

Geophysical Survey Report of Lands at Imphrick, Co. Cork



**Prepared for Jacobs Engineering
By Ger Dowling**

**Licence No.: 20R0016
Irish Transverse Mercator: 553511, 614540**

March 2020

SURVEY DETAILS

Project Name	Geophysical survey at Imphrick, Co. Cork
Licence No.	20R0016
Planning Ref.	N/A
Townland	Imphrick
Parish	Imphrick
Barony	Orrery and Kilmore
County	Cork
RMP No.	CO007-12001 and CO007-12002
Site Type	Church and Graveyard
ITM	553511, 614540
Land Use	Pasture
Geology	Yellow & red sandstone & green mudstone ('Kiltorcan Formation')
Soils	Sandstone till
Survey Type	Fluxgate Gradiometer
Instrument	Bartington Grad 601-2
Sample/Traverse interval	0.25m
Traverse interval	0.5m
Area surveyed	c.0.62ha
Licence Holder	Ger Dowling
Report Author	Ger Dowling
Report Status	Revision 1.3
Revision Date	19 March 2020
Document Reviewer	Bryn Coldrick
Approved By	Ed Danaher
File Name	Geophysical Survey Report_CLLC Project_Imphrick, Co. Cork_MARCH2020_v.1.3.docx

Archaeological Management Solutions Limited

Unit 1,

Hector Street Mills, Kilrush,

Co. Clare.

Tel: +353 (0)65 810 3001

www.ams-consultancy.com

Disclaimer

The results, conclusions and recommendations contained within this report are based on information available at the time of its preparation. Whilst every effort has been made to ensure that all relevant data has been collated, the author and AMS accept no responsibility for omissions and/or inconsistencies that may result from information becoming available subsequent to the report's completion.

© Archaeological Management Solutions Ltd 2020

Summary

This report details the results of a geophysical survey of lands at Imphrick, Co. Cork. The survey was undertaken on behalf of Jacobs Engineering to help inform an Environmental Impact Assessment Report (EIAR) currently being prepared for Iarnród Éireann's 'Cork Line Level Crossing Project'. The Project involves the removal/upgrading of seven separate level crossings located along the Cork to Dublin rail line. The survey area lies in the immediate vicinity of a Recorded Monument, a church and graveyard (CO007-12001 and CO007-12002).

The investigation, comprising high-resolution magnetic gradiometry, was undertaken by Ger Dowling of Archaeological Management Solutions (AMS) in mid-February 2020. This work resulted in the identification of an array of previously unknown features, many of which are of clear archaeological potential. Perhaps the most striking of these are three curving features to the east and south of the existing churchyard enclosure which may comprise the remains of an early (monastic/church?) enclosure. The dense concentration of other features mapped by the survey likely represents multi-period activity, perhaps involving settlement and/or agriculture.

The findings of the geophysical survey will help inform the scope of any potential future works at the target location. However, the geophysical results from Imphrick are complex and can only be unravelled by excavation.

Table of Contents

Disclaimer	2
Summary	3
Abbreviations and Definitions	5
1 Project Background	6
1.1 Survey Location and Aims.....	6
1.2 Proposed development	7
2 Archaeological Background	8
3 Survey Methodology and Instrumentation	9
3.1 Setting out	9
3.2 Data Management, Processing and Interpretation.....	9
3.3 General Considerations and Complicating Factors	10
3.3.1 Access and Ground Conditions.....	10
3.3.2 Modern Interference.....	10
3.3.3 Former Land Use	10
3.4 Anomaly Response	10
4 Survey Results	11
5 Conclusions	13
6 References	14
Figures	15

List of Tables

Table 1: Summary of level crossings & alternative options at the survey area.....	7
Table 2: Geophysical Survey Results.....	11

List of Figures

Figure 1: Site location map	
Figure 2: Location of the seven rail line crossing points proposed for upgrade	
Figure 3: Possible development (new road) at Imphrick and surrounding lands, Co. Cork	
Figure 4: Geophysical survey area, Imphrick	
Figure 5: Greyscale image of gradiometry results, Imphrick	
Figure 6: Interpretation plan of geophysical survey results, Imphrick	
Figure 7: Interpretation plan of survey results overlaid on Second-Edition (1905) Ordnance Survey Map, Imphrick	

Abbreviations and Definitions

Abbreviation	Definition
AMS	Archaeological Management Solutions Ltd
EIAR	Environmental Impact Assessment Report
GPS	Global Positioning System
ITM	Irish Transverse Mercator
MS	Magnetic susceptibility
OS	Ordnance Survey
QGIS	Quantum Geographical Information System (open-source GIS software product)
RMP	Record of Monuments and Places
SMR	Sites and Monuments Record

Coordinate System

All grid coordinates given in this report are in Irish Transverse Mercator (ITM).

1 Project Background

This report details the results of a geophysical survey undertaken at Imphrick townland, about 7km north of Buttevant, Co. Cork (Figure 1). The survey, comprising high-resolution magnetic gradiometry, was conducted 19 February 2020. The work was carried out on behalf of Jacobs Engineering to help inform an EIAR currently being prepared for Iarnród Éireann's 'Cork Line Level Crossing Project'. The Project involves the removal/upgrading of seven separate level crossings located along the Cork to Dublin rail line in order to reduce health and safety risks associated with the interface between road users and rail traffic (Figure 2).

An area of approximately 0.62ha in total was targeted for survey as part of the present investigation. The work was focused on lands in the immediate vicinity of Imphrick Church and Graveyard (CO007-12001 and CO007-12002) and was designed to help establish whether additional features of archaeological interest may be present that could potentially be affected by the Project. As far as can be ascertained, the target area had not been subject to archaeological investigation prior to the present study, which resulted in the discovery of an array of buried features, including portions of what may be several large enclosures as well as smaller enclosures and features of varying size and form.

