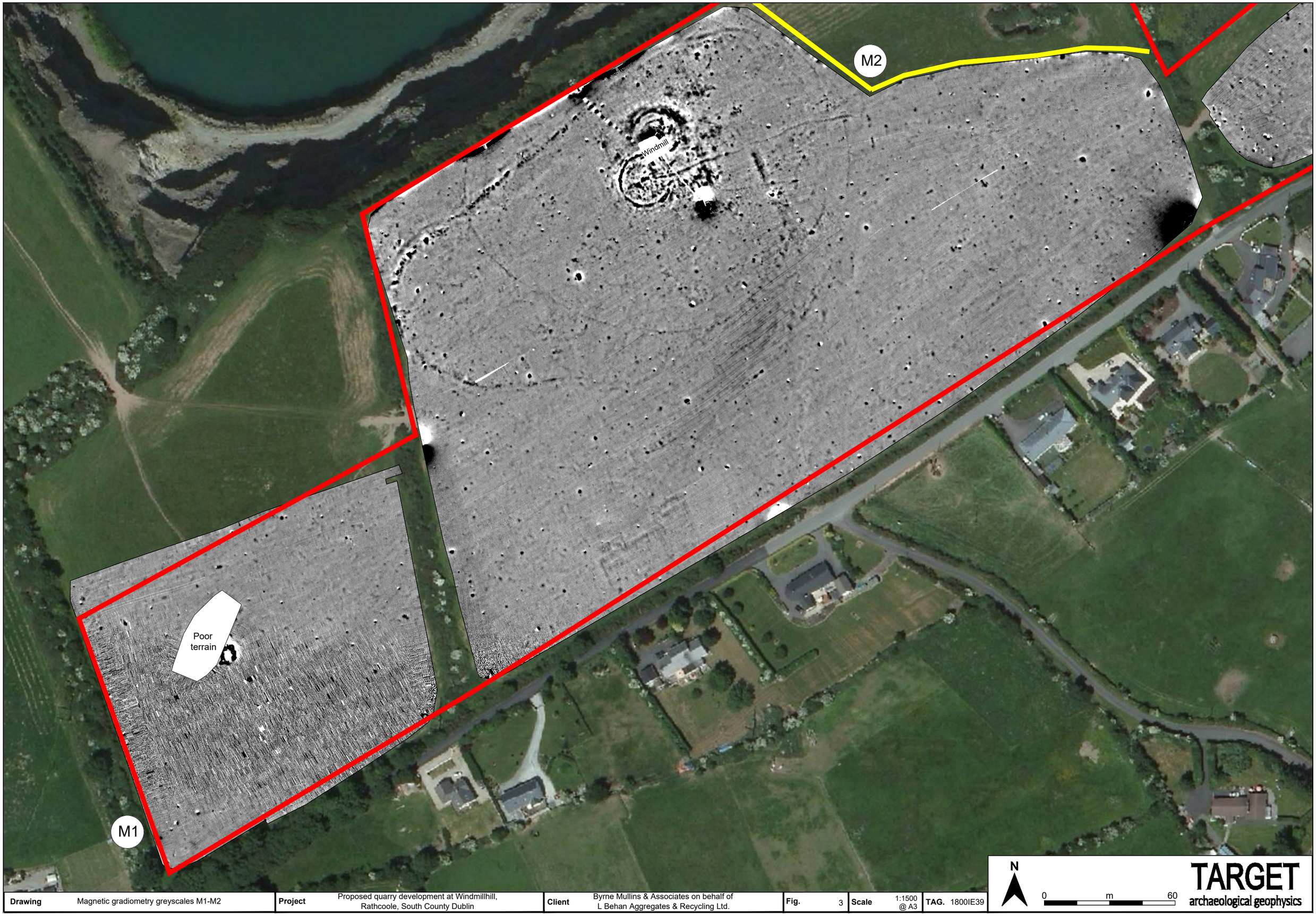


Drawing	Site location	**Project**	Proposed quarry development at Windmillhill, Rathcoole, South County Dublin	**Client**	Byrne Mullins & Associates on behalf of L Behan Aggregates & Recycling Ltd.	**Fig.**	1	**Scale**	1:5000 @ A3	**TAG.**	1800IE39

TARGET archaeological geophysics



Drawing	Magnetic gradiometry greyscales M1-M4	**Project**	Proposed quarry development at Windmillhill, Rathcoole, South County Dublin	**Client**	Byrne Mullins & Associates on behalf of L Behan Aggregates & Recycling Ltd.	**Fig.** 2	**Scale** 1:2000 @ A3	**TAG.** 1800IE39	TARGET archaeological geophysics



Drawing	Magnetic gradiometry greyscales M1-M2	**Project**	Proposed quarry development at Windmillhill, Rathcoole, South County Dublin	**Client**	Byrne Mullins & Associates on behalf of L Behan Aggregates & Recycling Ltd.	**Fig.**	3	**Scale**	1:1500 @ A3	**TAG.**	1800IE39