1.1 Survey Location and Aims

The area targeted for investigation encompasses the eastern portion of large, flat field located directly adjacent to Imphrick Church and Graveyard (CO007-12001 and CO007-12002). Situated a short distance to the west of the Dublin–Cork rail line and the main Limerick–Cork road (N20), the field is currently in agricultural use (pasture) and is bounded by earthen banks topped by wire fences, hedges and trees, supplemented in places by drainage ditches. The field lies over Grey-Brown Podzolic soils, developed mainly from glacial drift of Devonian sandstone derivation, with gley and alluvial soils also occurring in the wider locality (General Soil Map; Quaternary Sediments Map).

The aim of the geophysical investigation was to:

- identify any geophysical anomalies of possible archaeological origin within the specified survey area;
- accurately locate these anomalies and present the findings in map form;
- describe the anomalies and discuss their likely provenance in a written report; and
- incorporate all of the above in a report to the Client.

The findings of the geophysical survey will help inform the scope of any potential future works at the target location.

1.2 Proposed development

It is the policy of Córas Iompair Éireann (CIÉ) and Iarnród Éireann (IÉ) to remove all railway level crossings where possible and practicable on the Irish Railway network due to the health and safety risks associated with the interface between road users and rail traffic.¹ The Commission for Railway Regulation recognises that railway level crossings are a significant area of risk and commits itself to working with work with IÉ to reduce risk at all railway level crossings.

IÉ is proposing to eliminate/upgrade level crossings on the Dublin-Cork line. There are currently seven public road level crossings, as shown in Figure 2, that remain in operation on the Dublin-Cork Line between Limerick Junction and Mallow stations. The crossings are located within a 24 km section of the line.

Four potential options were considered at Imphrick, as outlined in Table 1 below, with green-orange (Figure 3) being identified as preferred through a multi-criteria analysis (MCA). It is proposed to close the existing XC215 level crossing and divert the traffic, along a new section of local road, to an existing road-over-rail bridge to the north. The existing tie-in to this bridge will be improved, it is also proposed to upgrade the existing junction onto N20 national road at this location, to accommodate the increase in traffic numbers. The remaining sections of the existing local road pavement to the east and west of the closed level crossing will be retained where required to allow access to properties or broken up and removed where no longer required. Additional geophysical survey will be conducted along the Green Route to help further inform the Project.

Table 1: Summary of level crossings & alternative options at the survey area

Imphrick:* XC215	Option 1 (Figure 3)	Green-Orange	New road alignment to northeast of level crossing to connect with upgraded junction at existing road over rail bridge. Upgrade existing junction on N20.
	Option 2 (Figure 3)	Green-Pink	New road alignment to northeast of level crossing. Extend diversion to existing junction on N20 with some traffic restrictions required at existing improved bridge junction.
	Option 3	Blue-Orange	New road alignment to northwest of level crossing to connect with upgraded junction at existing road over rail bridge. Upgrade existing junction on N20.
	Option 4	Blue-Pink	New road alignment to northwest of level crossing. Extend diversion to existing junction on N20 with some traffic restrictions required at existing improved bridge junction.

*** Designated 'Shinanagh (XC215)' on Jacobs' documentation but for purposes of the present geophysical survey is referred to as 'Imphrick'**

¹ Cork Line Level Crossing Project, Screening Report Updated. Available online at <https://www.irishrail.ie/about-us/iarnrod-eireann-projects-and-investments/cork-line-level-crossings-project>. Accessed 18 March 2020.

2 Archaeological Background

The survey area is adjacent to Imphrick Church and Graveyard (CO007-12001 and CO007-12002). A holy well (CO007-121) is situated a short distance to the east, on the opposite side of the Cork–Dublin rail line. The SMR describes these Recorded Monuments as follows:

Church CO007-12001

*In NW corner of graveyard (14583). Ruin of rectangular church (int. greater than 17.3m E-W; int. 4.85m N-S), heavily ivy-clad. West gable with returns of N (int. L 8.3m) and S (int. L 8.3m) walls all that now stand. West gable crowned by bellcote (see photograph Grove White 1905-25, vol. 3, opp. 186). High up on gable is window with single flat-headed light high. Gap in N wall (Wth 1.4m), immediately E of W gable, may mark site of doorway. External projection at W end of S wall may be remains of annexe (church depicted on 1842 OS 6-inch map as irregular 'T-shaped' structure) or may mark buttress (see photograph, *ibid.*). Also in N wall is ruined doorway covered by segmental arch. Line of S wall continues to E of standing portion as overgrown rise; position of E gable probably marked by similar rise and burial vault, c. 9m E of standing portions of N and S walls. A 1906 account of church (*ibid.*, 186) describes 'three different styles...of architecture', two different in age but ancient, the third 'more recent improvements...executed by the Holmes family, whose monument [dated 1757]...is so conspicuous an object'. Adjoining and parallel to church on S side were 'the foundations and part of the walls of some structure...nearly 30 feet by about 12 feet...[which] appears to be quite as old as the main building itself' (*ibid.*). Remains of parish church of Imphrick. Reported 'in ruins' in 1615 (Brady 1863, vol. 2, 306). A church here listed in Papal Taxation of 1291 (*ibid.*).*

Graveyard CO007-12002

In pasture, c. 100m N of road. Subrectangular graveyard (c. 40m E-W; c. 30m N-S), enclosed by low earthen bank. Ruin of parish church of Imphrick (14424) in NW corner. Much of graveyard densely overgrown; earliest headstone noted, inside N wall of church, dated 1783; recent burial near entrance to E. Grove White (1905-25, vol. 3, 186) noted monument to Holmes, dated 1757- may be overgrown vault at E end of church. Burials dated 1762 and 1790 have also been recorded (Grove White 1913-16, 241).

Ritual site - holy well CO007-121

Named 'Tobernadeecla' on 1842 OS 6-inch map. In small field on W side of road. Access to field by gate from road and to well area by stile. Rectangular well enclosed and partially covered by low stone surround. Votive offerings surround well and rags adorn over-hanging bush.²

A number of low-profile earthworks and depressions are visible in the field surrounding the church. These features, which were noted by AMS staff during field reconnaissance carried out (10 October 2020) as part of an archaeological assessment of the site,³ may be buried ditches, denuded earthen banks and/or other archaeological features. Some may be associated with the church site or settlement surrounding the medieval parish church.

² Historic Environment Viewer. Available online at <http://webgis.archaeology.ie/historicenvironment/>. Accessed 4 March 2020.

³ Bryn Coldrick, *pers. comm.*

3 Survey Methodology and Instrumentation

The survey involved magnetic gradiometry. This technique measures changes in the magnetic properties of the soil and is widely used in modern archaeological investigations due to its ability to detect a broad range of sub-surface archaeological remains, including ditches and pits, burnt and/or industrial features associated with metalworking and pottery production.

The magnetic survey was conducted using a Bartington Grad 601-2 (dual system) fluxgate gradiometer. The investigations were conducted over a large, irregularly shaped grid with maximum dimensions of 130m north–south by 110m east–west (total area c.0.62ha) (Figure 4).

The data capture strategy involved logging readings at 0.25m intervals on traverse lines spaced 0.5m apart within each 20 x 20m grid panel, giving a total of 3,200 individual measurements of magnetic data per grid panel. This sampling strategy will provide clarity to any archaeological features detected.

3.1 Setting out

The exact location of the survey area (divided into 20 x 20m grid panels) was selected in GIS software QGIS using a range of base mapping products. Once selected, the precise ITM grid coordinates of the survey panels were transferred to a GPS Field Controller (Lecia Viva GS14), which was used in the field to precisely ‘stake-out’ the position of the grid panels. The highly accurate positioning of the survey grids provides strong confidence when integrating the geophysical results with other datasets such as aerial imagery in GIS, and also ensures repeatability should further investigation of anomalies (e.g. test excavation) be required.

3.2 Data Management, Processing and Interpretation

Survey data was logged to a laptop computer and archived to an external hard drive. The collated data was processed using Geoplot 3.0 software. This involved:

- Clipping the dynamic range of the dataset to enhance weaker anomalies;
- Edge-matching of adjacent survey panels;
- Removal of occasional striping due to sensor mismatch; and
- Interpolation of the dataset (from 0.5m to 0.25m in traverse spacing) to improve the visual quality.

The processed data was imported into QGIS for final image production (Figures 5–7). Final geophysical datasets have been formatted as raster data models to enable subsequent geospatial analysis. Fieldwork, data processing and reporting adhered to the most up-to-date guidelines for conducting archaeo-geophysical surveys (Schmidt et al. 2016). All geophysical raster datasets will be

digitally archived to best practice (e.g. Nevin 2012; Schmidt & Ernenwein 2012).

3.3 General Considerations and Complicating Factors

3.3.1 Access and Ground Conditions

The target land comprised pasture and is bounded by an earthen bank topped by trees, hedges and a wire fence.

3.3.2 Modern Interference

Small-scale ferrous responses were evident in the results from across the survey area. These are a common occurrence in magnetic survey data, and in most cases represent modern metal debris contained within the topsoil. A small area of ferrous disturbance deriving from survey in proximity to the mesh-covered timber fence was recorded in the southern and eastern sectors of the survey area.

3.3.3 Former Land Use

Two, roughly east–west orientated, relict field boundaries (marked as ‘15’ and ‘16’ on Figure 6) are indicated in the survey results. Boundary ‘15’ is recorded on the first-edition OS map (1844), while boundary ‘16’ is marked the second-edition map (1905).

3.4 Anomaly Response

The survey results from Imphrick are somewhat unexpected and present interpretative difficulties as many of the linear, curvilinear and other anomalies recorded display a negative magnetic signature. Such a response could reflect the presence of buried stone walls and/or compact earth/stone (redeposited?) features, though in this case it is perhaps more likely to represent ditch deposits and other ‘cut’ fills.

The negative signature is opposite of those typical for ditches, however, which tend to exhibit a positive response deriving from a build-up of magnetically enhanced materials in their fill. The characteristic negative response of many of the anomalies mapped at Imphrick could relate, in part, to a lack of magnetic susceptibility (MS) or enhancement of the ditch deposits and/or the depletion of magnetic elements (e.g. iron oxides) in the fills owing to waterlogging and/or other natural, mineralogical processes. The low MS values of the probable ditch deposits relative to the higher MS values of the surrounding topsoils could also contribute to their negative magnetic expression. These explanations are tentative and further work (e.g. testing) is required to establish a greater understanding of the magnetic responses.