N

0 m 60

TARGET archaeological geophysics

Unavailable
for survey

Unavailable
for survey

M2

M3

M4

Drawing	Magnetic gradiometry greyscales M3-M4	**Project**	Proposed quarry development at Windmillhill, Rathcoole, South County Dublin	**Client**	Byrne Mullins & Associates on behalf of L Behan Aggregates & Recycling Ltd.	**Fig.**	4	**Scale**	1:1500 @ A3	**TAG.**	1800IE39

N

0 m 60

TARGET
archaeological geophysics

Archaeology -ditch
Archaeology - bank/mound
? Archaeology
?? Archaeology
Increased response
Trend
Buried cable/service
Cultivation
Natural
Magnetic disturbance
Ferrous

Unavailable for survey

Unavailable for survey

M1

M2

M3

M4

Windmill

Poor terrain

N

0 m 80

TARGET archaeological geophysics

Drawing	Magnetic gradiometry interpretations M1-M4	**Project**	Proposed quarry development at Windmillhill, Rathcoole, South County Dublin	**Client**	Byrne Mullins & Associates on behalf of L Behan Aggregates & Recycling Ltd.	**Fig.**	5	**Scale**	1:2000 @ A3	**TAG.**	1800IE39

Archaeology -ditch
Archaeology - bank/mound
? Archaeology
?? Archaeology
Increased response
Trend
Buried cable/service
Cultivation
Natural
Magnetic disturbance
Ferrous

M2
M1
Windmill
Poor terrain
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
19

N

0 m 60

TARGET archaeological geophysics

Drawing	Magnetic gradiometry interpretations M1-M2	**Project**	Proposed quarry development at Windmillhill, Rathcoole, South County Dublin	**Client**	Byrne Mullins & Associates on behalf of L Behan Aggregates & Recycling Ltd.	**Fig.** 6	**Scale** 1:1500 @ A3	**TAG.** 1800IE39

Archaeology -ditch
Archaeology - mound
? Archaeology
?? Archaeology
Increased response
Trend
Buried cable/service
Cultivation
Natural
Magnetic disturbance
Ferrous

Unavailable for survey

Unavailable for survey

M2

M3

M4

18

17

19

7

6

9

14

15

N

0 m 60

TARGET archaeological geophysics

Drawing	Magnetic gradiometry interpretations M3-M4	**Project**	Proposed quarry development at Windmillhill, Rathcoole, South County Dublin	**Client**	Byrne Mullins & Associates on behalf of L Behan Aggregates & Recycling Ltd.	**Fig.**	7	**Scale**	1:1500 @ A3	**TAG.**	1800IE39

Apparent conductivity

-9.4 mSm -8.02

EMI1

Windmill

EMI2

Apparent magnetic susceptibility

1.0163 ppt 1.092

EMI1

Windmill

EMI2

N

0 m 50

TARGET archaeological geophysics

Drawing	EMI greyscales EMI1-EMI2 - vertical dipole 0.5m depth range	**Project**	Proposed quarry development at Windmillhill, Rathcoole, South County Dublin	**Client**	Byrne Mullins & Associates on behalf of L Behan Aggregates & Recycling Ltd.	**Fig.**	8	**Scale**	1:1250 @ A3	**TAG.**	1800IE39

Apparent conductivity

8.38 mSm 12.7

EMI1

Windmill

EMI2

Apparent magnetic susceptibility

1.15 ppt 1.4

EMI1

Windmill

EMI2

N

0 m 50

TARGET archaeological geophysics

Drawing	EMI greyscales - vertical dipole 1.0m depth range	**Project**	Proposed quarry development at Windmillhill, Rathcoole, South County Dublin	**Client**	Byrne Mullins & Associates on behalf of L Behan Aggregates & Recycling Ltd.	**Fig.**	9	**Scale**	1:1250 @ A3	**TAG.**	1800IE39

Apparent conductivity

3.1 mSm 5.04

EMI1

Windmill

EMI2

Apparent magnetic susceptibility

1.15 ppt 1.85

EMI1

Windmill

EMI2

N

0 m 50

TARGET archaeological geophysics

Drawing	EMI greyscales - vertical dipole 1.8m depth range	**Project**	Proposed quarry development at Windmillhill, Rathcoole, South County Dublin	**Client**	Byrne Mullins & Associates on behalf of L Behan Aggregates & Recycling Ltd.	**Fig.**	10	**Scale**	1:1250 @ A3	**TAG.**	1800IE39

Enclosure
? Cairn
? Archaeology
?? Archaeology
Trend
Natural
Buried cable/service
Ferrous

EMI1
EMI2
Windmill
A
B
C
D
E
F
G

Drawing	EMI interpretations EMI1-EMI2	**Project**	Proposed quarry development at Windmillhill, Rathcoole, South County Dublin	**Client**	Byrne Mullins & Associates on behalf of L Behan Aggregates & Recycling Ltd.	**Fig.** 11	**Scale** 1:1250 @ A3	**TAG.** 1800IE39

N

0 m 50

TARGET archaeological geophysics

TARGET

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