4 Survey Results

Table 2: Geophysical Survey Results

Townland	Imphrick		
ITM (Easting/ Northing)	553511, 614540		
Area surveyed (hectares)	0.62		
Figure Numbers	5–7		
Anomaly Number	Form/nature of anomaly	Possible sources(s) of anomaly	Comparative discussion
1	Negative curvilinear anomaly	Archaeology	Curving ditch (length of arc c.68m), may form part of large enclosure. Appears to correspond to cropmark visible on Bing aerial imagery that extends NW beyond the survey area.
2	Negative curving anomaly	Archaeology	Curving ditch, traced for approx. 44m NE–SW. May form part of large enclosure and appears to run parallel to (3), approx. 8.5m to the south.
3	Negative curving anomaly	Archaeology	Curving ditch, c.44m in length (NE–SW). May form part of large enclosure and be associated with (2), approx. 8.5m to the north.
4	L-shaped negative anomaly	Archaeology	Portion of possible rectangular-shaped ditch; may be indicative of former field or other boundary-type feature. Corresponds to a cropmark visible on Bing aerial imagery that extends NW beyond the survey area.
5	Negative linear	Archaeology	Possible ditch, approx. 30m in length (NW–SE).
6	Integrated array of slender negative linears	Archaeology	Rectilinear pattern of possible narrow ditches/drains, perhaps indicative of former field system, boundary plots or other archaeological features. Extends across a small part of the survey area, at SW end of (2) and (3), and may be associated with (4).
7	Negative curving anomaly	Archaeology	Segment of possible narrow ditch, traced for approx. 19m roughly N–S.
8	Negative linear	Archaeology	Possible ditch, approx. 35m in length (E–W).
9	Negative linear	Archaeology	Possible ditch, approx. 23m in length (NW–SE).
10	Negative linear	Archaeology	Possible ditch, approx. 35m in length (E–W).
11	Negative curvilinear anomaly	Archaeology	Possible ditch or stone/compacted earth feature. May comprise part of a former field or boundary plot.
12	Slender negative linear	Archaeology	Possible narrow ditch/drain, oriented NE–SW.

13	Slender negative linear	Archaeology	Possible narrow ditch/drain, oriented NW–SE.
14	Negative arcuate anomaly	Possible archaeology	Possible curving ditch, approx. 10m in diameter.
15	Slender negative linear	Agricultural	Relict field boundary, oriented roughly E–W. Marked on first-edition OS map (1844).
16	Negative linear	Agricultural	Relict field boundary, oriented roughly E–W. Marked on second-edition OS map (1905).
	Multiple, faint negative lineations	Possible Archaeology	Possible narrow ditches/drains or stone/compacted earth features.
	Multiple, faint negative linear trends	Possible Archaeology	Possible narrow ditches/drains or stone/compacted earth features.
	Multiple, broad, amorphous areas of areas of high responses	Possible archaeology	Might reflect localised variations in soils due to past human activity; may mask weaker archaeological features.
	Multiple ferrous responses	Likely modern	Ferrous debris.
	Small areas of ferrous/magnetic disturbance	Modern	Disturbance from adjacent wire fence.

5 Conclusions

Magnetic gradiometry survey next to Imphrick Church and Graveyard has revealed an array of previously unknown features, many of which are of clear archaeological potential. Perhaps the most striking of these are three curving features (1–3) to the east and south of the existing churchyard enclosure which may comprise the remains of an early (monastic/church?) enclosure.

While the precise extent and significance of the latter anomalies is uncertain, the dense concentration of other, linear and curvilinear anomalies (4–14) recorded across the survey area likely reflects extensive multi-period activity, perhaps involving settlement and/or agriculture. Of more recent origin are the remains of two relict field boundaries (15 & 16) shown on both the first- and second-edition OS maps (1844 and 1905 respectively). Overall, the geophysical results from Imphrick are complex and can only be unravelled by excavation.

6 References

- Archaeology Data Service/Digital Antiquity. Guides to Good Practice. [Online] Available from: http://guides.archaeologydataservice.ac.uk/g2gp/Geophysics_Toc
- General Soil Map (2nd ed.), National Soil Survey. [Online] Available from: <https://www.teagasc.ie/media/website/environment/soil/General-Map.pdf>
- Quaternary Sediments Map; Geological Survey Ireland Spatial Resources, Public Data Viewer Series. [Online] Available from: <https://www.arcgis.com/apps/MapSeries>
- Nevin, K. 2012. *Raster images: a guide to good practice*. Archaeology Data Service/Digital Antiquity, Guides to Good Practice. [Online] Available from: https://guides.archaeologydataservice.ac.uk/g2gp/RasterImg_Toc
- Schmidt, A. and Ernenwein, E. 2012. *Guide to good practice: geophysical data in archaeology*. Second edition.
- Schmidt A., Linford P., Linford N., David A., Gaffney C., Sarris A., and Fassbinder J. 2016. *EAC Guidelines for the Use of Geophysics in Archaeology: Questions to ask and points to consider*. EAC Guidelines 2. [Online] Available from: <https://bradscholars.brad.ac.uk/handle/10454/8129>

Figures

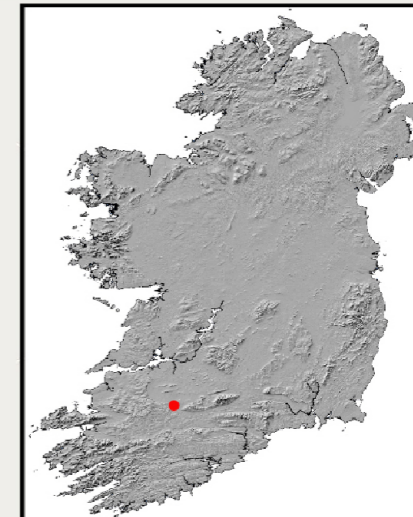
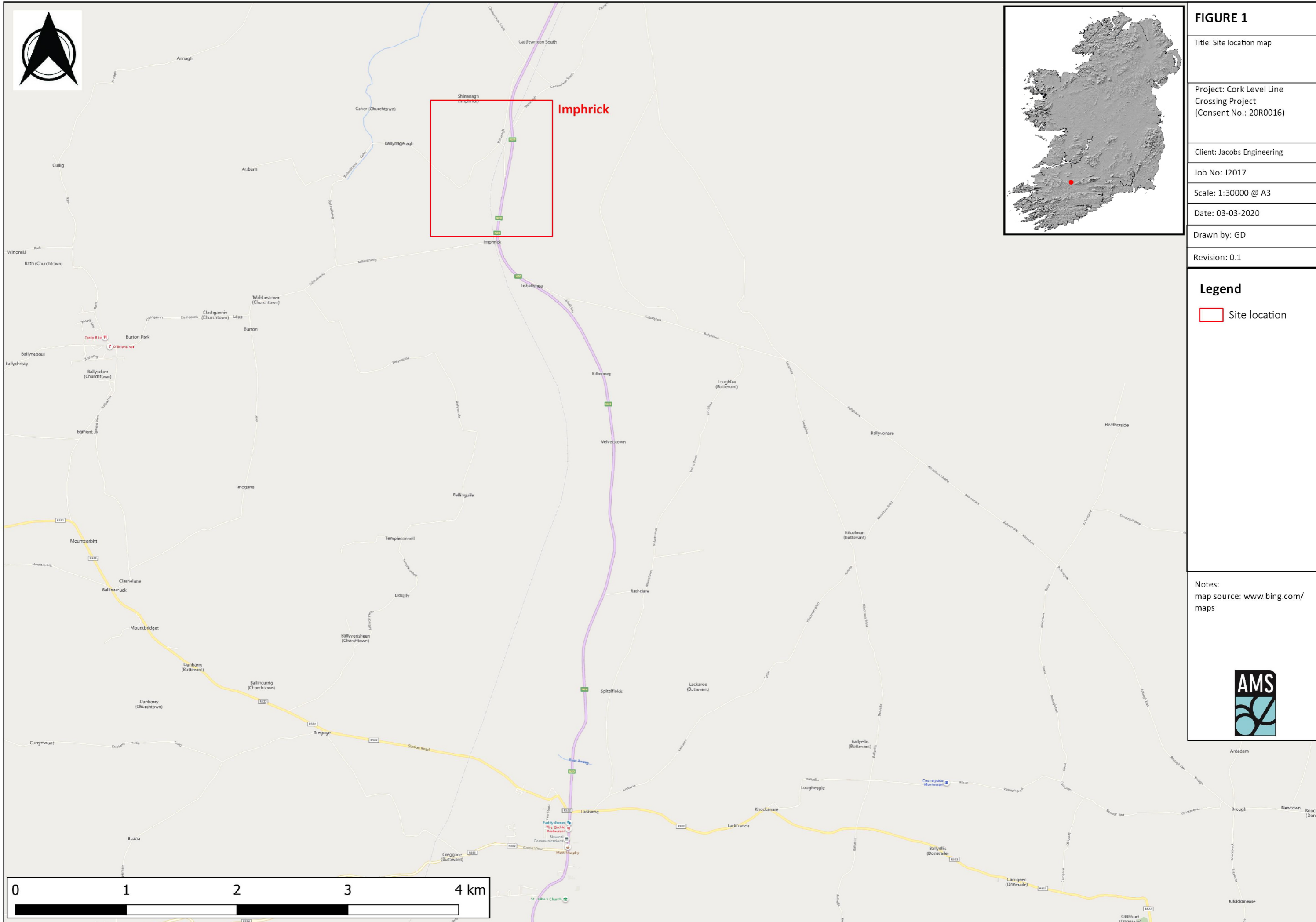


FIGURE 1

Title: Site location map

Project: Cork Level Line Crossing Project
(Consent No.: 20R0016)

Client: Jacobs Engineering

Job No: J2017

Scale: 1:30000 @ A3

Date: 03-03-2020

Drawn by: GD

Revision: 0.1

Legend

Site location

Notes:
map source: www.bing.com/maps



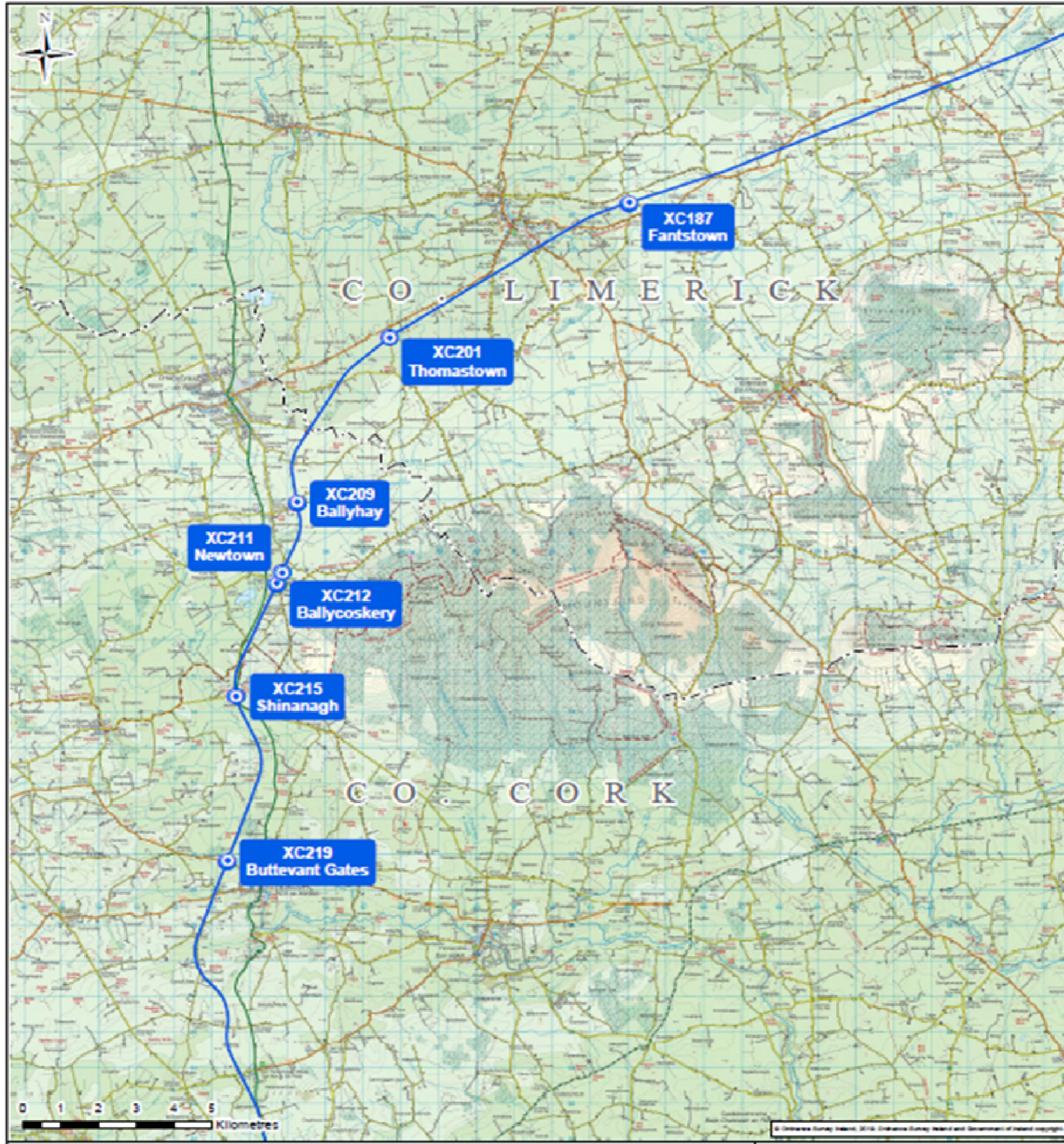


FIGURE 2

Title: Location of the seven rail line crossing points proposed for upgrade

Project: Cork Level Line Crossing Project (Consent No.: 20R0016)

Client: Jacobs Engineering

Job No: J2017

Scale: N/A

Date: 04-03-2020

Drawn by: GD

Revision: 0.1

Notes: Map provided by Jacobs Engineering



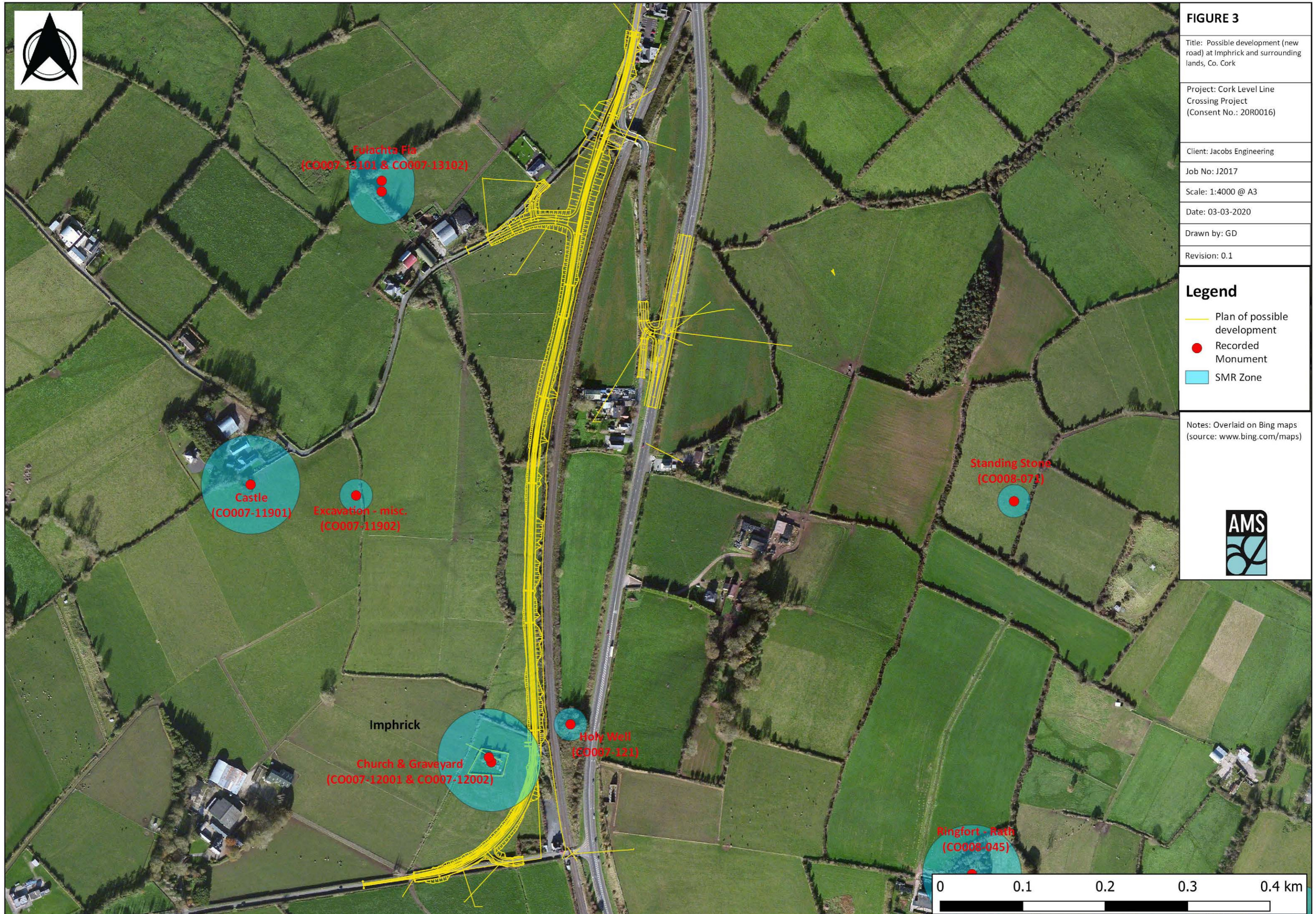


FIGURE 3

Title: Possible development (new road) at Imphrick and surrounding lands, Co. Cork

Project: Cork Level Line Crossing Project
(Consent No.: 20R0016)

Client: Jacobs Engineering

Job No: J2017

Scale: 1:4000 @ A3

Date: 03-03-2020

Drawn by: GD

Revision: 0.1

Legend

- Plan of possible development
- Recorded Monument
- SMR Zone

Notes: Overlaid on Bing maps
(source: www.bing.com/maps)



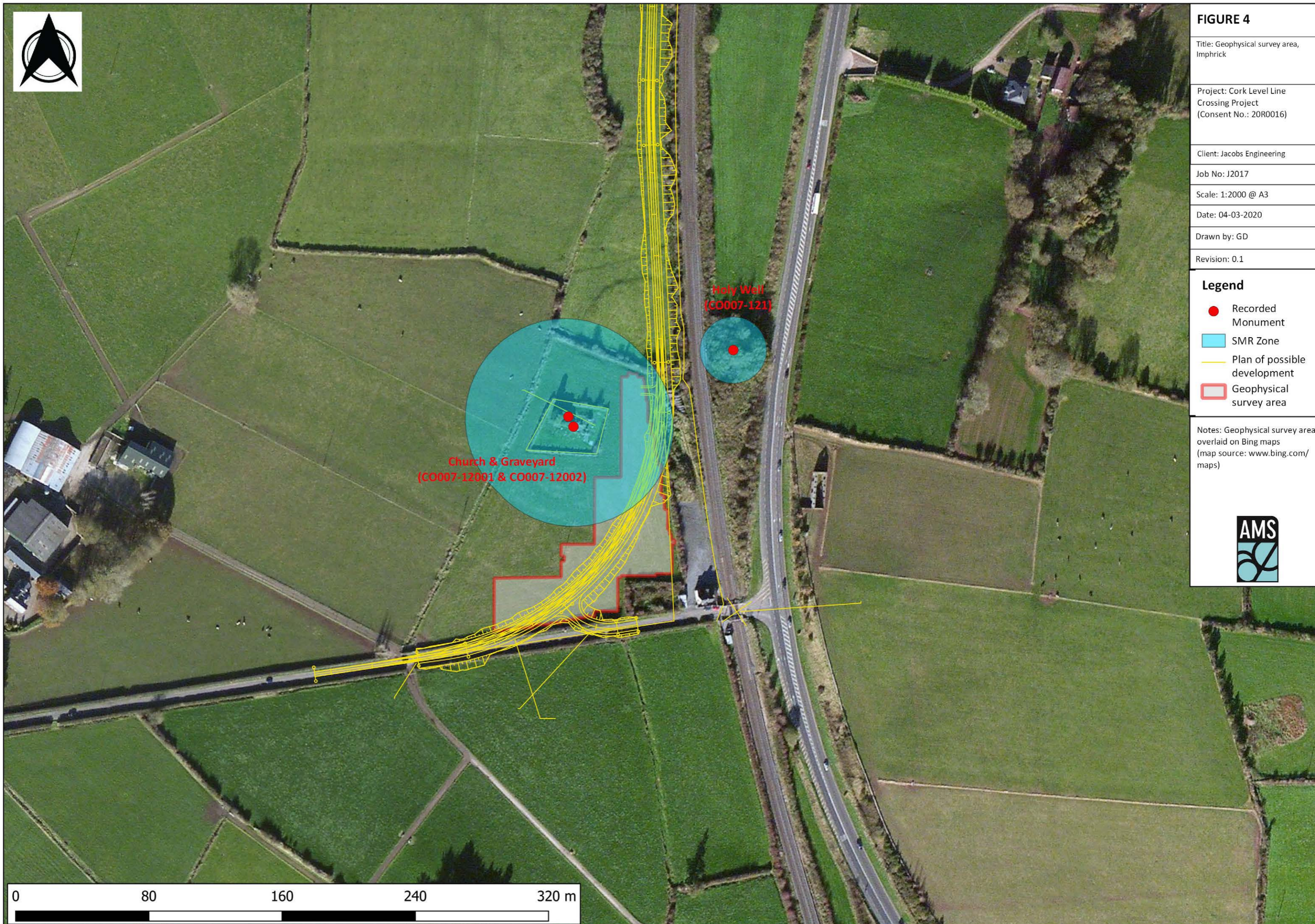


FIGURE 4

Title: Geophysical survey area, Imphrick

Project: Cork Level Line Crossing Project
(Consent No.: 20R0016)

Client: Jacobs Engineering

Job No: J2017





Scale: 1:2000 @ A3

Date: 04-03-2020

Drawn by: GD

Revision: 0.1

Legend

-  Recorded Monument
-  SMR Zone
-  Plan of possible development
-  Geophysical survey area

Notes: Geophysical survey area overlaid on Bing maps
(map source: www.bing.com/maps)



0 80 160 240 320 m



FIGURE 5

Title: Greyscale image of gradiometry results, Imphrick,

Project: Cork Level Line Crossing Project
(Consent No.: 20R0016)

Client: Jacobs Engineering

Job No: J2017

Scale: 1:1000 @ A3

Date: 25-02-2020

Drawn by: GD

Revision: 0.1

Legend

- Recorded Monument

Notes: Geophysical survey results overlaid on Bing aerial imagery
(map source: www.bing.com/maps)



0 40 80 120 160 m

-10 nT 10



FIGURE 6

Title: Interpretative Plan of geophysical survey results, Imphrick

Project: Cork Level Line Crossing Project (Consent No.: 20R0016)

Client: Jacobs Engineering

Job No: J2017

Scale: 1:600 @ A3

Date: 04-03-2020

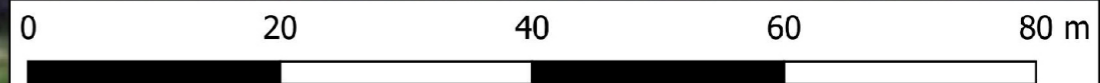
Drawn by: GD

Revision: 0.1

Legend

- Survey Area
- █ Archaeology
- █ ?Archaeology
- - - ?Archaeology (trend)
- █ Feature on early Ordnance Survey mapping
- █ Area of increased response
- █ Magnetic disturbance
- █ Ferrous response
- Recorded Monument

Notes: Interpretative plan overlaid on Bing aerial imagery (map source: www.bing.com/maps)



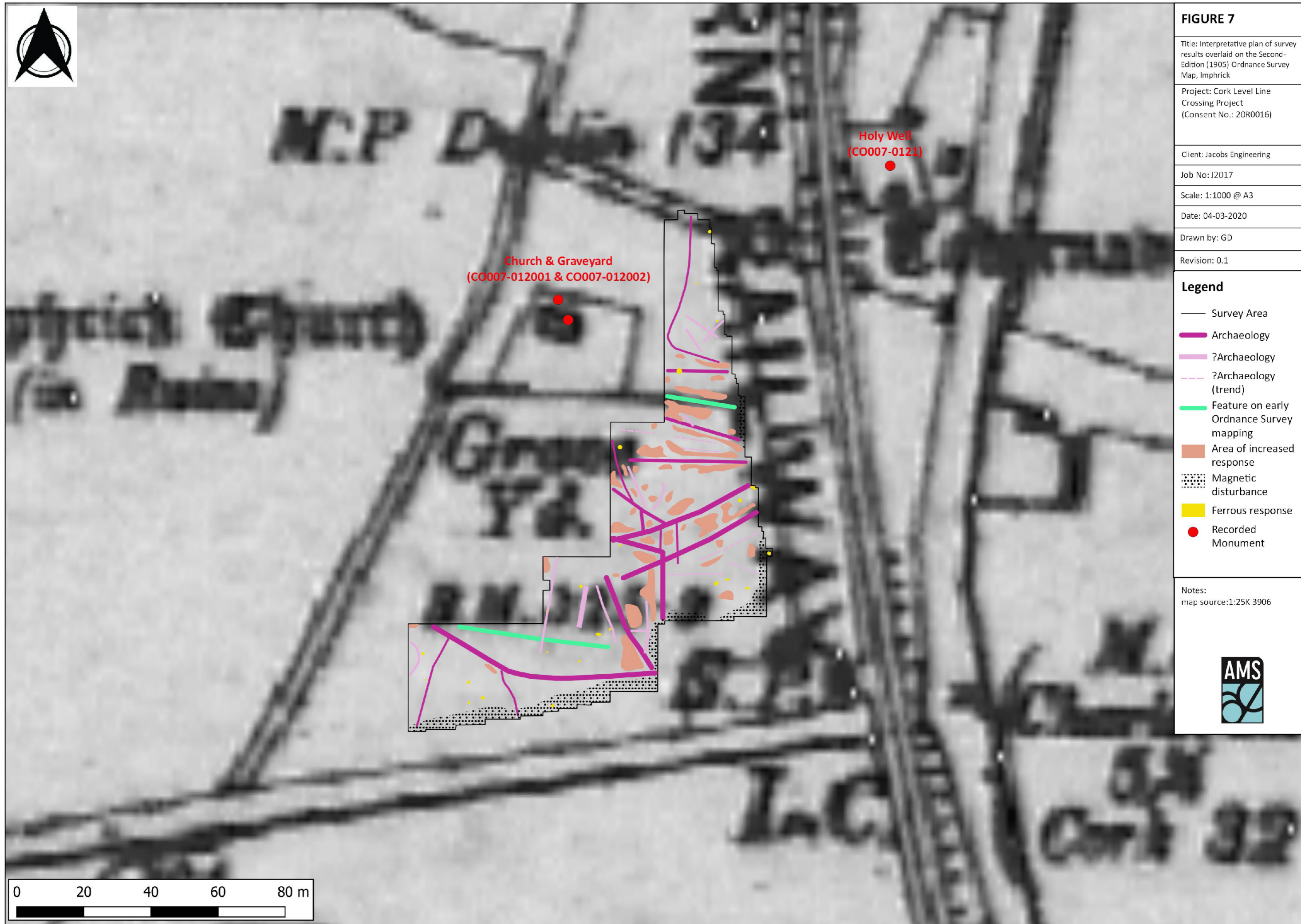


FIGURE 7

Title: Interpretative plan of survey results overlaid on the Second-Edition (1905) Ordnance Survey Map, Imphrick

Project: Cork Level Line Crossing Project (Consent No.: 20R0016)

Client: Jacobs Engineering

Job No: J2017

Scale: 1:1000 @ A3

Date: 04-03-2020

Drawn by: GD

Revision: 0.1

Legend

- Survey Area
- Archaeology
- ?Archaeology
- - - ?Archaeology (trend)
- Feature on early Ordnance Survey mapping
- Area of increased response
- Magnetic disturbance
- Ferrous response
- Recorded Monument

Notes:
map source:1:25K 3906

